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# **Biodiversity Development Assessment Report (BDAR)**



**Mamre South Precinct, Kemps Creek**

**Proposed Industrial Subdivision**

Prepared for: ALTIS Property Partners Pty Ltd and and Frasers Property Australia

**22 March 2019**

**Biodiversity Development Assessment Report, Mamre South Precinct, Kemps Creek,  
Western Sydney Employment Area**

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<b>PROJECT NAME</b>	Biodiversity Development Assessment Report (BDAR) – Mamre South Precinct, Kemps Creek, Western Sydney Employment Area	
<b>PROJECT ADDRESS</b>	Lot 34 // DP 1118173, Lot 1 // DP 1018318, Lot X // DP 421633, Lot Y // DP 421633 and Lot 22 / 258414, Mamre Road, Kemps Creek, NSW, 2178	
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# Glossary and abbreviations

Acronym	Description
BAM	Biodiversity Assessment Methodology
BC Act	NSW <i>Biodiversity Conservation Act 2016</i>
BC Reg	<i>Biodiversity Conservation Regulation 2017</i>
BCT	Biodiversity Conservation Trust
BDAR	Biodiversity Development Assessment Report
CEEC	Critically Endangered Ecological Community
DA	Development Application
DoEE	Commonwealth Department of the Environment and Energy
DNG	Derived Native Grassland
DPE	NSW Department of Planning and Environment
EEC	Endangered Ecological Community
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
ha	hectare(s)
HBT	Hollow Bearing Tree
IBRA	Interim Bioregionalisation of Australia
km	kilometre
LGA	Local Government Area
masl	Metres above sea level
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
PCT	Plant community type, as defined by OEH (2018)
PLEP	Penrith Local Environmental Plan 2010
SAII	Serious and Irreversible Impacts
SEARs	Secretary's Environmental Assessment Requirements
SSD	State Significant Development
TEC	Threatened Ecological Community, listed as vulnerable, endangered or critically endangered under either the BC Act and/or EPBC Act
WSEA	Western Sydney Employment Area

# 1. Introduction

## 1.1 Background

This Biodiversity Development Assessment Report (BDAR) has been undertaken to address the Secretary's Environmental Assessment Requirements (SEARs), for the proposed State Significant Development application (SSD9522), located at Lot 34 // DP 1118173, Lot 1 // DP 1018318, Lot X // DP 421633, Lot Y // DP 421633 and Lot 22 // 258414, Mamre Road, Kemps Creek, NSW (the 'subject land').

The study area covers an area of approximately 118 ha which includes part of the Bakers Lane Road corridor. Within the study area, the subject land covers an area of approximately 103.71 ha, which is zoned RU2 – Rural Landscape under the *Penrith Local Environmental Plan* (PLEP 2010). The subject site addressed under SEPP Western Sydney Employment Area (WSEA) and includes provisions for a proposed Warehouse, Logistics and Industrial Facilities Hub, similar to that in the north of the subject land and the adjacent Erskine Business Park, east of Mamre Road.

The SEARs issued by the Department of Planning and Environment (DPE), request a detailed assessment of the biodiversity impacts, in accordance with the Biodiversity Assessment Methodology (BAM) and documented in a BDAR in the form required by Section 6.12 of the *Biodiversity Conservation Act 2016* (BC Act) and Section 6.8 of the *Biodiversity Conservation Regulation 2017* (BC Reg).

This BDAR has been prepared by Lucas McKinnon, an Accredited Assessor (BAAS17012) under the BC Reg, and is consistent with the BAM (OEH 2017a).

Sources of information for this report included:

- NSW Planning Portal (NSW Dept. of Planning and Environment 2018)
- BioNet Atlas of NSW Wildlife (NSW Office of Environment and Heritage 2018a)
- Biodiversity Values map (OEH 2018b)
- Western Sydney native vegetation mapping (NPWS 2002 and OEH 2015)
- SIX Maps (LPI 2018)
- Threatened Biodiversity Data Collection (OEH 2018c)

## 1.2 Location and site identification

The 'study area' incorporates the entirety of Lot 34 // DP 1118173, Lot 1 // DP 1018318, Lot X // DP 421633, Lot Y // DP 421633 and Lot 22 // 258414 (Mamre Road, Kemps Creek, NSW, **Figure 1.1**). The study area is situated in the Penrith Local Government Area (LGA) and is zone RU2 – Rural Landscape with E2 – Environmental Conservation zoning of the land directly adjacent to South Creek. The study area is pursuant to SEPP WSEA. The total area, including the redevelopment of Bakers Lane, comprises 118 ha. Within the study area, the land proposed for development is referred to as the 'subject land' and covers an area of 103.71 ha. The subject land is predominately comprised of exotic pasture, degraded riparian vegetation, scattered paddock trees and farms dams.

The subject land is bounded by Mamre Road in the east, South Creek in the west and the Upper Canal System in the north (**Figure 1.2**). Bakers Lane runs off Mamre Road in a westerly direction and extends along the southern perimeter of Lot 34 // DP 1118173. The site currently contains residential dwellings in Lot 34 // DP 1118173, Lot 1 // DP 1018318, Lot Y // DP 421633 and Lot 22 / 258414 and a small business (Mamre Produce) along Bakers Lane in Lot X // DP 421633. The subject land does not include the proposed freight rail corridor in the north of the study area or the proposed South Creek riparian area in the west of the study area.

### 1.3 Proposed development

This proposal requires the development of the subject land including subdivision of the land, bulk earthworks, services, roads and the construction of warehouses. The proposed development will comprise the following works:

- Subdivision of the land to create lots, ranging in size from 3.26 ha to 8.88 ha;
- The construction of warehouses, including parking areas and ancillary offices;
- Public access roads in the south of the site, extending off Mamre Road in a westerly direction. Three access road will extend from this road to the north and service the warehouses in the south of the site;
- Establishment of an additional road to the south of Baker Lane (Link Road)
- Bulk earthworks, separated into two stages. Stage one in the east and stage two in the remaining land.

The proposed development is shown in **Figure 1.3**.





Figure 1.1: Subject land location.

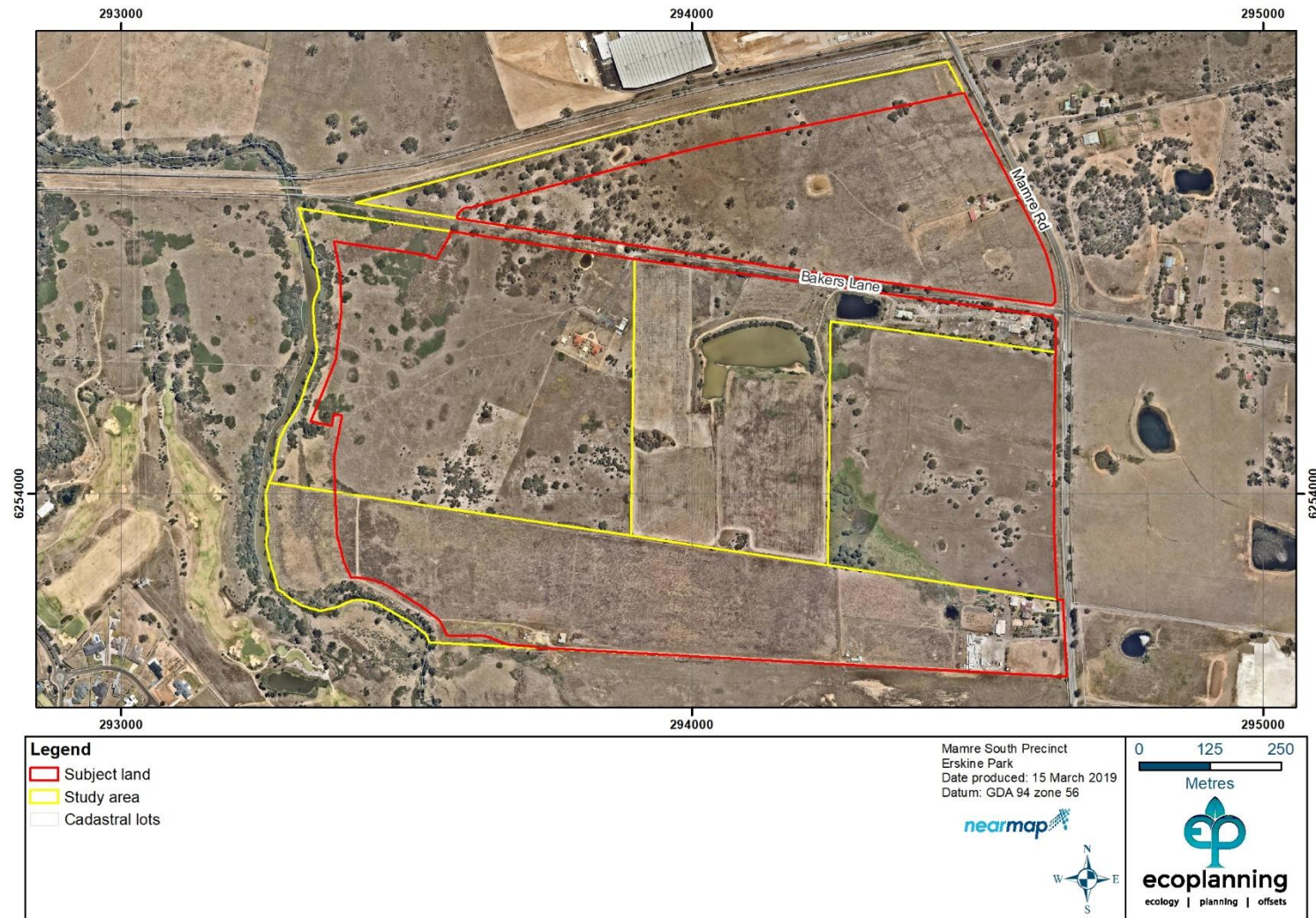


Figure 1.2: Site map.



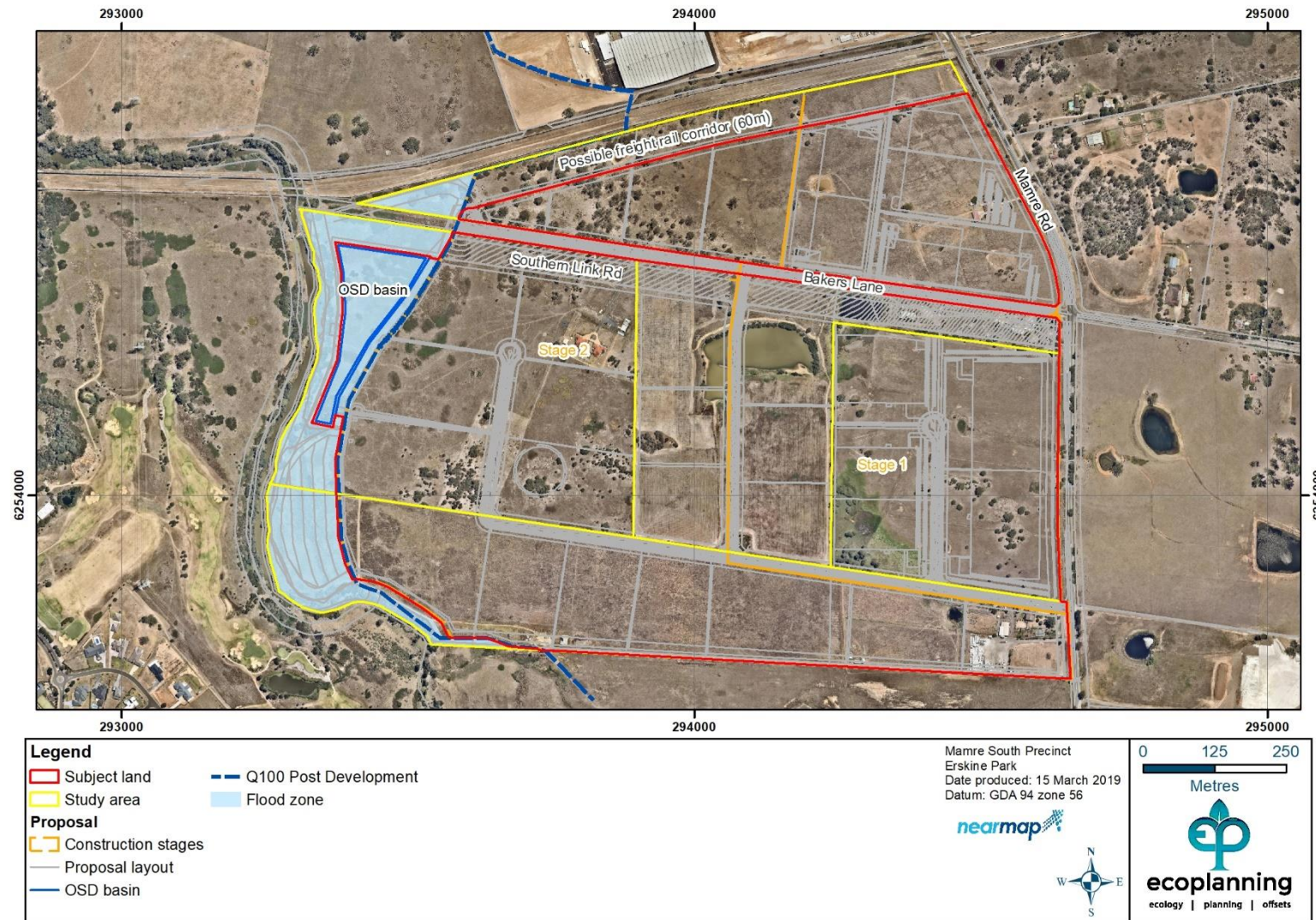


Figure 1.3: Proposed development footprint.

## 2. Landscape context

### 2.1 Identify landscape features

In accordance with the BAM, a number of features are assessed within and surrounding the subject land. Provided below are details related to IBRA region and subregion and NSW landscape regions (Mitchell Landscapes). Other features, such as rivers, streams, estuaries and wetlands, habitat connectivity, karst areas or areas of outstanding biodiversity value are considered where appropriate.

#### 2.1.1 IBRA bioregions and IBRA subregions

Interim Biogeographic Regionalisation of Australia (IBRA) regions represent a landscape based approach to classifying the land surface, including attributes of climate, geomorphology, landform, lithology, and characteristic flora and fauna species present. The subject land is located entirely within the Cumberland subregion (version 7) and within the NSW Sydney Basin IBRA region (version 7).

#### 2.1.2 NSW landscape regions (Mitchell Landscapes)

The subject land occurs in two NSW Mitchell Landscapes, being the '*Cumberland Plain*' and '*Hawkesbury – Nepean Channels and Floodplains*' landscapes (Mitchell Landscapes V3.1). The '*Cumberland Plain*' landscape dominates the subject land and 1,500 m buffer. The landscape '*Sydney Basin Diatremes*' also occurs in a small patch in the 1,500 m buffer (**Figure 2.1**).

The '*Cumberland Plain*' Mitchell Landscape was entered into the BAM calculator due to it being the dominant Mitchell Landscape within the subject land.

#### 2.1.3 Other features

##### *Rivers, streams and estuaries*

No drainage lines are mapped within the subject land, although South Creek and Cosgroves Creek are mapped within the 1,500 m assessment circle (**Figure 2.1**). While there are no mapped watercourses within the subject land, there are low-lying areas, which may have once been part of informal drainage networks through the site.

South Creek, a fifth order stream flows north through the western portion of the 1500 m buffer, along the western edge of the subject land (**Figure 2.1**). An unnamed tributary of South Creek flows west, just south of the subject land. The riparian buffers associated with South Creek and its tributaries, calculated in accordance with Appendix 3 of the BAM, are shown in **Figure 2.1**. The buffer of South Creek intersects the subject land in the south-western corner of the subject land.

##### *Local and important wetlands*

No important wetlands, as defined by the BAM, are within the subject land or buffer area. There are numerous constructed farm dams within the subject land which have been mapped as part of this assessment (see **Section 3**).

#### *Habitat connectivity*

The vegetation within the subject land is connected to the riparian corridor along South Creek, west of the subject land (**Figure 2.1**). The vegetation along this riparian corridor is connected along South Creek, Cosgroves Creek to vegetated patches along Blaxland Creek (north-west of the 1,500 m buffer). The landscape is highly modified and these riparian corridors, albeit thin, provide the only vegetated corridors through the landscape. As such, the native vegetation in the subject land is poorly connected to vegetation in reserves north, west and east of the subject land.

#### *Areas of geological significance and soil hazard features*

The subject land does not incorporate areas of geological significance or any soil hazard features.

#### *Areas of outstanding biodiversity value*

The subject land does not include any areas of outstanding biodiversity value as defined under the BC Act.



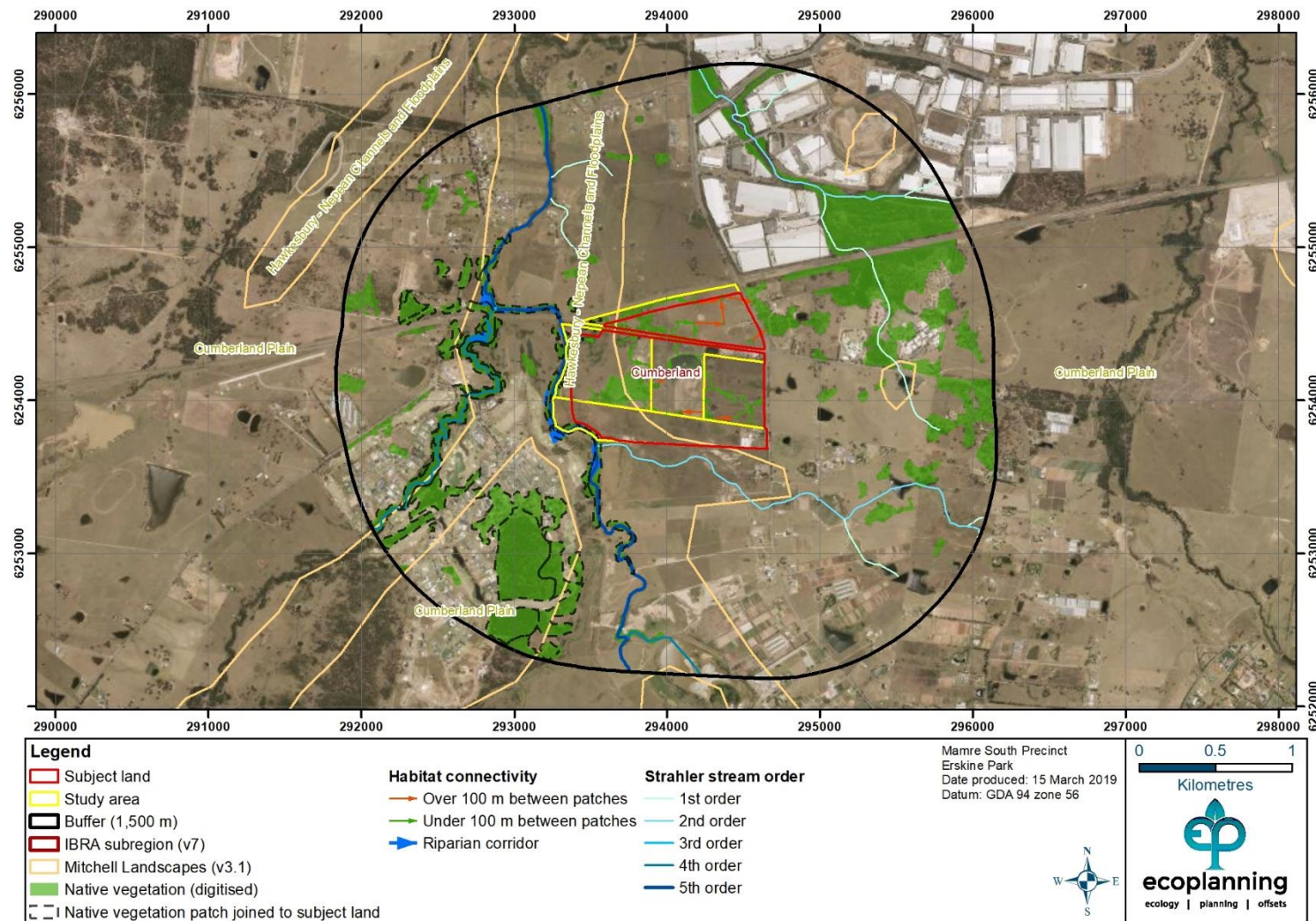


Figure 2.1: Location map.

## 2.2 Determining site context

### 2.2.1 Assessing native vegetation cover

A layer of native vegetation cover is required for a 1,500m buffer around the subject land to determine the context of the site. The extent of native vegetation on the subject land and immediate surrounds was mapped using the Western Sydney updated vegetation layer (OEH 2015) as a base, with edits made to the layer where obvious changes to vegetation extent had occurred **Figure 2.1**.

The total area of the 1,500m buffer around the subject land is 1426.54 ha, with the area of vegetation mapped within the buffer being 228.29ha. This is a native vegetation cover of 16.0 % (10-30% class as defined in s4.3.2 of the BAM) and this value was entered into the BAM calculator.

### 2.2.2 Assessing patch size

Patch size as defined by the BAM as:

*‘an area of native vegetation that:*

*a) occurs on the development site or biodiversity stewardship site, and*

*b) includes native vegetation that has a gap of less than 100m from the next area of moderate to good condition native vegetation (or  $\leq 30\text{m}$  for non-woody ecosystems).*

*Patch size may extend onto adjoining land that is not part of the development site or biodiversity stewardship site.’*

In assessing patch size, stands of native vegetation within 100 m (where in a moderate to good condition) but which are separated by hard barriers including permanent artificial structures, wide roads or other barriers have been treated as separate patches. These highly modified breaks in vegetation connectivity would significantly alter ecological function of these areas of native vegetation such that these areas warrant recognition as separate patches.

Patch size was calculated for the vegetation on the development site using the field validated map of vegetation types identified and the updated native vegetation extent data layer prepared for the 1,500 m buffer (based on OEH 2015). Patch size is required to be assessed as one of four classes per vegetation zone mapped, being <5 ha, 5-24 ha, 25-100 ha or >100 ha.

The majority of woody patches of vegetation in the subject land are less than 100 m apart and hence are considered one patch of vegetation (**Figure 2.1**). This patch connects to woody vegetation along South Creek and to a patch of vegetation south of the subject land. This patch comprises over 100 ha and has been assigned the largest patch class of >100 ha. This patch includes one of the three patches of Shale Plains Woodland.

The two small stands of Shale Plains Woodland (Grey Box – Forest Red Gum grassy woodland on flats of the Cumberland Plain) in the north-east of the subject land are not connected to each other, other patches in the subject land or to vegetation east of the subject land. Hence, they are both considered individual patches of <5 ha.

The DNG in the south-west of the subject land does not occur within 30 m of other patches of DNG and hence is not connected beyond the patch mapped. This patch has been assigned <5 ha class.

Where vegetation zones included multiple patch sizes (where the Shale Plains Woodland vegetation zone occurs in three different patches), the larger patch size was entered into the BAM Calculator.

## 3. Native vegetation

### 3.1 Plant community types (PCTs) and threatened ecological communities

#### 3.1.1 Previous vegetation mapping

Desktop assessment identified two native vegetation communities within the subject land (OEH 2015 after NPWS 2002). These communities are Shale Plains Woodland (MU10) and Alluvial Woodland (MU11). The patch of Alluvial Woodland is mapped in the north of the subject land within a rectangular shaped area between Bakers Lane and the Upper Canal System. Shale Plains Woodland was mapped adjacent to the Alluvial Woodland in the north of the site and encompasses several small patch of vegetation in the south west and south east of the subject land. For the vast majority of the subject land, no native vegetation community was identified as being present by OEH (2015).

Identification of vegetation communities within the subject land and community nomenclature follows the vegetation classification of NPWS (2002). Based on the floristic composition of the vegetation in the subject land, two native vegetation communities and two exotic communities, with varying condition classes, were identified (**Figure 3.1**) and are listed below:

- Alluvial woodland
- Shale Plains Woodland
- Cleared land 'exotic grasslands'
- Planted 'exotics, native indigenous and non-indigenous'

Regional vegetation mapping by Tozer et al. (2006) identified one small patch of vegetation in the south east of the subject land as Cumberland Shale Plain Woodland (GW p. 29) (**Figure 3.2**). For remainder of the subject land, no native vegetation was identified as being present by Tozer et al. (2006). Vegetation mapped in proximity to the subject land includes a large patch of Cumberland Shale Plain Woodland to the north east of the site on the eastern side of Mamre Road and Cumberland River Flat Forest (FoW p. 33) along South Creek to the west and north of the subject land (Tozer et al. 2006).

Shale Plains Woodland forms part of the Critically Endangered Ecological Community (CEEC), '*Cumberland Plain Woodland in the Sydney Basin Bioregion*' under the BC Act and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Whereas, Alluvial Woodland forms part of the Endangered Ecological Community (EEC), '*River-flat Eucalypt Forest on Coastal Floodplains of the in the Sydney Basin Bioregion*'. The relationship between these native vegetation communities, Threatened Ecological Communities (TECs) and the corresponding Plant Community Types (PCTs) are summarised in **Table 3.1**. A description of each of the vegetation communities, including justification for the assigned vegetation community and PCTs is provided for each vegetation community in the following sections.



**Table 3.1: Corresponding vegetation communities, PCTs and TECs.**

Vegetation communities (NPWS 2002)	Plant Community Types (PCTs)	Threatened Ecological Communities (TECs)	BC Act	EPBC Act
Shale Plains Woodland (MU10)	PCT 849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Cumberland Plain Woodland in the Sydney Basin Bioregion ('Cumberland Plain Woodland')	CE	CE
Alluvial Woodland (MU11)	PCT 835 - Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions ('River-flat Eucalypt Forest')	E	-

CE = Critically Endangered; E = Endangered

### 3.1.2 Field assessment of vegetation communities

Assessment and mapping of Plant Community Types (PCTs) was undertaken on 30 April 2018 by Lucas Mckinnon (Principal Ecologist, Director), Thomas Hickman (Ecologist) and Kieren Northman (Ecologist). The subject land was traversed to identify the vegetation structure and dominant species within patches of native vegetation. The entire distribution of each patch of vegetation was traversed to sample any spatial variation within each polygon, identify boundaries between vegetation communities and to identify and map vegetation zones (variation in the broad condition state of vegetation polygons) in accordance with the BAM.

Based upon traverses of the subject land, vegetation communities present were identified, and their boundaries were mapped. The floristics of each of these vegetation communities were then sampled within 20x20 m plot-based floristic vegetation surveys, consistent with Section 5.2.1.9 of the BAM. These are also the location of vegetation integrity plots in accordance with Section 5.3 of the BAM. The location of floristic vegetation plots were based upon randomly sampled areas of each vegetation community, whilst ensuring that the plot-based surveys included representative areas within each community and avoided, where possible, edge effects (i.e. located close to edges of vegetation extent) or ecotones with adjacent vegetation zones.

The identification of PCTs was in accordance with the NSW PCT classification as described in the BioNet Vegetation Classification. Determination of the most appropriate PCTs for vegetation communities within the subject land used the BioNet Vegetation Classification database to identify PCT types which matched the geographic distribution (based upon IBRA subregions), vegetation formation and floristics of vegetation within the subject land. The data for each potential PCT including vegetation formation, descriptive attributes and distribution information were then reviewed to determine the most appropriate PCT for each of the vegetation communities sampled within the subject land. Observations of vegetation structure and composition made during traverses of the subject land as well as adjacent areas also informed the determination of most appropriate PCTs for the vegetation communities within the subject land. It is noted that identification of vegetation communities and PCTs was complicated by the fact that field observations were of disturbed, fragmented and previously



cleared stands of vegetation. Consequently, the identification of vegetation communities was based upon observations of the communities in a highly modified state with some elements of native vegetation communities absent or highly modified including where non-local native plantings has occurred.

The field survey identified two PCTs in the subject land (**Figure 3.3**):

- Forest Red Gum – Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion (PCT 835; HN526).
- Grey Box – Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (PCT 849; HN528).

A summary of two PCTs within the subject land including areas of vegetation zones, the percent cleared for each PCT and Serious and Irreversible Impacts (SAIL) candidate entities is included in **Table 3.2**.

**Table 3.2: Details of PCTs within the subject land including area of vegetation zones and candidate SAIL entities.**

Plant Community Types (PCTs)	Vegetation Formation & class	Vegetation zones	Area (ha)	Threatened Ecological Communities (TECs)	SAIL candidate entity
PCT 835 - Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	Forested Wetlands - Coastal Floodplain Wetlands	Underscrubbed	6.88	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	No
		Scattered Paddock Trees	0.14		
		DNG	4.04		
		Disturbed / Shrubby	0.10		
PCT 849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Grassy Woodlands - Coastal Valley Grassy Woodlands	Underscrubbed	0.24	Cumberland Plain Woodland in the Sydney Basin Bioregion	Yes
<i>Planted exotic, indigenous and non-indigenous trees</i>	N/A	N/A	0.72	N/A	N/A
<i>Exotic grassland / Infrastructure</i>	N/A	N/A	86.04	N/A	N/A
<b>Total native vegetation</b>			<b>11.40*</b>		
<b>Total vegetation</b>			<b>98.15*</b>		

\* Rounding errors may apply as calculations were done to 6 decimal places and reported to 2 decimal places

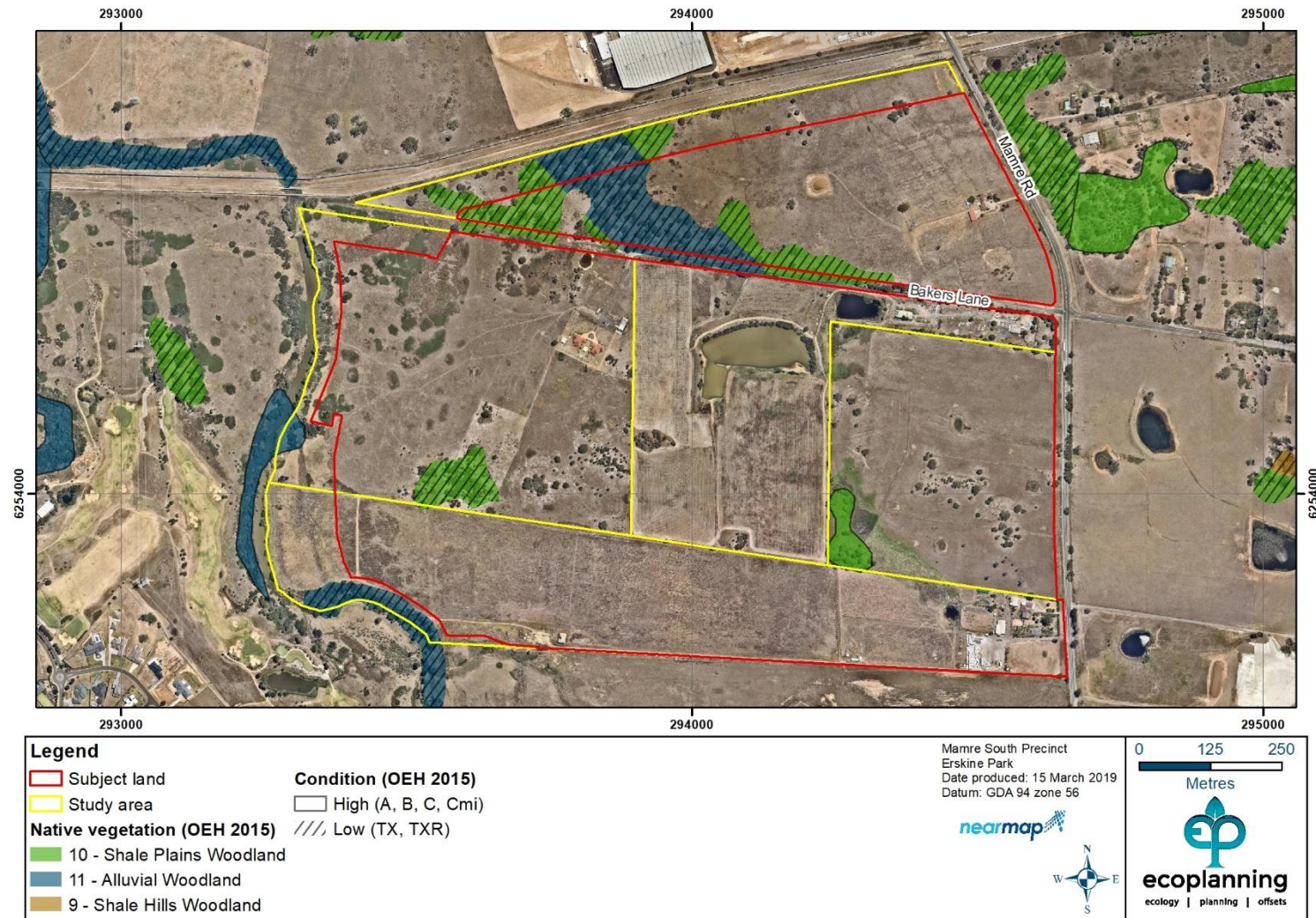


Figure 3.1: Vegetation types (OEH 2015).



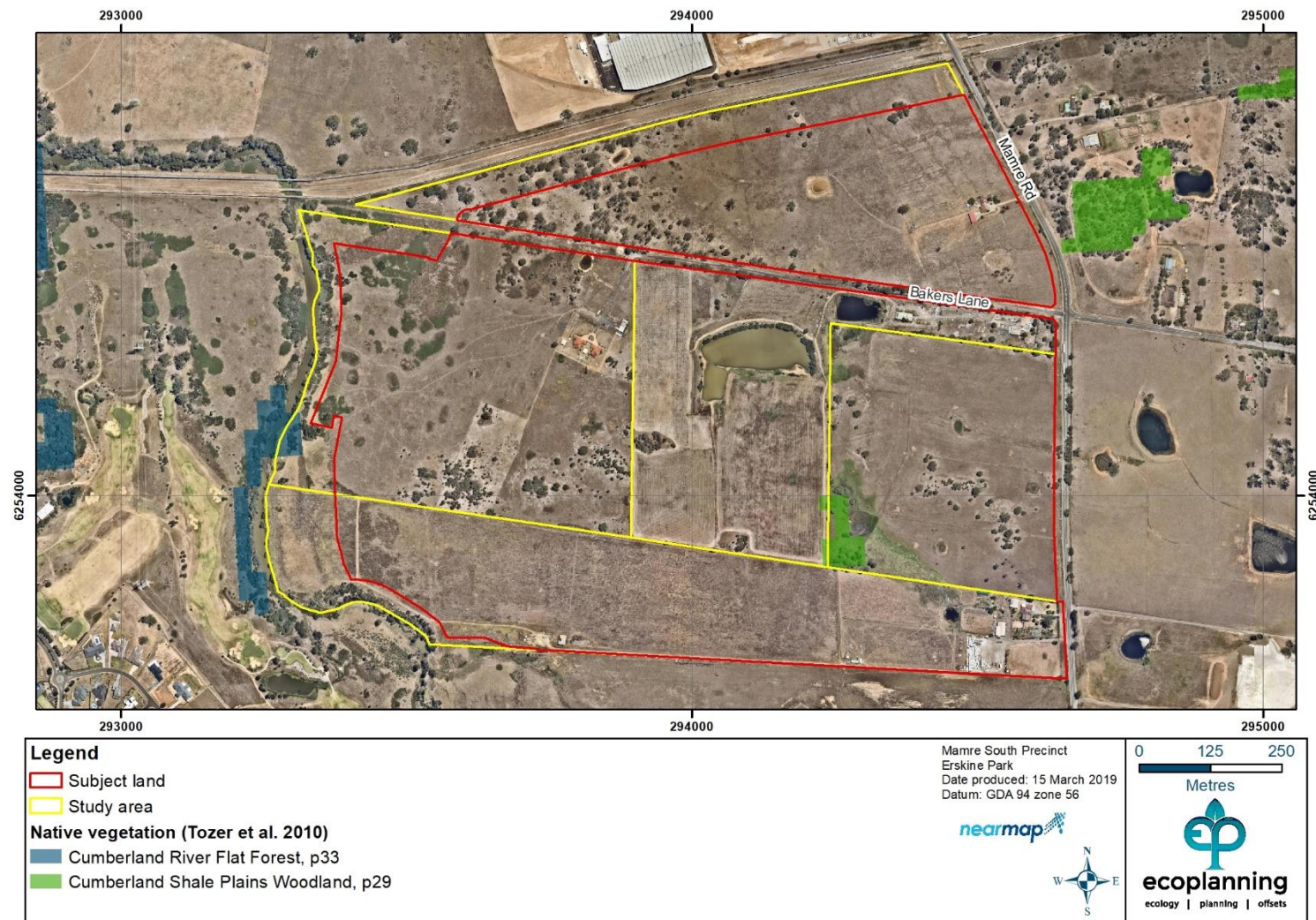


Figure 3.2: Vegetation types (Tozer et al. 2006).



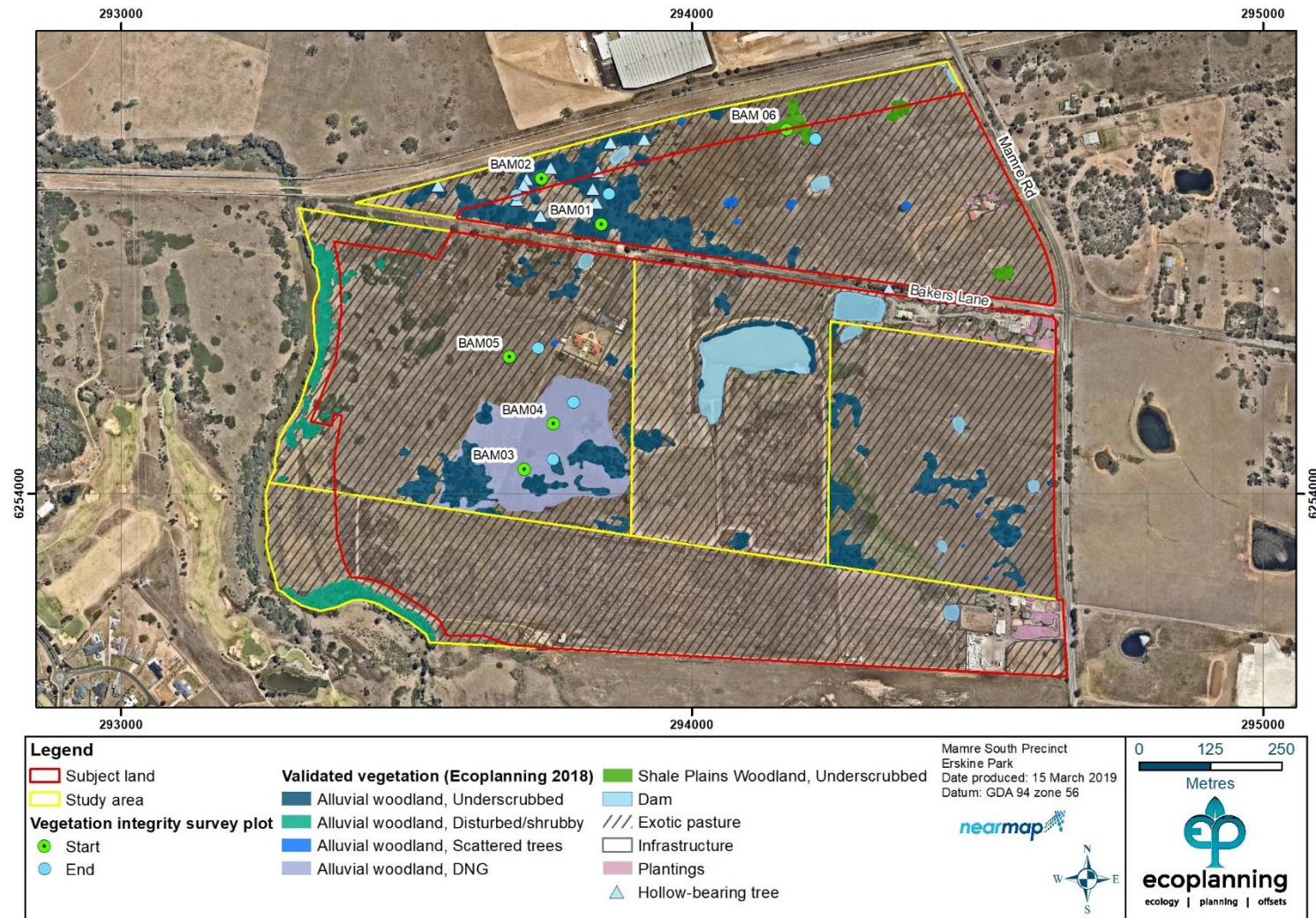


Figure 3.3: Field results and validated vegetation (Ecoplanning 2018).

### 3.1.3 Forest Red Gum – Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion (PCT 835; HN526).

Field assessment confirmed a majority of the vegetation in the subject land to be consistent with Alluvial Woodland (MU11) (**Figure 3.3**). Alluvial Woodland corresponds with the PCT 'Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion' (PCTID: 835). PCT 835 is situated on broad alluvial flats of the Hawkesbury and Nepean River systems at altitudes between one and 160 metres above sea level (masl) and with a mean annual rainfall of 750-1000 mm. Two distinct condition classes of Rough-barked Apple grassy woodland on alluvial flats were identified onsite, including 'underscrubbed' (**Figure 3.4**) and 'Derived Native Grassland' (DNG) (**Figure 3.5**).

This vegetation community consisted of a grassy woodland dominated by *Eucalyptus amplifolia* (Cabbage Gum) and *Angophora floribunda* (Rough-barked Apple), with *Casuarina glauca* (Swamp Oak) also present around the perimeter of the large dam in the centre of the subject land. A sparse shrub layer was present within this vegetation community including *Bursaria spinosa* subsp. *spinosa* (Blackthorn), *Grevillea juniperina* subsp. *juniperina* and *Melaleuca decora*. Several patches of vegetation almost exclusively dominated by *Melaleuca decora* were identified within the subject land, including several patches of vegetation with substantial distance from Kemps Creek. These patches were often dominated by *Carex appressa* (Tall Sedge) in the groundlayer, which suggests some level of floodplain influence.

A grassy understorey was present throughout this vegetation community including grasses, forbs and sedges such as *Carex appressa*, *Centella asiatica* (Indian Pennywort), *Commelina cyanea*, *Cynodon dactylon* (Couch), *Juncus usitatus*, *Lomandra filiformis* (Wattle Mat-rush), *Microlaena stipoides* subsp. *stipoides* (Weeping Grass), *Themeda triandra* (Kangaroo Grass) and *Paspalidium distans*. Exotic species occurred sporadically through the vegetation community; with a higher proportion observed between the interface of the community and the cleared land 'exotic grassland'. Dominant exotic grasses and herbaceous weeds included, *Axonopus fissifolius*\* (Narrow-leafed Carpet Grass), *Eragrostis curvula*\* (African Lovegrass), *Hypochaeris radicata*\* (Flatweed), *Paspalum dilatatum*\* (Paspalum), *Senecio madagascariensis*\* (Fireweed) and *Setaria parviflora*\* (Pigeon Grass).

Identification of the corresponding PCT was based on a review of the BioNet Vegetation Classification and specifically PCTs which occur within the 'Sydney Basin – Cumberland Plain' IBRA subregion and included *Eucalyptus amplifolia* as a dominant species. Based upon this search PCT 835 was identified as the most appropriate PCT based upon the floristic description and the landscape position identified as stream banks and alluvial flats on the Cumberland Plain. Additionally, the reference for PCT 835 'Cumberland River Flat Forest' (Tindall et al 2004) was considered a good description of the vegetation community within the subject land.

'Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion' (PCT 835) within the subject lands forms part of the 'River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions' EEC listed under the BC Act. This vegetation community is not identified as a potential SAIL entity within Appendix 3 of the *Guidance to assist a decision-maker to determine a serious and irreversible impact* (OEH 2017b) and is therefore unlikely to meet the relevant SAIL principles.



A summary of the PCT profile for the native vegetation type in the Vegetation Information System (VIS) (OEH (2018b)) is provided in **Table 3.3**. Species recorded onsite within this patch are highlighted in **bold text**.



Figure 3.4: Forest Red Gum – Rough-barked Apple grassy woodland 'underscrubbed'.



Figure 3.5: Forest Red Gum – Rough-barked Apple grassy woodland 'DNG'.

Table 3.3: VIS plant community type profile (OEH 2018b) – Forest Red Gum – Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion (PCT 835; HN526).

<b>Plant community type (PCT)</b>	Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion
<b>PCT and BioMetric veg type (BVT) ID</b>	PCT 835 / HN526 / ME018
<b>Vegetation formation</b>	KF_CH9 Forested Wetlands
<b>Vegetation class</b>	Coastal Floodplain Wetlands
<b>Upper stratum</b>	<i>Eucalyptus tereticornis</i> (Forest Red Gum), <i>Angophora floribunda</i> (Rough-barked Apple) and <i>Eucalyptus amplifolia</i> subsp. <i>amplifolia</i> (Cabbage Gum)
<b>Middle stratum</b>	<i>Acacia parramattensis</i> (Parramatta Wattle) <i>Bursaria spinosa</i> subsp. <i>spinosa</i> (Blackthorn) and <i>Sigesbeckia orientalis</i> (Indian Weed)
<b>Ground stratum</b>	<i>Microlaena stipoides</i> var. <i>stipoides</i> , <i>Oplismenus aemulus</i> , <i>Dichondra repens</i> (Kidney Weed), <i>Entolasia marginata</i> (Bordered Panic), <i>Solanum prinophyllum</i> (Forest Knightshade), <i>Pratia purpurascens</i> (Whiteroot), <i>Desmodium gunnii</i> , <i>Echinopogon ovatus</i> (Forest Hedgehog Grass), <i>Commelina cyanea</i> (Native Wandering Jew) and <i>Veronica plebeia</i> (Trailing Speedwell)
<b>Landscape position</b>	Occurs on stream banks and alluvial flats on the Cumberland Plain.
<b>Profile source</b>	FoW p33 (Tindall et al. 2004)
<b>Full reference details</b>	Tindall, D., Pennay, C., Tozer, M., Turner, K. and Keith, D., 2004 , Native vegetation map report series No. 4. The Araluen, Batemans Bay, Braidwood, Burragorang, Goulburn, Jervis Bay, Katoomba, Kiama, Moss Vale, Penrith, Port Hacking, Sydney, Taralga; 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. Version 1.0; OEH (2013) The Native Vegetation of the Sydney Metropolitan Area Version 2.0 NSW Office of Environment and Heritage Sydney
<b>Estimate remaining pre-European extent rounded to nearest 5%</b>	5%
<b>EEC Name (Listing status)</b>	TSC Act: River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions – Endangered EPBC Act: Not listed

### 3.1.4 Grey Box – Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (PCT 849; HN528).

Field assessment identified Shale Plains Woodland (MU10) in the higher elevation areas of the site nearer to Mamre Road (**Figure 3.3**). Shale Plains Woodland corresponds with the PCT Grey Box – Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (PCTID: 849). PCT 849 occurs on clay/loam soils derived from Wianamatta Shales on the Cumberland Plain at low altitudes, typically below 150m. The three small patches of Grey Box – Forest Red Gum grassy woodland in the subject land were identified in an 'underscrubbed' condition class (**Figure 3.6**).

The vegetation community is represented by three small patches of vegetation; one exclusively dominated by *Eucalyptus moluccana* (Grey Box) and the other two by *Melaleuca decora*. The midstorey is devoid of a shrub layer a result of past underscrubbing and ongoing grazing of the vegetation community. The groundlayer was dominated by exotic grasses, including *Cenchrus clandestinus*\* (Kikuyu Grass), *Eragrostis curvula*\* and *Paspalum dilatatum*\*. Native grasses, forbs and sedges occurred within the vegetation community in low abundance and cover, including *Carex inversa*, *Commelina cyanea*, *Microlaena stipoides* var. *stipoides* and *Sporobolus creber* (Western Rat-tail Grass).

Identification of the corresponding PCT was based review of the BioNet Vegetation Classification database and specifically PCTs within the 'Grassy Woodland' vegetation formation which occur within the 'Sydney Basin – Cumberland Plain' IBRA subregion. Based upon this search PCT 849 identified as the most appropriate PCT based upon the floristic description and the landscape position which is identified as gently inclined areas on the Cumberland Plain. Additionally, the reference for PCT 849, '*Cumberland Shale Plains Woodland*' (Tozer et. al. 2006) was considered a good description of the vegetation community within the subject land.

The Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain (Shale Plains Woodland) vegetation community within the subject land forms part of the '*Cumberland Plain Woodland in the Sydney Basin Bioregion*' CEEC listed under the BC Act. This vegetation community is identified as a potential SAI entity within Appendix 3 of the 'Guidance to assist a decision-maker to determine a serious and irreversible impact' (OEH 2017b).

A summary of the PCT profile for the native vegetation type in the Vegetation Information System (VIS) (OEH (2018b) is provided in **Table 3.4**. Species recorded onsite within this patch are highlighted in **bold text**.





Figure 3.6: Grey Box - Forest Red Gum grassy woodland ‘underscrubbed’.

Table 3.4: VIS plant community type profile (OEH 2015) – Grey Box – Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (PCT 849; HN528).

<b>Plant community type (PCT)</b>	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
<b>PCT and BioMetric veg type (BVT) ID</b>	PCT 849 / BVT: HN528 and ME020
<b>Vegetation formation</b>	KF_CH3 Grassy Woodlands
<b>Vegetation class</b>	Coastal Valley Grassy Woodlands
<b>Upper stratum</b>	<i>Eucalyptus moluccana</i> (Grey Box) and <i>Eucalyptus tereticornis</i> (Forest Red Gum)
<b>Middle stratum</b>	<i>Bursaria spinosa</i> subsp. <i>spinosa</i> (Native Blackthorn)
<b>Ground stratum</b>	<i>Dichondra repens</i> (Kidney Weed), <i>Cheilanthes sieberi</i> subsp. <i>sieberi</i> (Rock Fern), <i>Aristida vagans</i> (Threeawn Speargrass), <i>Microlaena stipoides</i> var. <i>stipoides</i> (Weeping Grass), <i>Themeda australis</i> (Kangaroo Grass), <i>Brunoniella australis</i> (Blue Trumpet), <i>Desmodium gunnii</i> (Slender Tick-trefoil), <i>Opercularia diphylla</i> (Stinkweed), <i>Wahlenbergia gracilis</i> (Sprawling Bluebell), <i>Dichelachne micrantha</i> (Shorthair Plumegrass), <i>Paspalidium distans</i> , <i>Eragrostis leptostachya</i> (Paddock Lovegrass), <i>Lomandra filiformis</i> (Wattle Matt-rush), <i>Lomandra multiflora</i> (Many-flowered Mat-rush), <i>Dianella longifolia</i> (Blueberry Lily), <i>Oxalis perennans</i> , <i>Euchiton sphaericus</i> (Star Cudweed), <i>Goodenia hederacea</i> (Ivy Goodenia), <i>Aristida ramosa</i> (Purple Wiregrass), <i>Arthropodium milleflorum</i> (Pale Vanilla-lily), <i>Austrodanthonia tenuior</i> (A Wallaby Grass), <i>Cymbopogon refractus</i> (Barbed Wire Grass) and <i>Echinopogon caespitosus</i> (Bushy Hedgehog-grass)
<b>Landscape position</b>	Occurs on clay/loam soils derived from Wianamatta Shales on the Cumberland Plain at low altitudes (mainly below 150m).
<b>Profile source</b>	GW p29 (Tozer et al. 2006)
<b>Full reference details</b>	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. Version 1.0
<b>Estimate remaining pre-European extent rounded to nearest 5%</b>	5%
<b>EEC Name (Listing status)</b>	TSC Act: Cumberland Plain Woodland in the Sydney Basin Bioregion (Critically Endangered) EPBC Act: Cumberland Shale Plains and Shale Gravel Transition Forest (Critically Endangered)



### 3.1.5 Other vegetation

#### *Planted 'exotic, indigenous and non-indigenous trees'*

This vegetation type consists of planted exotics, native indigenous and non-indigenous trees surrounding the dwellings in the north east of the site and to the south of Bakers Lane. Planting included species such as, *Eucalyptus maculata* (Spotted Gum) and *Photinia serratifolia*\* (Chinese Photinia).

#### *Cleared land 'exotic grassland'*

Cleared land 'exotic grassland' within the subject land which was not assigned to a native vegetation community or an equivalent PCT. This included large areas throughout the subject land which have been subject to previous clearing and now support grasslands dominated by exotic grasses and herbaceous weeds (**Figure 3.7**) including *Axonopus fissifolius*\*, *Briza subaristata*\*, *Eragrostis curvula*\*, *Hypochaeris radicata*\* and *Paspalum dilatatum*\*. Native species were generally absent or rare within this vegetation community although several species were infrequently present and at low abundance including *Bothriochloa macra* (Red-leg Grass), *Eragrostis leptostachya* (Paddock Lovegrass), *Tricoryne elatior* (Yellow Autumn-lily), *Themeda australis* (Kangaroo Grass).

This grassland vegetation was noted to be predominantly exotic (approximately 90-95 % cover), with the most abundant native species recorded as, *Cynodon dactylon*†, which is a cosmopolitan species that is quite possibly introduced given the overall site context and propensity of other introduced exotic pasture grasses. There is debate, and doubt, over the status of *C. dactylon*† within Australia (Langdon 1954), with the species having been recorded as an introduced species as early as 1802-1804 by Brown, R. (Groves 2002), although some authors recognise both indigenous and introduced populations within Sydney (Harden 1993 in Groves 2002) and Australia (Jessop et al. 2006). Within the subject land *C. dactylon*† commonly occurred with an array of other introduced pasture grasses suggesting that it is an introduced species. For this reason, these grassland areas have been mapped as 'exotic grassland' and no PCT has been assigned for this vegetation zone.



Figure 3.7: Cleared land 'exotic grassland' in the foreground.

## 3.2 Vegetation zones

### 3.2.1 Condition classes, subcategories and areas

The PCTs identified within the development site were classified into vegetation zones for credit calculation purposes. The vegetation zones are based on the condition descriptions above with the area of each vegetation zones shown in **Table 3.2**. **Figure 3.8** shows the spatial arrangement of the vegetation zones within the development site and associated vegetation integrity survey plots.

### 3.2.2 Vegetation integrity survey plots

Six vegetation integrity survey plots were completed on the subject land, with all being used to meet the requirements of the BAM (see **Appendix A** for data captured) (**Figure 3.8**). The number of plots surveyed within each vegetation zone is consistent with the requirements as outlined within Table 4 of the BAM, with the exception of the cleared land 'exotic grassland' vegetation zone, although this was not identified as a native vegetation community or assigned a PCT.

Table 3.5: Vegetation integrity scores.

Veg zone number	Plant community type	Condition class	Area impacted (ha)	Veg integrity plots required	Veg integrity plots undertaken
1	PCT 835 - Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	Underscrubbed	7.11	3*	2*
2		DNG	4.04	2	2
3	PCT 849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Underscrubbed	0.24	1	1
NA	Exotic grassland	Exotic grasslands	86.04	NA	1

\* Only two vegetation integrity survey plots were undertaken in Vegetation Zone 1. Three plots are required to fulfil the requirements of the BAM. As such, the two plots were entered twice into the calculator to estimate the credit requirements for this zone. Prior to finalisation, an extra vegetation integrity plot will be required and the calculator re-run with the sufficient data required to satisfy the requirements of the BAM.

### 3.2.3 Current and future vegetation integrity scores

Vegetation integrity scores were calculated based on the vegetation integrity survey plots collected for each vegetation zone assigned to a native PCT. While the cleared land 'exotic grassland' vegetation zone was not assigned to a native PCT, the data collected from the single plot surveyed within this vegetation zone was entered into the BAM Calculator as a zone of PCT 835 (the most likely PCT prior to previous vegetation clearing across this vegetation zone) in order to calculate a vegetation integrity score for this vegetation zone. As the area of cleared land 'exotic grassland' within the subject land is between 50 ha and 100 ha, five vegetation integrity plots would be required for a vegetation zone of this size which was assigned to a native PCT. As this vegetation zone was not identified as forming part of any native PCT, only a single plot was collected and data from this plot was entered into the BAM calculator in order to allow for a vegetation integrity score to be calculated for this vegetation zone.

The vegetation integrity scores for each vegetation zone are provided in **Table 3.6**. Vegetation integrity scores ranges from 1.4/100 for the exotic grassland to 55.1/100 for the PCT 835 'underscrubbed' condition class. It is noted that the cosmopolitan species, *Cynodon dactylon*†, was not included as a native species within the Shale Plains Woodland (PCT 849) vegetation zones for the purposes of calculating the vegetation integrity score (see **Section 3.1.5**). A conservative approach has been taken for occurrences of this species within the Alluvial Wetland (PCT 835) vegetation zones where this species was treated as native grass when calculating vegetation integrity scores, as *C. dactylon*† is listed as being a component of some native vegetation communities on floodplains within the Sydney Basin (NSW Scientific Committee 2004b).

Future vegetation integrity scores were allocated for each vegetation zone. For all vegetation zones the project would involve complete clearing of all vegetation and the default future vegetation integrity score of 0 was retained.

**Table 3.6: Vegetation integrity scores.**

Veg zone number	Plant community type	Condition class	Area impacted (ha)	Veg integrity score – before development	Veg integrity score – after development
1	PCT 835 - Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion (Alluvial Woodland)	Underscrubbed	7.11	55	0
2		DNG	4.04	35	0
3	PCT 849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (Shale Planes Woodland)	Underscrubbed	0.24	6.4	0
NA	Exotic grassland	Exotic grasslands	86.04	1.4	NA

Note: The exotic grassland is not considered native vegetation due to its dominance of exotic species. A vegetation integrity plot was undertaken to assess the vegetation integrity score to ensure it was lower than the threshold.



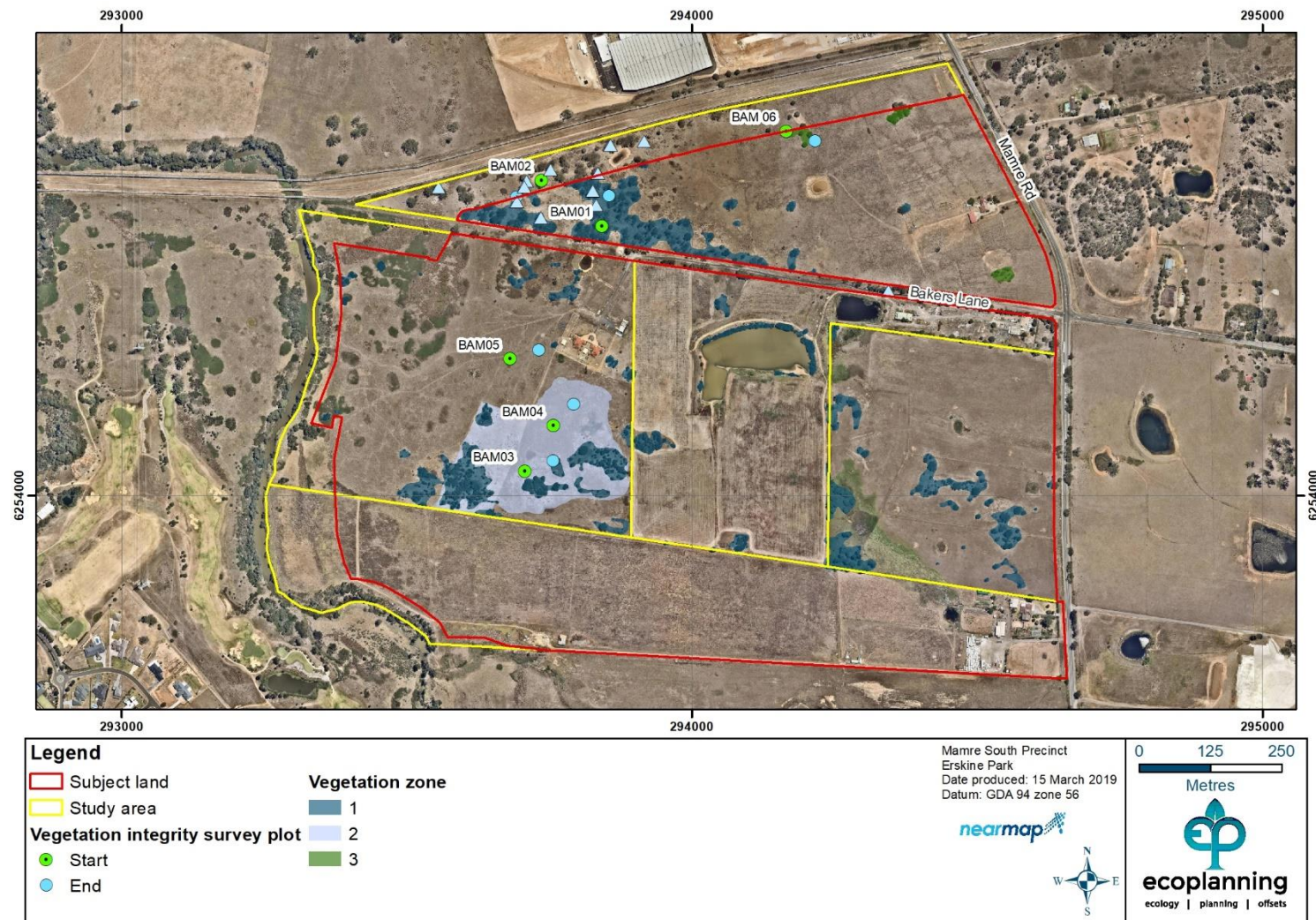


Figure 3.8: Vegetation zones and vegetation integrity survey plot locations.



## 4. Threatened species

Section 6 of the BAM, details the process for determining the habitat suitability for threatened species.

Under the BAM, threatened species are separated into two classes, 'ecosystem' and 'species' credit species. Those threatened species where the likelihood of occurrence of a species or elements of the species' habitat can be predicted by vegetation surrogates and landscape features, or for which a targeted survey has a low probability of detection, are identified as 'ecosystem' credit species. Targeted surveys are not required for ecosystem species and potential impacts to these species are assessed in conjunction with impacts to PCTs.

Threatened species where the likelihood of occurrence of a species or elements of suitable habitat for the species cannot be confidently predicted by vegetation surrogates and landscape features and can be reliably detected by survey are identified as 'species' credit species. A targeted survey or an expert report is required to confirm the presence or absence of these species on the subject land.

For some threatened species, they are identified as both ecosystem and species credit species, with different aspects of the habitat and life cycle representing different credit types. Commonly, threatened fauna species may have foraging habitat as an ecosystem credit, while their breeding habitat represents a species credit.

The following sections outline the process for determining the habitat suitability for threatened species within the subject lands, and the results of targeted surveys for candidate threatened species.

### 4.1 Identifying threatened species for assessment

Threatened species that require assessment are initially identified based upon the following criteria:

- the distribution of the species includes the IBRA subregion in which the subject land (Cumberland IBRA subregion).
- the subject land is within any geographic constraints of the distribution of the species within the IBRA subregion.
- the species is associated with any of the PCTs identified within the subject land
- the native vegetation cover within an assessment area including a 1500m buffer around the subject land is equal to or greater than the minimum required for the species.
- the patch size that each vegetation zone is part of is equal to or greater than the minimum required for that species.
- the species is identified as an ecosystem or species credit species in the Threatened Biodiversity Data Collection.

The process for identifying threatened species which meet the above criteria is completed through the BAM Calculator. The PCTs identified within the subject land, patch sizes and

native vegetation cover, as outlined in **Section 3**, were entered into the BAM Calculator and a preliminary list of threatened species were identified.

#### 4.1.1 Ecosystem credit species

The ecosystem credit species predicted on site are provided in **Table 4.1**. All ecosystem credit species were maintained in the assessment, as at least one species with the highest sensitivity to potential gain is likely to occur in each vegetation zone. Additionally, areas of exotic grassland were not considered as habitat for any ecosystem credit species.

**Table 4.1: Ecosystem credit species predicted on site.**

Scientific Name / Common Name	NSW listing status*	National listing status*
<i>Anthochaera phrygia</i> Regent Honeyeater (Foraging)	CE	CE
<i>Artamus cyanopterus cyanopterus</i> Dusky Woodswallow	V	-
<i>Botaurus poiciloptilus</i> Australasian Bittern	E	E
<i>Callocephalon fimbriatum</i> Gang-gang Cockatoo (Foraging)	V	-
<i>Chthonicola sagittata</i> Speckled Warbler	V	-
<i>Circus assimilis</i> Spotted Harrier	V	-
<i>Climacteris picumnus victoriae</i> Brown Treecreeper (eastern subspecies)	V	-
<i>Daphoenositta chrysoptera</i> Varied Sittella	V	-
<i>Dasyurus maculatus</i> Spotted-tailed Quoll	V	E
<i>Glossopsitta pusilla</i> Little Lorikeet	V	-
<i>Grantiella picta</i> Painted Honeyeater	V	V
<i>Haliaeetus leucogaster</i> White-bellied Sea-Eagle (Foraging)	V	-

Scientific Name / Common Name	NSW listing status*	National listing status*
<i>Hieraaetus morphnoides</i> Little Eagle (Foraging)	V	-
<i>Ixobrychus flavicollis</i> Black Bittern	V	-
<i>Lathamus discolor</i> Swift Parrot (Foraging)	E	CE
<i>Lophoictinia isura</i> Square-tailed Kite (Foraging)	V	-
<i>Melanodryas cucullata cucullata</i> Hooded Robin (south-eastern form)	V	-
<i>Melithreptus gularis gularis</i> Black-chinned Honeyeater (eastern subspecies)	V	-
<i>Miniopterus australis</i> Little Bentwing-bat (Foraging)	V	-
<i>Miniopterus schreibersii oceanensis</i> Eastern Bentwing-bat (Foraging)	V	-
<i>Mormopterus norfolkensis</i> Eastern Freetail-bat	V	-
<i>Neophema pulchella</i> Turquoise Parrot	V	-
<i>Ninox connivens</i> Barking Owl (Foraging)	V	-
<i>Ninox strenua</i> Powerful Owl (Foraging)	V	-
<i>Pandion cristatus</i> Eastern Osprey (Foraging)	V	-
<i>Petroica boodang</i> Scarlet Robin	V	-
<i>Petroica phoenicea</i> Flame Robin	V	-
<i>Phascolarctos cinereus</i> Koala (Foraging)	V	V



Scientific Name / Common Name	NSW listing status*	National listing status*
<i>Pteropus poliocephalus</i> Grey-headed Flying-fox (Foraging)	V	V
<i>Saccolaimus flaviventris</i> Yellow-bellied Sheath-tail-bat	V	-
<i>Stagonopleura guttata</i> Diamond Firetail	V	-
<i>Tyto novaehollandiae</i> Masked Owl (Foraging)	V	-

\* CE- Critically Endangered; E- Endangered, V- Vulnerable

#### 4.1.2 Species credit species

##### *Geographic and habitat features*

Species credit species are predicted following assessment of geographic and habitat features in the credit calculator, such as site location (IBRA subregion), PCTs and condition, patch size and the area of surrounding vegetation within the buffer. Some species require further assessment of habitat constraints and/or geographic limitations before being confirmed as candidate species for assessment. **Table 4.2** outlines the questions asked for these species, and whether the species is confirmed as a candidate species.

**Table 4.2: Assessment of habitat constraints and geographic limitations.**

Scientific Name / Common Name	Habitat constraints	Geographic limitations	Maintained as candidate species
<i>Burhinus grallarius</i> Bush Stone-curlew	Fallen/standing dead timber including logs	-	Yes
<i>Chalinolobus dwyeri</i> Large-eared Pied Bat	1. Cliffs 2. Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels	-	No. There are no caves in the subject land. It is unlikely that there are any habitat constraints within 2 km of the subject land.

Scientific Name / Common Name	Habitat constraints	Geographic limitations	Maintained as candidate species
<i>Dillwynia tenuifolia</i> - endangered population <i>Dillwynia tenuifolia</i> , Kemps Creek	-	1. The area bounded by western Road, Elizabeth Drive, Devonshire Road and Cross Street, Kemps Creek in the Liverpool Local Government Area	No. The subject land is not within the Liverpool LGA.
<i>Litoria aurea</i> Green and Golden Bell Frog	1. Semi- permanent/ephemeral wet areas 2. Within 1km of wet areas Swamps 3. Within 1km of swamp Waterbodies Within 1km of waterbody	-	Yes
<i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i> - endangered population <i>Marsdenia viridiflora</i> R. Br. subsp. <i>viridiflora</i> population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	-	Those LGAs named in the population's listing	Yes
<i>Myotis macropus</i> Southern Myotis	1. Hollow bearing trees 2. Within 200 m of riparian zone 3. Bridges, caves or artificial structures within 200 m of riparian zone	-	No (No hollow bearing or caves/culverts trees within 200m of riparian zone)

Scientific Name / Common Name	Habitat constraints	Geographic limitations	Maintained as candidate species
<i>Pilularia novae-hollandiae</i> <i>Austral Pillwort</i>	<ol style="list-style-type: none"> <li>1. Semi-permanent/ephemeral wet areas</li> <li>2. Periodically waterlogged sites (including drains and farm dams)</li> </ol>	-	Yes
<i>Pommerhelix duralensis</i> Dural Woodland Snail	<ol style="list-style-type: none"> <li>1. Other</li> <li>2. Leaf litter and shed bark or within 50m of litter or bark Rocky areas</li> <li>3. Rocks or within 50m of rocks Fallen/standing dead timber including logs</li> <li>3. Including logs and bark or within 50m of logs or bark</li> </ol>	-	Yes
<i>Wahlenbergia multicaulis</i> - endangered population Tadgell's Bluebell in the local government areas of Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield	<ol style="list-style-type: none"> <li>1. Other</li> <li>2. Land situated in damp, disturbed sites</li> </ol>	-	No. Although the habitat constraint is present in the subject land, this population has geographic constraints identified in the name (although not identified as a geographic limitation in the credit calculator). This assessment has taken the geographic constraint in the name to be a geographic limitation as per s6.4.1.3 of the BAM



## 4.2 Identify candidate species

In accordance with Section 6.4.1.17 of the BAM, a predicted candidate species can be considered unlikely to occur within the subject land (or specific vegetation zones) where habitat is substantially degraded such that the species is unlikely to utilise area, or where an expert report identifies that the species is unlikely to be present within the subject land (or a vegetation zone within the subject land). A predicted candidate species credit species that is not considered to have suitable habitat on the subject land (or specific vegetation zones) in accordance with Section 6.4.1.17 of the BAM does not require further assessment on the subject land (or specific vegetation zones). The reasons for determining that a predicted species credit species is unlikely to have suitable habitat on the subject land (or specific vegetation zones) must be documented.

As discussed in **Section 3**, much of the vegetation within the subject land has been previously cleared and fragmented which would represent substantial degradation for selected species credit species. To inform an assessment of how habitat degradation has impacted candidate threatened species a search of the Atlas of NSW Wildlife (OEH 2018a) was undertaken. The search identified all records from the last 20 years within a 5 km radius around the subject land. The likelihood of occurrence of candidate threatened species was assessed by:

- review of location and date of recent (<5 years) and historical (>5-20 years) records
- review of available habitat within the subject land and surrounding areas
- review of 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 following review of location and date of records of threatened species, available habitat within the subject land, and the condition of such habitat. **Table 4.3** outlines the predicted candidate species which were deemed to not have suitable habitat within the subject land, including justification for this decision.

**Table 4.3: Candidate species for which the subject land is not considered suitable habitat.**

Species	Justification*
<b>FLORA</b>	
<i>Acacia bynoeana</i> (Bynoe's Wattle)	Unsuitable habitat within the subject lands, this species occurs in heath or dry sclerophyll forest on sandy soils. Seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches. Not recorded during the last 20 years within 5 km of the subject land.
<i>Caladenia tessellata</i> (Thick Lip Spider Orchid)	Unsuitable habitat within the subject land, this species is known from the Sydney area (old records), Wyong, Ulladulla and Braidwood in NSW becoming more common to the south in coastal parts of Victoria. Generally found in coastal heaths, heathy woodland and open-forest on well drained sand to clay loam soils (Backhouse 2018). Not recorded during the last 20 years within 5 km of the subject land.
<i>Eucalyptus benthamii</i> (Camden White Gum)	Unsuitable habitat within the subject land, the species requires a combination of deep alluvial sands and a flooding regime that permits seedling establishment. There are two major subpopulations: in the

Species	Justification*
	Kedumba Valley of the Blue Mountains National Park and at Bents Basin State Recreation Area. Several trees are scattered along the Nepean River around Camden and Cobbitty, with a further stand at Werriberri (Monkey) Creek in The Oaks. At least five trees occur on the Nattai River in Nattai National Park Not recorded during the last 20 years within 5 km of the subject land.
<i>Hibbertia</i> sp. <i>Bankstown</i> (syn. <i>H. puberula</i> subsp. <i>glabrescens</i> )	Unsuitable habitat within the subject land, the species is currently known to occur in only one population on tertiary alluvial soil along Airport Creek at Bankstown Airport. Habitat is in Castlereagh Ironbark Forest although some remnant vegetation at and near the site suggests Castlereagh Scribbly Gum Woodland is equally valid. Not recorded during the last 20 years within 5 km of the subject land.
<i>Persoonia bargoensis</i> (Bargo Geebung)	Unsuitable habitat within the subject land, the species occurs in woodland or dry sclerophyll forest on sandstone and on heavier well drained, loamy, gravelly soils of the Wianamatta Shale and Hawkesbury Sandstone. Much of the vegetation the species occurs within would be recognised as the Shale/Sandstone Transition Forest. Not recorded during the last 20 years within 5 km of the subject land.
<i>Persoonia hirsuta</i> (Hairy Geebung)	Unsuitable habitat within the subject land, this species is found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone. Not recorded during the last 20 years within 5 km of the subject land.
<i>Pterostylis saxicola</i> (Sydney Plains Greenhood)	Unsuitable and degraded habitat within the subject land, the species is restricted to western Sydney between Freemans Reach in the north and Picton in the south. Most commonly found growing in small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines. The vegetation communities above the shelves where <i>Pterostylis saxicola</i> occurs are sclerophyll forest or woodland on shale/sandstone transition soils or shale soils. Not recorded during the last 20 years within 5 km of the subject land.
<i>Thesium australe</i> (Austral Toadflax)	No suitable habitat for this species. Although originally described from material collected in the SW Sydney area, populations have not been seen in a long time. Records from the Sydney basin are from 1803. Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Not recorded during the last 20 years within 5 km of the subject land.
<b>FAUNA</b>	
<i>Anthochaera phrygia</i> (Regent Honeyeater) (Breeding)	No suitable breeding habitat within the subject land. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. In NSW the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands.
<i>Burhinus grallarius</i> (Bush Stone-curlew)	Unsuitable and degraded habitat within the subject land. This species is found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Only in northern Australia is it still common however and in the south-east it is either rare or extinct throughout its former range. Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber. Fallen

Species	Justification*
	timber was largely absent from the subject land due to previous vegetation clearing. Not recorded during the last 20 years within 5 km of the subject land.
<i>Callocephalon fimbriatum</i> (Gang-gang Cockatoo) (Breeding)	No suitable breeding habitat within the subject land. In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. Favours old growth forest and woodland attributes for nesting and roosting. Nests are located in hollows that are 10 cm in diameter or larger and at least 9 m above the ground in eucalypts. No hollow bearing trees of suitable diameter for Gang-gang Cockatoo to nest in were identified in the subject land. Not recorded during the last 20 years within 5 km of the subject land.
<i>Cercartetus nanus</i> (Eastern Pygmy-possum)	Unsuitable and degraded habitat within the subject land. This species is found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred. Not recorded during the last 20 years within 5 km of the subject land.
<i>Chalinolobus dwyeri</i> (Large-eared Pied Bat)	This species is found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin ( <i>Petrochelidon ariel</i> ), frequenting low to mid-elevation dry open forest and woodland close to these features. Not recorded during the last 20 years within 5 km of the subject land.
<i>Haliaeetus leucogaster</i> (White-bellied Sea-Eagle) (Breeding)	No suitable breeding habitat within the subject land. Breeding habitat for this species consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat (characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea). Nest trees are typically large emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'. Nests are large structures built from sticks and lined with leaves or grass.
<i>Lathamus discolor</i> (Swift Parrot) (Breeding)	No suitable breeding habitat within the subject land. This species breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland.
<i>Litoria aurea</i> (Green and Golden Bell Frog)	There are no Key Populations identified in the South Creek catchment. There are no records of this species within 5 km of the subject land. The last known records of this species west the M7 are from 1966 and 1973.
<i>Lophoictinia isura</i> (Square-tailed Kite) (Breeding)	Habitat within the subject land is unsuitable and degraded for breeding. This species nests on horizontal branches in mature living trees, especially eucalypts, often near water, and they need extensive areas of forest or woodland surrounding or nearby (Birdlife 2018).
<i>Miniopterus australis</i> (Little Bentwing-bat) (Breeding)	No suitable breeding habitat within the subject land. Only five nursery sites /maternity colonies are known in Australia. In NSW the largest maternity colony is in close association with a large maternity colony of Eastern Bentwing-bats ( <i>Miniopterus schreibersii</i> ) and appears to depend on the large colony to provide the high temperatures needed to rear its young.



Species	Justification*
<i>Miniopterus schreibersii oceanensis</i> (Eastern Bentwing-bat) (Breeding)	No suitable breeding habitat within the subject land. The species forms discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. Maternity caves have very specific temperature and humidity regimes.
<i>Ninox connivens</i> (Barking Owl) (Breeding)	This species nests in living or dead trees with hollows >20 cm diameter and >4 m above the ground. Habitat includes woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in ot close forest and more open areas. Requires very large permanent territories in most habitats due to sparse prey densities. Monogamous pairs hunt over as much as 6000 hectares, with 2000 hectares being more typical in NSW habitats.  No hollow bearing trees of suitable diameter for Barking Owl to nest in were identified in the subject land.  Not recorded during the last 20 years within 5 km of the subject land.
<i>Ninox strenua</i> (Powerful Owl) (Breeding)	This species nests in large tree hollows (at least 0.5 m deep), in large eucalypts (diameter at breast height of 80-240 cm) that are at least 150 years old. While the female and young are in the nest hollow the male Powerful Owl roosts nearby (10-200 m) guarding them, often choosing a dense "grove" of trees that provide concealment from other birds that harass him.  No hollow bearing trees of suitable diameter for Powerful Owl to nest in were identified in the subject land.
<i>Pandion cristatus</i> (Eastern Osprey) (Breeding)	No suitable breeding habitat within the subject land. This species nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.
<i>Petaurus norfolcensis</i> (Squirrel Glider)	No suitable habitat within the subject land. Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Require abundant tree hollows for refuge and nest sites.  Not recorded during the last 20 years within 5 km of the subject land.
<i>Phascolarctos cinereus</i> (Koala) (Breeding)	Habitat within the subject land is unsuitable and degraded for Koala breeding habitat. The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. Inhabit eucalypt woodlands and forests. The subject land has been fragmented and isolated from any nearby records by previous vegetation clearing and urban and industrial development.  Not recorded during the last 20 years within 5 km of the subject land.
<i>Pommerhelix duralensis</i> (Dural Woodland Snail)	No suitable habitat within the subject land. The species is a shale-influenced-habitat specialist, which occurs in low densities along the western and northwest fringes of the Cumberland IBRA subregion on shale-sandstone transitional landscapes. Found in an area of north-western Sydney between Rouse Hill - Cattai and Wiseman's Ferry, west from Berowra Creek.  Not recorded during the last 20 years within 5 km of the subject land.
<i>Tyto novaehollandiae</i> (Masked Owl) (Breeding)	No suitable breeding habitat within the subject land. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting. The Masked Owl utilises hollows greater than 20cm diameter in living or dead trees.

Species	Justification*
	No hollow bearing trees of suitable diameter for Masked Owl to nest in were identified in the subject land.

\* Unless otherwise stated, habitat information is sourced from OEH (2018b)

Based upon the assessment of available habitat for predicted candidate species within the subject land, the following predicted candidate species were confirmed for the subject land:

- *Acacia pubescens* (Downy Wattle)
- *Callistemon linearifolius* (Netted Bottle Brush)
- *Cynanchum elegans* (White-flowered Wax Plant)
- *Dillwynia tenuifolia*
- *Grevillea juniperina* subsp. *juniperina* (Juniper-leaved Grevillea)
- *Marsdenia viridiflora* subsp. *viridiflora* (endangered population including occurrences in the Blacktown LGA)
- *Persicaria elatior* (Tall Knotweed)
- *Pilularia novae-hollandiae* (Austral Pillwort)
- *Pimelea curviflora* var. *curviflora*
- *Pimelea spicata* (Spiked Rice-flower)
- *Pomaderris brunnea* (Brown Pomaderris)
- *Pultenaea pedunculata* (Matted Bush-pea)
- *Hieraaetus morphnoides* (Little Eagle) (Breeding)
- *Meridolum corneovirens* (Cumberland Plain Land Snail)
- *Pteropus poliocephalus* (Grey-headed Flying-fox) (Breeding)

### 4.3 Determine presence or absence of a candidate species credit species

Species survey has not been conducted for the predicted candidate species confirmed for the subject land. The field survey was conducted outside of the nominated survey period specified for several of the candidate species and was not in accordance with OEH threatened species survey guidelines. Confirmed candidate species will need to be assessed consistent with Steps 4 – 6 of Section 6.4 of the BAM and targeted surveys for species credit species should be undertaken in accordance within section 6.5 of the BAM. However, the level of survey conducted is suitable for this planning proposal.

#### 4.3.1 Targeted field surveys - flora

Targeted surveys for candidate threatened flora species was not conducted in accordance with the *NSW Guide to Surveying Threatened Plants* (OEH 2016) and was outside of the nominated survey period for several of the predicted candidate species (**Table 4.4**).

*Grevillea juniperina* subsp. *juniperina* (listed as Vulnerable under the BC Act **Figure 4.2**) was inadvertently recorded within the subject land. A total of 29 individuals of this species were observed within a well defined cluster in the north of the subject land (**Figure 4.1**). As per section 6.4.1.28 of the BAM a species polygon has been used to measure the area and location of suitable habitat for *Grevillea juniperina* subsp. *juniperina*. The area of suitable

habitat for the species polygon was determined by applying a 30 m buffer to the individual records recorded onsite, following advise received by OEH (John Seidel | A/ Senior Team Leader, Ecosystem Assessment – Conservation and Regional Delivery). The total area of the species polygon within the subject land is approximately 0.56 ha.

Table 4.4: Survey periods for confirmed candidate threatened flora species.

Candidate species	Survey period (BAM Calculator)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<i>Acacia pubescens</i> (Downy Wattle)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
<i>Callistemon linearifolius</i> (Netted Bottle Brush)	Y	Y	Y						Y	Y	Y	Y
<i>Cynanchum elegans</i> (White-flowered Wax Plant)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
<i>Dillwynia tenuifolia</i>	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
<i>Grevillea juniperina</i> subsp. <i>juniperina</i> (Juniper-leaved Grevillea)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
<i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i> (endangered population including occurrences in the Blacktown LGA)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
<i>Persicaria elatior</i> (Tall Knotweed)	Y	Y	Y	Y	Y							Y
<i>Pilularia novae-hollandiae</i> (Austral Pillwort)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
<i>Pimelea curviflora</i> var. <i>curviflora</i>	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
<i>Pimelea spicata</i> (Spiked Rice-flower)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
<i>Pomaderris brunnea</i> (Brown Pomaderris)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
<i>Pultenaea pedunculata</i> (Matted Bush-pea)									Y	Y	Y	

Blue column indicates the primary survey month.



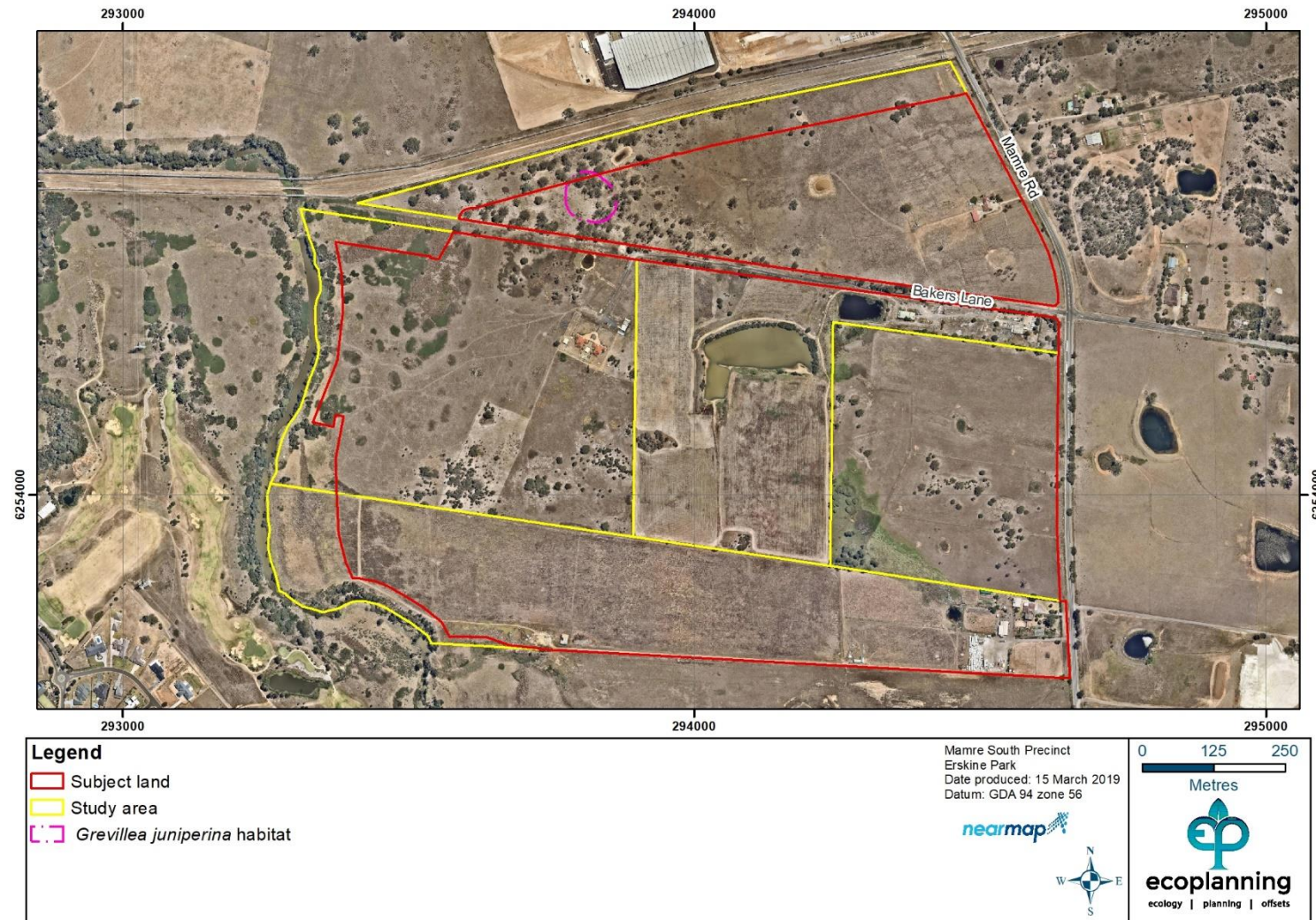


Figure 4.1: *Grevillea juniperina* subsp. *juniperina* habitat.





Figure 4.2: *Grevillea juniperina* subsp. *juniperina* within the subject land.

#### 4.3.2 Targeted field surveys – fauna

Targeted surveys for candidate threatened fauna species requiring further assessment and their associated survey periods are outlined for each of the candidate threatened fauna species below.

Table 4.5: Survey periods for candidate threatened fauna species.

Candidate species	Survey period (BAM Calculator)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<i>Meridolum corneovirens</i> (Cumberland Plain Land Snail)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
<i>Pteropus poliocephalus</i> (Grey-headed Flying-fox) (Breeding)										Y	Y	Y
<i>Hieraaetus morphnoides</i> (Little Eagle) (Breeding)								Y	Y	Y		

Blue: indicates the survey months

## 4.4 Field survey and results

### 4.4.1 Field survey

A field survey was undertaken on 30 April 2018 by Lucas Mckinnon (Principal Ecologist, Director), Thomas Hickman (Ecologist) and Kieren Northman (Ecologist) (**Figure 4.3**). The field survey included a general flora and fauna habitat and vegetation community assessment and the completion of 6 vegetation integrity plots in accordance with the BAM (OEH 2017a) over a total of 18 person hours. Weather conditions on the days were cool-warm with 1 mm of rain recorded within 24 hours prior to the survey (**Table 4.6**).

**Table 4.6: Daily weather observation at Horsley Park Equestrian Centre (9 km south southeast of the subject land).**

Date	Temp (°C)		Rainfall (mm)	Max wind	
	Min	Max		Direction	Speed (km/h)
29/04/18	12.2	22.9	1.0	SW	41
30/04/18	11.0	21.8	7.2	SE	26

### *Fauna and fauna habitat*

Opportunistic fauna survey was undertaken for birds, amphibians, reptiles and mammals, which included opportunistic observations along with 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 native fauna).

Fauna habitat searches were conducted for potential foraging, roosting, breeding or nesting habitat of nocturnal and diurnal species. This includes inspection for the presence of 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.

### 4.4.2 Field survey results

#### *Flora species*

A total of 78 flora species were identified in the subject land during the field survey, of which 45 were native and 32 were exotic (**Appendix C**). Nomenclature follows the Flora of NSW (Harden 1990-2002) and updates provided in PlantNET (RBGDT 2018). One threatened flora species, *Grevillea juniperina* subsp. *juniperina* was identified in the subject land and is listed as vulnerable under the BC Act. A total of 29 individuals were counted in a well defined patch in the north of the subject land.



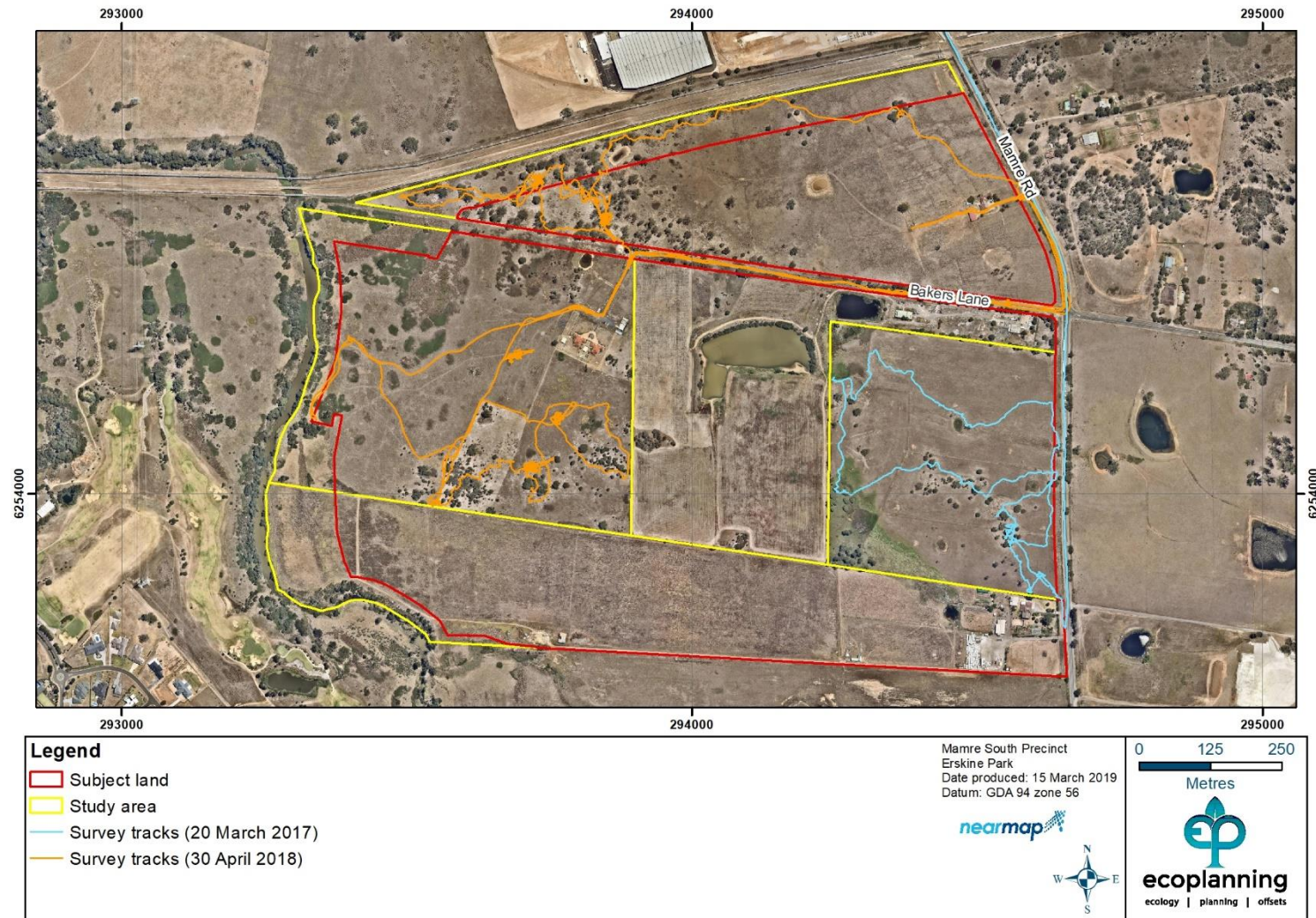


Figure 4.3: Survey effort.



### Fauna habitat

The site contains habitat features, with the potential to provide refuge for a range of native fauna (**Table 4.7**). Habitat within the subject land provides potential foraging, roosting, breeding and nesting resources for native fauna. A total of 11 hollow bearing trees (HBTs) were identified, most of which were confined to the northern portion of the subject land. A large farm dam is situated in the centre of the subject land and several smaller dams are scattered across the northern and eastern portions of the site. The dam provides habitat for common frog and waterfowl species, including *Limnodynastes peronii* (Brown-striped Frog), *Porphyrio porphyrio* (Purple Swamphen), *Elseyornis melanops* (Black-fronted Dotterel), *Tachybaptus novaehollandiae* (Australasian Grebe) and *Poliiocephalus poliocephalus* (Hoary-headed Grebe).

**Table 4.7: Key fauna habitat features present across the subject land.**

Habitat features	Fauna species
Underscrubbed vegetation	Diurnal and nocturnal birds, arboreal mammals, microchiropteran bats, reptiles and frogs
Hollow bearing trees	Arboreal mammals, birds, microchiropteran bats, reptiles and frogs
Dam	Frogs and birds
Open pasture	Birds, microchiropteran bats and reptiles
Coarse woody debris	Mammals, reptiles and frogs

### Fauna species

The field survey undertaken for this report recorded a total of 42 fauna species, of which three were introduced. Of the 42 species, there were 34 birds, two frog species, 5 mammals and one reptile (**Appendix C**). No threatened fauna species were identified in the subject land. However, targeted fauna survey has not been conducted in accordance with the BAM and several candidate species requiring further assessment have been highlighted in **Section 4.3.2**.

## 5. Avoiding and minimising impacts on biodiversity values

### 5.1 Avoiding and minimising impacts on native vegetation and habitat during project planning

A number of options for avoiding impacts to native vegetation and habitat were considered during the project planning phase, in particular consideration of a Biodiversity Stewardship (BS) site along the western edge of the property is still under consideration. The subject land has however been identified for a proposed 60 m freight rail corridor along the northern boundary of the site, adjacent to the Sydney Water pipeline. This corridor runs directly through the area of highest conservation value on the site, where the native vegetation is mapped as River-flat Eucalypt Forest EEC with a vegetation integrity score of 55/100, and also the location of numerous hollow bearing trees and 29 individuals of *G. juniperina* subsp. *juniperina*, a vulnerable species. The subject land has further been dissected by a future road corridor in regional planning documentation, which also been identified as Southern Link Road in **Figure 6.1**.

These two infrastructure corridors have the effect of isolating a large part of the potential BS site, limiting the future long term viability of any retained vegetation in this area. As such, avoiding impacts to the native vegetation within this part of the subject land was, in this case, not considered feasible.

However, a large riparian corridor has been retained along South Creek, which may still be considered as potential BS site, and avoid some clearing of Rough-barked Apple – Forest Red Gum grassy woodland (Alluvial Woodland). There is also opportunity during future planning for a large part of this corridor to be revegetated beyond the 40 m Vegetated Riparian Zone requirement of the NSW *Water Management Act 2000* (WM Act). The extent of future revegetation and potential for a BS site in this area will be considered further during future project planning.

The remainder of the subject land consists of vegetation that is mostly isolated, in small patches and is in a poor condition, resulting in reduced viability, particularly when considering the current adjacent (and proposed future) adjacent industrial land uses. Furthermore, a majority of the impacts will be incurred to cleared land 'exotic grassland' (86.04 ha, or approximately 82.95 % of the subject land).

### 5.2 Avoiding and minimising prescribed biodiversity impacts during project planning

As described in **Section 2.1.3**, no prescribed biodiversity impacts are anticipated from the proposed development.

## 6. Assessing and offsetting impacts

### 6.1 Assessment of impacts

#### 6.1.1 Assessing impacts to native vegetation and habitat

Impacts to native vegetation are anticipated through the direct clearing of 11.40 ha of native vegetation within the subject land. This includes 7.11 ha of Alluvial Woodland in an 'underscrubbed' condition, 4.04 ha of Alluvial Woodland in a 'DNG' condition, and 0.24 ha of Shale Plains Woodland in an 'underscrubbed' condition. The Alluvial Woodland is synonymous with the TEC River-flat Eucalypt Forest and the Shale Plains Woodland is synonymous with the TEC Cumberland Plain Woodland. The direct clearing and subsequent development of the subject land would represent a permanent impact, or loss, of this native vegetation and habitat. A further 0.72 ha of exotic plantings and 86.04 ha of cleared land 'exotic grassland' including only occasional native species would also be impacted by the project.

#### 6.1.2 Assessing indirect impacts on native vegetation and habitat

It is difficult to quantify indirect impacts associated with the project, but these may include impacts such as noise and/or erosion associated with the construction phase of the project. The location of the subject lands adjacent to existing urban infrastructure and supporting highly modified native vegetation is considered unlikely to have inadvertent impacts on adjacent areas of native vegetation and habitat. Given the highly modified nature of the subject land and broader locality, and its proximity to industrial land use and large urban roads, the project is considered unlikely to reduce viability of any adjacent native vegetation or habitat due to edge effects, noise dust or light spill, or disturbance to breeding habitats. Further, within adjacent areas of native vegetation and habitat, the project is considered unlikely to cause any increase in trampling of flora, rubbish dumping, firewood or bush rock collection or introduce any pests, weeds or pathogens to the adjacent areas of native vegetation and habitat.

Measures to mitigate and manage indirect impacts are discussed in **Section 6.3**.

### 6.2 Assessing prescribed biodiversity impacts

As described in **Section 2.1.3**, no prescribed biodiversity impacts are anticipated from the proposed development.



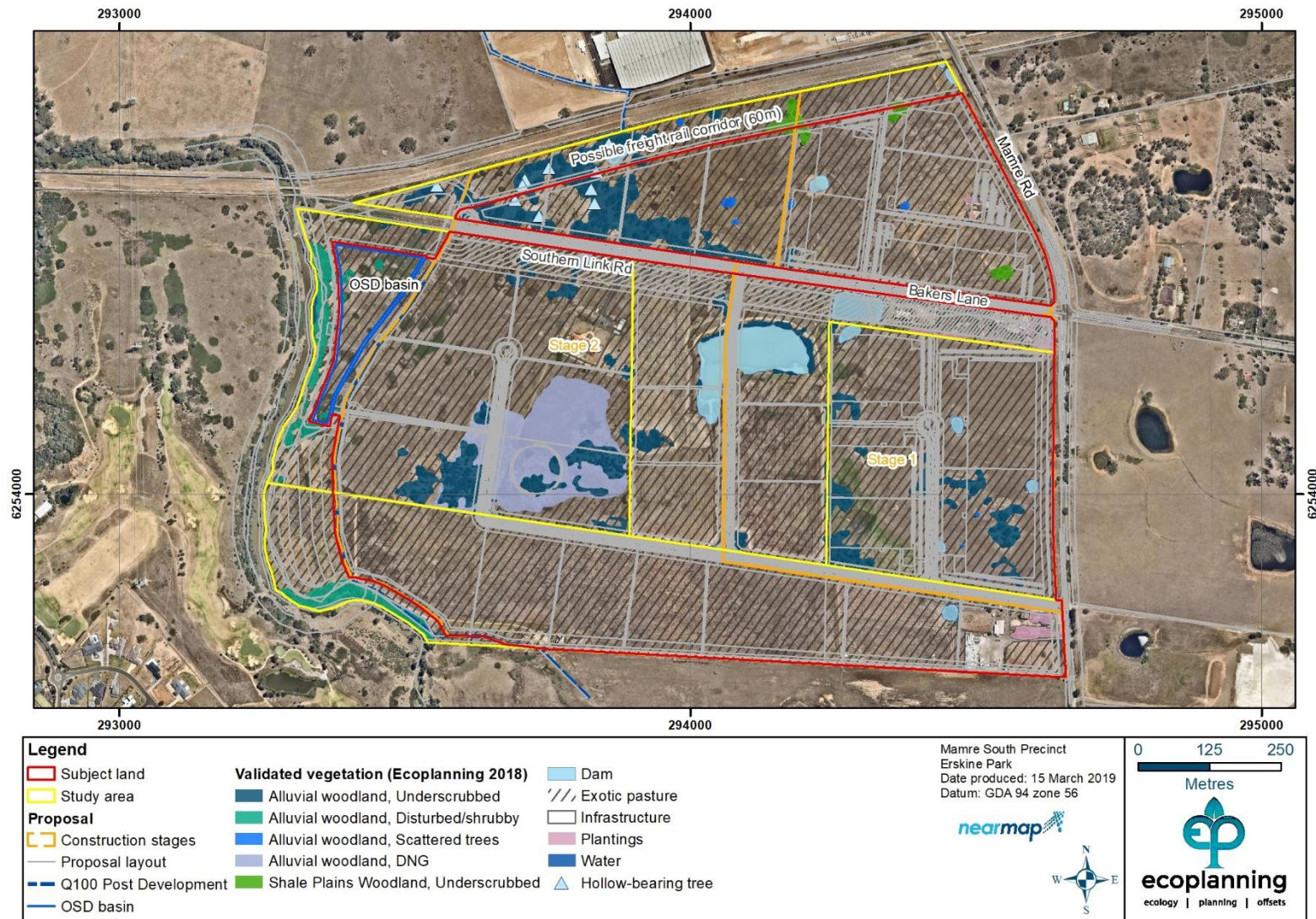


Figure 6.1: Field validated vegetation (Ecoplanning 2018) and proposed footprint.



## 6.3 Mitigating and managing impacts on biodiversity values

As described above, a majority of the impact will be incurred to cleared land 'exotic grassland'. Several measures will be implemented to reduce impacts where possible, such as appropriate pre-clearance protocols and a CEMP. Details are provided below.

### 6.3.1 Pre-clearance protocols

A number of non-threatened fauna species such as birds, arboreal mammals and amphibians are likely to be present at the development site. Appropriate pre-clearance protocols will be put in place at the time of construction to avoid and mitigate any potential harm or injury to these individuals. These protocols are discussed below and should be included as a component of the Construction Environmental Management Plan (CEMP).

#### *On-site supervision of habitat tree felling and relocation of fauna*

An ecologist will be required to be present onsite when felling habitat trees (hollow bearing and/or stag trees). Hollows should be inspected from an elevated work platform or cameras mounted to telescopic poles, prior to felling operations. Any fauna occupying a hollow during felling operations will be relocated (where feasible) to bushland immediately adjacent to the site.

The ecologist will need to work closely with the plant operators to identify each hollow and to stop work if an animal is observed and requires rescue. The ecologist will encourage any fauna species that may be present to move from site or if considered necessary capture, store and actively relocate them to another area. All habitat trees should be left over night to give species that are not possible to handle, further opportunity to relocate. Advice on appropriate actions for individuals that continue to utilise habitat of trees should be provided by the onsite ecologist. Any variation to this protocol must be approved by onsite ecologist.

The ecologist will ensure that any injured animals receive the appropriate levels of care. The nearest veterinary clinics should be contacted prior to the works beginning to ensure that they have the capabilities to care for injured native animals. Qualified wildlife carer organisations (e.g. WIRES) should also be identified and contacted if required.

#### *Soft felling operations*

Soft felling of hollow bearing trees is encouraged to avoid unnecessary injuries to undetected fauna. This process involves an excavator or bulldozer softly 'nudging' trees before felling, in order to encourage any fauna that may be occupying a hollow or crevice to vacate the tree prior to being felled. Once the tree has been felled, the ecologist will undertake further searches of the tree for any animal that has not fled or is unable to flee. As above, fauna will be relocated to bushland adjacent to the site, or if required, veterinary clinics and/or qualified wildlife carers contacted.

### 6.3.2 Vegetation Management Plan

The South Creek riparian corridor will require revegetation in accordance with the WM Act, to a width of 40 m from the Top of Bank. A Vegetation Management Plan will be prepared to outline the requirements for revegetation and rehabilitation of retained vegetation in this area.

### 6.3.3 Construction Environmental Management Plan (CEMP)

To avoid potential indirect offsite impact during construction, an appropriate erosion and sedimentation control plan should be in place following best practice protocols such as Landcom (2004). It is recommended that this is included in a site specific Construction Environmental Management Plan (CEMP), prior to any construction works taking place.

The CEMP will be required to span the pre, during and post-construction period, and will include the above pre-clearance and fauna management protocols.

## 6.4 Adaptive management for uncertain impacts

Excluding the need for a CEMP, no additional adaptive management measures are proposed.

## 6.5 Thresholds for the assessment and offsetting of impacts of development

### 6.5.1 Serious and Irreversible impacts

The Guidance to assist a decision-maker to determine a serious and irreversible impact (OEH 2017b) was used to determine whether or not an impact on biodiversity values is likely to be a Serious and Irreversible Impact. The guide (OEH 2017b) lists in Appendix 3 the ecological communities that have potential to meet the SAIL principles and criteria. One potential entity that may trigger Serious and Irreversible Impacts (SAIL) will be impacted by the proposal, being impacts to the Cumberland Plain Woodland CEEC (PCT 849). Information is not yet available on size and condition thresholds related to this potential SAIL entity. Discussions will be held with OEH as to how best to proceed without the information required.

Appendix 2 is a list of potential species that meet the SAIL principles and criteria. *Grevillea juniperina* subsp. *juniperina* is not listed in Appendix 2 (OEH 2017b) as an entity that is at risk of a serious and irreversible impact.

### 6.5.2 Impacts which require an offset

Section 10.3.1 of the BAM outlines that the following vegetation zones require offsets:

- vegetation zones that have a vegetation integrity score  $\geq 15$  where the PCT is representative of an endangered or critically endangered ecological community.
- a vegetation zone that has a vegetation integrity score of  $\geq 17$  where the PCT is associated with threatened species habitat or is a vulnerable ecological community.
- a vegetation zone that has a vegetation integrity score  $\geq 20$ .

Impacts associated with two of the three vegetation zones for the project will require offset under the BAM. The areas of Vegetation Zone 3: PCT 849 (Shale Plains Woodland) mapped as 'underscrubbed' do not require an offset as the vegetation integrity score for this vegetation zone was 6.4.

### 6.5.3 Impacts that do not require further assessment

As described in s31.1.3 of the BAM, impacts to non-native vegetation (cleared land, exotic grassland and built structures, and planted non-indigenous trees) were not considered beyond s5.4 or for s6.2 (including 6.2.1.4) of the BAM and did not require an offset. Hence, they have not been assessed here.

As outlined above, impacts to those areas of PCT 849 (Shale Plains Woodland) mapped as 'underscrubbed' do not require offsetting (**Table 6.1**), due to the vegetation integrity score being less than 15.

**Table 6.1: Vegetation zones which do not require offsets.**

Veg zone number	Plant community type	Condition class	Area impacted (ha)	Veg integrity score
<b>Vegetation zones which <u>do not</u> require impacts to be offset</b>				
3	PCT 849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Underscrubbed	0.24	6.4

## 7. Final Credit Calculations

### 7.1 Credit calculations and classes

#### 7.1.1 Ecosystem credits

The ecosystem credits required to offset the proposal are provided in **Table 7.1** and **Appendix D**. A total of 267 ecosystem credits are required to offset the development, including 58 for Stage 1 and 209 for Stage 2.

The following offset rules apply:

- River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (including PCT's 686, 828, 835, 839, 941, 971, 1064, 1108, 1109, 1212, 1228, 1232, 1293, 1318, 1326, 1386, 1522, 1556, 1594, 1618, 1646, 1648, 1720, 1794, 1800)
- In the following subregions - Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site..
- Containing hollow bearing trees - yes

The total cost of ecosystem credits, should the Biodiversity Conservation Trust (BCT) be used to offset the impacts, are currently (March 2019) estimated to be **\$5,618,336.66** (excluding GST). Details are provided in **Table 7.2**. Note that the credit prices were updated on 4 January 2019, and are revised quarterly. The proponent may also wish to purchase credits available on the market or may wish to pursue other offset sites as required. A final decision on how the credits will be secured will be made as the project progresses.



Table 7.1: Ecosystem credits summary and credit profiles.

Veg zone number	Plant community type	Condition class	Stage 1	Credit requirement	Stage 2	Credit requirement	Total impact (ha)	Credits required
1	PCT 835 - Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	Underscrubbed	2.12	58	4.99	138	7.11	196
2		DNG	0.00	0	4.04	71	4.04	71
Total							11.15	267

Table 7.2: Ecosystem credits summary and credit profiles.

Plant community type	Baseline price per credit	Price per credit	No. of ecosystem credits	Final credits price (ex GST)
PCT 835 - Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	\$16,500.00	\$19,503.64	267	\$5,207,471.08*

\* this equates to \$1,131,210.95 for Stage 1 and \$4,076,260.13 for Stage 2

### 7.1.2 Species credits

Species credits are required for *Grevillea juniperina* subsp. *juniperina*. Depending on results from further field surveys, additional species credits may also be required. *Grevillea juniperina* subsp. *juniperina* uses 'Area' as a Unit of Measure (UOM) for the credit calculator. The area and location of suitable habitat for this species was mapped using the PCT mapping generated in **Section 3**.

A total of 15 species credits are required for the full loss of suitable habitat in the subject land for this species.

The total cost of species credits, should the Biodiversity Conservation Trust (BCT) be used to offset the impacts, are currently (4 June 2018) estimated to be **\$2,945.06** (excluding GST) (**Table 7.3** and **Appendix D**). The final credit price includes administrative cost and a risk premium. Note that the credit prices were updated on 4 January 2019.

The following offset rules apply for like-for-like options for *Grevillea juniperina* subsp. *juniperina*:

- *Grevillea juniperina* subsp. *juniperina* / Juniper-leaved Grevillea in any IBRA subregion in NSW

**Table 7.3: Species credits summary and credit profiles.**

Species	Price per credit	No. of species credits	Final credits price (ex GST) <sup>1</sup>
<i>Grevillea juniperina</i> subsp. <i>juniperina</i>	\$146.35	15	\$2,945.06
<b>Total cost for species credits (excl. GST)</b>			<b>\$2,945.06</b>

<sup>1</sup> including BCT Risk Premium and Administrative cost

## 8. References

- Groves, R.H. (2002). Robert Brown and the naturalised flora of Australia. *Cunninghamia* 7(4): 623-629.
- Harden, G. J. (ed.) (1990-2002). Flora of New South Wales Volume 1-4, and including revisions and supplements. New South Wales University Press, Sydney.
- Jessop, J., Dashorst, G.R.M. & James, F.M. (2006) *Grasses of South Australia: An Illustrated Guide to the Native and Naturalised Species*. Wakefield Press, Kent Town, South Australia.
- Langdon, R.F.N. (1954). *The origin and distribution of Cynodon Dactylon (L.) Pers.* Department of Botany, University of Queensland Press, Queensland.
- New South Wales National Parks and Wildlife Service (NPWS) (2002). *Interpretation Guidelines for the Native Vegetation Maps of the Cumberland Plain, Western Sydney, Final Edition*. NSW NPWS, Hurstville.
- NSW Dept. of Planning and Environment (DPE) (2018). NSW Planning Portal. NSW Government. Accessed at: <https://www.planningportal.nsw.gov.au/>.
- NSW Land and Property Information (LPI) (2018). SIX Maps. Accessed at: <https://maps.six.nsw.gov.au/>.
- NSW Office of Environment and Heritage (NSW OEH) (2016). *NSW Guide to Surveying Threatened Plants*. Office of Environment and Heritage, Sydney.
- NSW Office of Environment and Heritage (NSW OEH) (2017a). Biodiversity Assessment Method. Office of Environment and Heritage for the NSW Government, Sydney.
- NSW Office of Environment and Heritage (NSW OEH) (2017b). Guidance to assist a decision-maker to determine a serious and irreversible impact. Office of Environment and Heritage for the NSW Government, Sydney.
- NSW Office of Environment and Heritage (NSW OEH) (2018a). BioNet Atlas of NSW Wildlife. Accessed at: [http://www.environment.nsw.gov.au/atlaspublicapp/UI\\_Modules/ATLAS\\_/AtlasSearch.aspx](http://www.environment.nsw.gov.au/atlaspublicapp/UI_Modules/ATLAS_/AtlasSearch.aspx).
- NSW Office of Environment and Heritage (NSW OEH) (2018b). NSW Vegetation Information Sydney (VIS) Classification Database VIS 2.1, logged in as public user at: <http://www.environment.nsw.gov.au/NSWVCA20PRapp/LoginPR.aspx?ReturnUrl=%2fNSWVCA20PRapp%2fdefault.aspx>.
- NSW Scientific Committee (2004b). *Swamp oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions - endangered ecological community listing*. Available online: <http://www.environment.nsw.gov.au/determinations/SwampOakFloodplain-EndSpListing.htm>, accessed 28 March 2018.
- Office of Environment and Heritage (OEH) (2015). *Remnant Vegetation of the western Cumberland subregion, 2013 Update*. Office of Environment and Heritage for the NSW Government, Sydney.

Tindall D, Pennay C, Tozer MG, Turner K, Keith, DA (2004) *Native vegetation map report series. No. 4. Araluen, Batemans Bay, Braidwood, Burragorang, Goulburn, Jervis Bay, Katoomba, Kiama, Moss Vale, Penrith, Port Hacking, Sydney, Taralga, Ulladulla, Wollongong*. NSW Department of Environment and Conservation and NSW Department of Infrastructure, Planning and Natural Resources, Sydney.

Tozer MG (2003). The native vegetation of the Cumberland Plain, western Sydney: systematic classification and field identification of communities. *Cunninghamia* 8: 1-75.

Tozer, M. G., Turner, K., Simpson, C. C., Keith, D. A., Beukers, P., Mackenzie, B., Tindall, D. & Pennay, C. (2006) *Native Vegetation of Southeast NSW: A Revised Classification and Map for the Coast and Eastern Tablelands*. Version 1.0. Department of Environment & Conservation and Department of Natural Resources, Sydney.



## Appendix A: Plot data collected

Plot No.	PCT	Area (ha)	Patch size	Condition class	Zone	Easting	Northing	Bearing
1	835	8.0	101	Underscrubbed	56	293842	6254472	0
2	835	8.0	101	Underscrubbed	56	293737	6254552	223
3	835	4.0	4	DNG	56	293707	6254043	55
4	835	4.0	4	DNG	56	293758	6254123	30
5	Exotic grassland – 835x		101	Exotic	56	293681	6254239	57
6	849	0.4	1	Underscrubbed	56	294166	6254638	90

Plot No.	Composition					
	Tree	Shrub	Grass	Forb	Fern	Other
1	1	1	4	2	1	0
2	2	1	5	1	1	0
3	1	0	10	3	0	0
4	0	0	8	3	0	0
5	0	0	5	2	0	0
6	0	1	4	1	0	0

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Plot No.	Structure					
	Tree	Shrub	Grass	Forb	Fern	Other
1	25.0	3.0	96.1	0.2	0.1	0.0
2	9.0	1.0	82.6	0.1	0.1	0.0
3	0.2	0.0	82.7	0.3	0.0	0.0
4	0.0	0.0	85.7	0.3	0.0	0.0
5	0.0	0.0	0.9	1.1	0.0	0.0
6	0.0	5.0	0.4	0.1	0.0	0.0

Plot No.	Function										
	Large trees	Hollow trees	Litter cover	Fallen logs	Tree stem 5-10	Tree stem 10-20	Tree stem 20-30	Tree stem 30-50	Tree stem 50-80	Tree regen	High threat exotic
1	1	0	31.0	0.0	1	1	1	1	1	1	3.7
2	1	1	27.0	2.0	0	0	1	0	1	1	3.2
3	0	0	20.0	0.0	0	0	0	0	0	1	10.5
4	0	0	9.0	0.0	0	0	0	0	0	1	14.1
5	0	0	31.0	0.0	0	0	0	0	0	0	88.1
6	0	0	47.0	0.0	0	0	0	0	0	0	35.3

## Appendix B: Likelihood Table

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						
<i>Apus pacificus</i> Fork-tailed Swift	EPBC Act: C, J, K	2	3.0 km (13/07/2005)	3.0 km (13/07/2005)	Low	Low
<i>Artamus cyanopterus cyanopterus</i> Dusky Woodswallow	BC Act: V	21	2.4 km (15/10/2014)	2.7 km (16/10/2014)	Moderate	Moderate
<i>Chthonicola sagittata</i> Speckled Warbler	BC Act: V	9	3.8 km (20/04/2006)	3.8 km (20/04/2006)	Low	Low
<i>Daphoenositta chrysoptera</i> Varied Sittella	BC Act: V	14	3.7 km (19/04/2006)	4.3 km (21/04/2006)	Low	Low
<i>Gallinago hardwickii</i> Latham's Snipe	EPBC Act: C, J, K	3	1.3 km (17/11/2009)	4.4 km (10/12/2013)	Low	Low
<i>Haliaeetus leucogaster</i> White-bellied Sea-Eagle	BC Act: V EPBC Act: C	3	2.9 km (10/01/2008)	2.9 km (28/09/2017)	Low	Low
<i>Hieraaetus morphnoides</i> Little Eagle	BC Act: V	1	1.5 km (22/02/2008)	1.5 km (22/02/2008)	Low	Low
<i>Ixobrychus flavicollis</i> Black Bittern	BC Act: V	1	4.3 km (15/06/2016)	4.3 km (15/06/2016)	Low	Low
<i>Ninox strenua</i> Powerful Owl	BC Act: V	2	3.7 km (25/05/2012)	4.2 km (17/07/2013)	Low	Low

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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
<i>Rostratula australis</i> Australian Painted Snipe	BC Act: E1 EPBC Act: E	1	2.0 km (28/01/2015)	2.0 km (28/01/2015)	Low	Low
<i>Stagonopleura guttata</i> Diamond Firetail	BC Act: V	1	1.9 km (27/03/2012)	1.9 km (27/03/2012)	Low	Not present
<i>Tringa nebularia</i> Common Greenshank	EPBC Act: C, J, K	1	2.9 km (21/04/2006)	2.9 km (21/04/2006)	Low	Low
<b>KINGDOM: Animalia; CLASS: Gastropoda</b>						
<i>Meridolum corneovirens</i> Cumberland Plain Land Snail	BC Act: E1	414	0.59 km (28/05/2000)	4.1 km (16/11/2016)	High	Moderate
<b>KINGDOM: Animalia; CLASS: Mammalia</b>						
<i>Falsistrellus tasmaniensis</i> Eastern False Pipistrelle	BC Act: V	1	3.4 km (16/10/2001)	3.4 km (16/10/2001)	Moderate	Moderate
<i>Miniopterus australis</i> Little Bentwing-bat	BC Act: V	1	3.4 km (27/10/2018)	3.4 km (27/10/2018)	Moderate	Moderate
<i>Miniopterus schreibersii oceanensis</i> Eastern Bentwing-bat	BC Act: V	3	1.6 km (26/06/2016)	1.6 km (26/06/2016)	Low	Low
<i>Mormopterus norfolkensis</i> Eastern Freetail-bat	BC Act: V	5	1.3 km (17/11/2009)	2.9 km (7/02/2012)	Moderate	Moderate
<i>Myotis macropus</i> Southern Myotis	BC Act: V	9	0.61 km (18/02/2014)	3.8 km (16/11/2016)	Moderate	Moderate



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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
<i>Pteropus poliocephalus</i> Grey-headed Flying-fox	BC Act: V EPBC Act: V	11	2.4 km (30/10/2014)	4.4 km (16/11/2016)	Moderate	Moderate
<i>Scoteanax rueppellii</i> Greater Broad-nosed Bat	BC Act: V	4	0.61 km (18/02/2014)	4.4 km (16/11/2016)	Low	Low
<b>KINGDOM: Plantae</b>						
<i>Acacia pubescens</i> Downy Wattle	BC Act: V EPBC Act: V	1	4.6 km (11/04/2013)	4.6 km (11/04/2013)	Low	Not present
<i>Dillwynia tenuifolia</i>	BC Act: V	2828	1.1 km (16/02/2016)	3.1 km (24/10/2017)	Moderate	Low
<i>Dillwynia tenuifolia</i> Dillwynia tenuifolia, Kemps Creek	BC Act: E2, V	577	4.6 km (5/09/2006)	4.6 km (5/09/2006)	Moderate	Low
<i>Grevillea juniperina subsp. juniperina</i> Juniper-leaved Grevillea	EPBC Act: V	3733	0.77 km (1/01/1999)	1.1 km (16/02/2016)	High	Recent Record
<i>Grevillea parviflora subsp. parviflora</i> Small-flower Grevillea	BC Act: V EPBC Act: V	6	4.7 km (3/05/2001)	4.8 km (4/05/2001)	Low	Not present
<i>Hypsela sessiliflora</i>	EPBC Act: X	7	0.35 km (18/07/2002)	0.35 km (18/07/2002)	Low	Not present
<i>Marsdenia viridiflora subsp. viridiflora</i> Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	EPBC Act: E2	88	3.6 km (29/10/2010)	4.1 km (7/05/2015)	Moderate	Low

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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
<i>Persoonia nutans</i> Nodding Geebung	BC Act: E EPBC Act: E1	2	3.2 km (26/04/2001)	4.8 (11/04/2013)	Low	Not present
<i>Pimelea spicata</i> Spiked Rice-flower	BC Act: E EPBC Act: E1	1	3.6 km (28/11/1998)	3.6 km (28/11/1998)	Low	Not present
<i>Pultenaea parviflora</i>	BC Act: V EPBC Act: E1	1989	1.1 km (16/02/2016)	3.5 km (24/10/2017)	High	Low

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, E4A = Critically Endangered, 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*

## Appendix C: Flora and fauna species inventories

### Flora

Family	Scientific Name	Common name	Native/Exotic	Form	BAM01		BAM02		BAM03		BAM04		BAM05	
					C	A	C	A	C	A	C	A	C	A
Alliaceae	<i>Nothoscordum gracile</i>	Onion Weed	Exotic	F										
Amaranthaceae	<i>Alternanthera denticulata</i>	Lesser Joyweed	Native	F										
Anthericaceae	<i>Tricoryne elatior</i>	Yellow Autumn-lily	Native	F					0.1	10	0.1	50	0.1	2
Apiaceae	<i>Centella asiatica</i>	Indian Pennywort	Native	F			0.1	20			0.1	5	1	50
Apiaceae	<i>Foeniculum vulgare</i>	Fennel	Exotic	F										
Apocynaceae	<i>Araujia sericifera</i>	Moth Vine	Exotic	L										
Asteraceae	<i>Bidens subalternans</i>	Greater Beggar's Ticks	Exotic	F										
Asteraceae	<i>Cirsium vulgare</i>	Spear Thistle	Exotic	F										
Asteraceae	<i>Conyza</i> sp.		Exotic	F	0.1	1			0.1	5			0.1	1
Asteraceae	<i>Gamochaeta</i> sp.		Exotic	F					0.1	1				
Asteraceae	<i>Hypochaeris radicata</i>	Flatweed	Exotic	F	0.1	20			1	200	1.5	200	3	200
Asteraceae	<i>Senecio madagascariensis</i>	Fireweed	Exotic	F	0.1	5	0.1	2			0.1	1	0.1	5
Asteraceae	<i>Senecio pterophorus</i>		Exotic	F	0.1	1								
Asteraceae	<i>Senecio quadridentatus</i>	Cotton Fireweed	Native	F										
Cactaceae	<i>Opuntia</i> sp.		Exotic	?										
Campanulaceae	<i>Wahlenbergia gracilis</i>	Tufted Bluebell	Native	F										

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Family	Scientific Name	Common name	Native/Exotic	Form	BAM01		BAM02		BAM03		BAM04		BAM05	
					C	A	C	A	C	A	C	A	C	A
Casuarinaceae	<i>Casuarina glauca</i>	Swamp Oak	Native	T										
Chenopodiaceae	<i>Einadia nutans</i>	Climbing Saltbush	Native	F										
Chenopodiaceae	<i>Einadia trigonos</i>	Fishweed	Native	F										
Commelinaceae	<i>Commelina cyanea</i>		Native	F	0.1	50								
Convolvulaceae	<i>Convolvulus erubescens</i>	Blushing Bindweed	Native	L										
Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed	Native	F										
Cyperaceae	<i>Carex appressa</i>	Tall Sedge	Native	V	15	100	65	100			0.1	1		
Cyperaceae	<i>Carex inversa</i>		Native	V										
Fabaceae - Mimosoideae	<i>Acacia parramattensis</i>	Parramatta Wattle	Native	S/T										
Hypericaceae	<i>Hypericum gramineum</i>	Small St. Johns Wort	Native	F							0.1	1		
Hypoxidaceae	<i>Hypoxis hygrometrica</i>	Golden Weather-grass	Native	F										
Juncaceae	<i>Juncus cognatus</i>		Exotic	R			1	20						
Juncaceae	<i>Juncus continuus</i>		Native	R			0.1	10						
Juncaceae	<i>Juncus</i> sp.		Exotic	R	0.1	20								
Juncaceae	<i>Juncus usitatus</i>		Native	R	0.1	10	0.5	50	0.1	10	0.1	10	0.1	2
Lobeliaceae	<i>Pratia purpurascens</i>	Whiteroot	Native	F	0.1	50								
Lomandraceae	<i>Lomandra filiformis</i>	Wattle Mat-rush	Native	F					3	200	0.5	10		
Lomandraceae	<i>Lomandra multiflora</i>	Many-flowered Mat-rush	Native	F					2	50				
Malvaceae	<i>Modiola caroliniana</i>	Red-flowered Mallow	Exotic	F										
Malvaceae	<i>Sida rhombifolia</i>	Paddy's Lucerne	Exotic	F										



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Family	Scientific Name	Common name	Native/Exotic	Form	BAM01		BAM02		BAM03		BAM04		BAM05	
					C	A	C	A	C	A	C	A	C	A
Marsileaceae	<i>Marsilea</i> sp.		Native	E	0.1	10	0.1	5						
Myrtaceae	<i>Angophora floribunda</i>	Rough-barked Apple	Native	T			1	1						
Myrtaceae	<i>Eucalyptus amplifolia</i>	Cabbage Gum	Native	T	25	20	8	1	0.2	2				
Myrtaceae	<i>Eucalyptus eugenioides</i>	Thin-leaved Stringybark	Native	T										
Myrtaceae	<i>Eucalyptus moluccana</i>	Grey Box	Native	T										
Myrtaceae	<i>Eucalyptus tereticornis</i>	Forest Red Gum	Native	T										
Myrtaceae	<i>Melaleuca decora</i>		Native	S/T			1	1						
Oleaceae	<i>Ligustrum sinense</i>	Small-leaved Privet	Exotic	S										
Oxalidaceae	<i>Oxalis perennans</i>		Native	F					0.1	1				
Phyllanthaceae	<i>Phyllanthus virgatus</i>		Native	F					0.1	1				
Pittosporaceae	<i>Bursaria spinosa</i> subsp. <i>spinosa</i>	Blackthorn	Native	S	3	100								
Plantaginaceae	<i>Plantago lanceolata</i>	Lamb's Tongue	Exotic	F										
Poaceae	<i>Axonopus fissifolius</i>	Narrow-leaved Carpet Grass	Exotic	G	0.5	50	1	50	4	200	10	500	5	300
Poaceae	<i>Bothriochloa macra</i>	Red-leg Grass	Native	G					0.5	50			0.1	2
Poaceae	<i>Briza subaristata</i>		Exotic	G					2	100	5	200	30	1000
Poaceae	<i>Cenchrus clandestinus</i>	Kikuyu Grass	Exotic	G										
Poaceae	<i>Chloris gayana</i>	Rhodes Grass	Exotic	G										
Poaceae	<i>Cynodon dactylon</i>	Couch	Native	G	500	80	15	500	2	50	3	200	10	200

Biodiversity Development Assessment Report, Mamre South Precinct, Kemps Creek,  
Western Sydney Employment Area

Family	Scientific Name	Common name	Native/Exotic	Form	BAM01		BAM02		BAM03		BAM04		BAM05	
					C	A	C	A	C	A	C	A	C	A
Poaceae	<i>Eragrostis brownii</i>	Brown's Lovegrass	Native	G					2	100	3	200		
Poaceae	<i>Eragrostis curvula</i>	African Lovegrass	Exotic	G	0.1	1	0.1	5	0.5	2				
Poaceae	<i>Eragrostis leptostachya</i>	Paddock Lovegrass	Native	G									0.1	5
Poaceae	<i>Eriochloa</i> sp.		Native	G										
Poaceae	<i>Imperata cylindrica</i>	Blady Grass	Native	G										
Poaceae	<i>Microlaena stipoides</i>	Weeping Grass	Native	G	1	100	2	200	3	200	5	200		
Poaceae	<i>Paspalidium distans</i>		Native	G					5	200	1	50		
Poaceae	<i>Paspalum dilatatum</i>	Paspalum	Exotic	G	2	100	2	200	4	300	5	500	65	2000
Poaceae	<i>Setaria parviflora</i>	Pigeon Grass	Exotic	G	0.1	1	0.1	2	0.1	50	1	100	1	50
Poaceae	<i>Sporobolus creber</i>	Western Rat-tail Grass	Native	G					0.1	10			0.1	10
Poaceae	<i>Stenotaphrum secundatum</i>	Buffalo Grass	Exotic	G										
Poaceae	<i>Themeda australis</i>	Kangaroo Grass	Native	G					65	2000	80	2000	0.5	10
Poaceae	<i>Vulpia</i> sp.		Exotic	G			1	100						
Polygonaceae	<i>Persicaria</i> sp.		Native	F										
Proteaceae	<i>Grevillea juniperina</i> subsp. <i>juniperina</i>		Native	S										
Proteaceae	<i>Hakea sericea</i>	Needlebush	Native	S										
Rosaceae	<i>Rubus fruticosus</i>		Exotic	L	1	10								
Rubiaceae	<i>Asperula conferta</i>	Common Woodruff	Native	F										

Biodiversity Development Assessment Report, Mamre South Precinct, Kemps Creek,  
Western Sydney Employment Area

Family	Scientific Name	Common name	Native/Exotic	Form	BAM01		BAM02		BAM03		BAM04		BAM05	
					C	A	C	A	C	A	C	A	C	A
Solanaceae	<i>Cestrum parqui</i>	Green Cestrum	Exotic	S										
Solanaceae	<i>Lycium ferocissimum</i>	African Blackthorn	Exotic	S										
Solanaceae	<i>Solanum sisymbriifolium</i>		Exotic	F										
Typhaceae	<i>Typha orientalis</i>	Broadleaf Cumbungi	Native	?										
Verbenaceae	<i>Verbena bonariensis</i>	Purpletop	Exotic	F										
Verbenaceae	<i>Verbena rigida</i>	Veined Verbena	Exotic	F										

## Fauna

Class	Family	Scientific name	Common name	Native/ Exotic	Ecoplanning (30/04/18)	Ecoplanning (20/03/17)
Amphibia	Limnodynastidae	<i>Limnodynastes peronii</i>	Brown-striped Frog	Native	-	W
Amphibia	Myobatrachidae	<i>Crinia signifera</i>	Common Eastern Froglet	Native	W	W
Aves	Anatidae	<i>Anas gracilis</i>	Grey Teal	Native	O	-
Aves	Anatidae	<i>Anas superciliosa</i>	Pacific Black Duck	Native	O	O
Aves	Anatidae	<i>Aythya australis</i>	Hardhead	Native	O	-
Aves	Ardeidae	<i>Ardea ibis</i>	Cattle Egret	Native	OW	-
Aves	Ardeidae	<i>Egretta novaehollandiae</i>	White-faced Heron	Native	O	-
Aves	Artamidae	<i>Cracticus tibicen</i>	Australian Magpie	Native	OW	OW
Aves	Artamidae	<i>Cracticus torquatus</i>	Grey Butcherbird	Native	W	W
Aves	Cacatuidae	<i>Cacatua galerita</i>	Sulphur-crested Cockatoo	Native	-	OW
Aves	Cacatuidae	<i>Cacatua sanguinea</i>	Little Corella	Native	-	-
Aves	Campephagidae	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike	Native	-	OW
Aves	Charadriidae	<i>Elseyornis melanops</i>	Black-fronted Dotterel	Native	O	-
Aves	Charadriidae	<i>Vanellus miles</i>	Masked Lapwing	Native	W	W
Aves	Cisticolidae	<i>Cisticola exilis</i>	Golden-headed Cisticola	Native	W	OW
Aves	Columbidae	<i>Ocyphaps lophotes</i>	Crested Pigeon	Native	OW	O
Aves	Corvidae	<i>Corvus coronoides</i>	Australian Raven	Native	OW	OW
Aves	Estrildidae	<i>Neochmia temporalis</i>	Red-browed Finch	Native	O	-
Aves	Falconidae	<i>Falco cenchroides</i>	Nankeen Kestrel	Native	OW	-
Aves	Hirundinidae	<i>Hirundo neoxena</i>	Welcome Swallow	Native	OW	-
Aves	Maluridae	<i>Malurus cyaneus</i>	Superb Fairy-wren	Native	OW	W
Aves	Meliphagidae	<i>Manorina melanocephala</i>	Noisy Miner	Native	OW	W
Aves	Monarchidae	<i>Grallina cyanoleuca</i>	Magpie-lark	Native	OW	OW



Class	Family	Scientific name	Common name	Native/ Exotic	Ecoplanning (30/04/18)	Ecoplanning (20/03/17)
Aves	Pelecanidae	<i>Pelecanus conspicillatus</i>	Australian Pelican	Native	OW	-
Aves	Phalacrocoracidae	<i>Microcarbo melanoleucos</i>	Little Pied Cormorant	Native	O	-
Aves	Podicipedidae	<i>Poliocephalus poliocephalus</i>	Hoary-headed Grebe	Native	O	-
Aves	Podicipedidae	<i>Tachybaptus novaehollandiae</i>	Australasian Grebe	Native	O	-
Aves	Psittacidae	<i>Platycercus elegans</i>	Crimson Rosella	Native	-	W
Aves	Psittacidae	<i>Platycercus eximius</i>	Eastern Rosella	Native	OW	-
Aves	Psittacidae	<i>Psephotus haematonotus</i>	Red-rumped Parrot	Native	OW	W
Aves	Psittacidae	<i>Trichoglossus haematodus</i>	Rainbow Lorikeet	Native	OW	W
Aves	Rallidae	<i>Fulica atra</i>	Eurasian Coot	Native	O	-
Aves	Rallidae	<i>Porphyrio porphyrio</i>	Purple Swamphen	Native	OW	W
Aves	Rhipiduridae	<i>Rhipidura leucophrys</i>	Willie Wagtail	Native	OW	W
Aves	Sturnidae	<i>Sturnus tristis</i> *	Common Myna*	Exotic	W	OW
Aves	Threskiornithidae	<i>Threskiornis spinicollis</i>	Straw-necked Ibis	Native	O	O
Mammalia	Canidae	<i>Vulpes Vulpes</i> *	European Red Fox*	Exotic	O	-
Mammalia	Leporidae	<i>Lepus europaeus</i> *	European Hare*	Exotic	O	-
Mammalia	Macropodidae	<i>Macropus giganteus</i>	Eastern Grey Kangaroo	Native	O	O
Mammalia	Macropodidae	<i>Wallabia bicolor</i>	Swamp Wallaby	Native	O	-
Mammalia	Vombatidae	<i>Vombatus ursinus</i>	Wombat	Native	FB, P	-
Reptilia	Elapidae	<i>Pseudechis porphyriacus</i>	Red-bellied Black Snake	Native	-	O

Observation type = O (seen), W (heard call), OW (seen and heard), FB (burrow), P (scat)

## Appendix D: Biodiversity payment summary report and credit summary

### Stage 1



### Biodiversity payment summary report

Assessment Id	Payment data version	Revision number	Report created
00010965/BAAS17012/19/00010966	45	0	15/03/2019

#### PCT list

Include	PCT common name	Credits
Yes	<b>835</b> - Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	58
Yes	<b>849</b> - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	0

#### Species list

Include	Species	Credits
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#### Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

IBRA sub region	PCT common name	Baseline price	Dynamic coefficient	Market coefficient	Risk premium	Administrative cost	Methodology adjustment factor	Price per credit	No. of ecosystem credits	Final credits price
Cumberland	<b>835</b> - Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion <b>Note: This PCT has trades recorded</b>	\$16,500.00	0.61941120	3.63955900	24.80%	\$40.55	1.0000	\$19,503.64	58	\$1,131,210.95



## Biodiversity payment summary report

Cumberland	<b>849</b> - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion <b>Note: This PCT has trades recorded</b>	\$ 17,200.00	0.70738540	2.76020800	20.49%	\$40.73	1.0000	\$ 18,913.91	0	\$0.00
Subtotal (excl. GST)									<b>\$1,131,210.95</b>	
GST									<b>\$113,121.10</b>	
Total ecosystem credits (incl. GST)									<b>\$1,244,332.04</b>	

### Species credits for threatened species

Species profile ID	Species	Threat status	Price per credit	Risk premium	Administrative cost	No. of species credits	Final credits price
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No species available

Grand total							<b>\$1,244,332.04</b>
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## BAM Credit Summary Report

### Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00010965/BAAS17012/19/00010966	Warehouse and Logistics Hub Orchard Hills SSD 7173	04/01/2019
Assessor Name	Report Created	BAM Data version *
Lucas McKinnon	15/03/2019	6
Assessor Number	* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.	
BAAS17012		

### Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	Vegetation integrity loss / gain	Area (ha)	Constant	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Candidate SAI	Ecosystem credits
<b>Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion</b>								
1	835_Underscrubbed	55.1	2.1	0.25	High Sensitivity to Potential Gain	2.00		58
2	835_ClearedLand	1.4	0.1	0.25	High Sensitivity to Potential Gain	2.00		0
							<b>Subtotal</b>	<b>58</b>





## BAM Credit Summary Report

Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion							
3 849_Dist_Shrubby	6.4	0.2	0.25	High Sensitivity to Potential Gain	2.50	TRUE	0
						<b>Subtotal</b>	<b>0</b>
						<b>Total</b>	<b>58</b>

### Species credits for threatened species

Vegetation zone name	Habitat condition (HC)	Area (ha) / individual (HL)	Constant	Biodiversity risk weighting	Candidate SAI	Species credits
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Stage 2



## Biodiversity payment summary report

Assessment Id	Payment data version	Revision number	Report created
00010965/BAAS17012/19/000127 58	45	0	15/03/2019

### PCT list

Include	PCT common name	Credits
Yes	<b>835</b> - Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	209
Yes	<b>849</b> - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	0

### Species list

Include	Species	Credits
Yes	<i>Grevillea juniperina subsp. juniperina</i> (Juniper-leaved Grevillea)	15

### Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

IBRA sub region	PCT common name	Baseline price	Dynamic coefficient	Market coefficient	Risk premium	Administrative cost	Methodology adjustment factor	Price per credit	No. of ecosystem credits	Final credits price
Cumberland	<b>835</b> - Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion <b>Note: This PCT has trades recorded</b>	\$16,500.00	0.61941120	3.63955900	24.80%	\$40.55	1.0000	\$19,503.64	209	\$4,076,260.13

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## Biodiversity payment summary report

Cumberland	<b>849</b> - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion <b>Note: This PCT has trades recorded</b>	\$ 17,200.00	0.70738540	2.76020800	20.49%	\$40.73	1.0000	\$ 18,913.91	0	\$0.00
Subtotal (excl. GST)									<b>\$4,076,260.13</b>	
GST									<b>\$407,626.01</b>	
Total ecosystem credits (incl. GST)									<b>\$4,483,886.14</b>	

### Species credits for threatened species

Species profile ID	Species	Threat status	Price per credit	Risk premium	Administrative cost	No. of species credits	Final credits price
10367	<b><i>Grevillea juniperina subsp. juniperina</i></b> (Juniper-leaved Grevillea)		\$146.35	20.4900%	\$20.00	15	\$2,945.06
Subtotal (excl. GST)							<b>\$2,945.06</b>
GST							<b>\$294.51</b>
Total species credits (incl. GST)							<b>\$3,239.57</b>
Grand total							<b>\$4,487,125.71</b>

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## BAM Credit Summary Report

### Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00010965/BAAS17012/19/00012758	Warehouse and Logistics Hub Orchard Hills SSD 7173	04/01/2019
Assessor Name	Report Created	BAM Data version *
Lucas McKinnon	15/03/2019	6
Assessor Number	* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.	
BAAS17012		

### Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	Vegetation integrity loss / gain	Area (ha)	Constant	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Candidate SAI	Ecosystem credits
<b>Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion</b>								
1	835_Underscrubbed	55.1	5.0	0.25	High Sensitivity to Potential Gain	2.00		138
2	835_DNG	35.0	4.0	0.25	High Sensitivity to Potential Gain	2.00		71
							<b>Subtotal</b>	<b>209</b>



## BAM Credit Summary Report

Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion								
3	849_DistShrubby	6.4	0.2	0.25	High Sensitivity to Potential Gain	2.50	TRUE	0
							Subtotal	0
							Total	209

### Species credits for threatened species

Vegetation zone name	Habitat condition (HC)	Area (ha) / individual (HL)	Constant	Biodiversity risk weighting	Candidate SAIL	Species credits
<b><i>Grevillea juniperina subsp. juniperina</i> / Juniper-leaved Grevillea ( Flora )</b>						
835_Underscrubbed	55.1	0.56	0.25	2	False	15
					<b>Subtotal</b>	<b>15</b>