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Biodiversity Assessment Report

Framework for Biodiversity Assessment



**Lots 17 - 23 // DP 13961, Trivet Street and
Cowpasture Road, Wetherill Park**

Proposed Horsley Drive Business Park Stage 2 (SSD 16_7664)

Prepared for Western Sydney Parklands Trust

24 November 2016

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Glossary and abbreviations

ACRONYM	DESCRIPTION
BAR	Biodiversity Assessment Report
CEEC	Critically Endangered Ecological Community
CPW	Cumberland Plain Woodland
DA	Development Application
DPE	NSW Department of Planning and Environment
Subject site	Lots 18 - 23 // DP 13961, Wetherill Park
EEC	Endangered Ecological Community
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
FBA	Framework for Biodiversity Assessment
ha	hectare(s)
IBRA	Interim Bioregionalisation of Australia
km	kilometre
LGA	Local Government Area
LPI	Land and Property Information
masl	Metres above sea level
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
PCT	Plant community type, as defined by OEH (2015b)
RFEF	River-Flat Eucalypt Forest
SEARs	Secretary's Environmental Assessment Requirements
SSD	State Significant Development
TSC Act	NSW <i>Threatened Species Conservation Act 1995</i>

1. Introduction

1.1 Background

This Biodiversity Assessment Report (BAR) has been undertaken to accompany a Development Application (DA) relating to the proposed Horsley Drive Business Park Stage 2, located at lots 17 - 23 // DP 13961, Trivet Street and Cowpasture Road, Wetherill Park (the *development site*).

The development site covers an area of 18.02 ha (see **Section 1.2**), and is subject to the Western Sydney Parklands State Environmental Planning Policy (SEPP), within which the proposed development is permissible with consent (JBA 2016).

The proposed development is considered a State Significant Development (SSD), and as such Secretary's Environmental Assessment Requirements (SEARS) have been issued by the Department of Planning and Environment (DPE). The SEARs state the following regarding the assessment of biodiversity impacts:

Biodiversity impacts related to the proposed development are to be assessed and documented in accordance with the Framework for Biodiversity Assessment, by a person accredited in accordance with section 142B(1)(c) of the Threatened Species Conservation Act 1995.

This BAR has been prepared by Lucas McKinnon, an Accredited BioBanking Assessor (No. 76) under Part 7A of the TSC Act, and is consistent with the Framework for Biodiversity Assessment (FBA) (OEH 2014). This BAR therefore satisfies the requirements of the SEARs.

Although most of the development site is dominated by non-native vegetation such as blackberry and pasture grasses, two native vegetation types were identified. Most native vegetation within the development site is consistent with the description of Cumberland Plain Woodland in the Sydney Basin Bioregion, a critically endangered ecological community (CEEC), listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) (NSW SC 2014). Field survey confirmed that, due to the degraded condition of the vegetation on-site and the distance between patches, the areas of CPW do not meet the definition of the threatened ecological community as listed on the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) (CoA 2010).

A number of small patches of River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (RFEF), an endangered ecological community (EEC), listed under the NSW TSC Act, have also been identified within the development site.

The total proposed impact to native vegetation within the development site is 1.09 ha.

Sources of information for this report included:

- NSW Planning Viewer (NSW Dept. of Planning and Environment 2016)
- BioNet Atlas of NSW Wildlife (NSW Office of Environment and Heritage 2016)
- Preliminary Environmental Investigation Report - Request for SEARs State Significant Development (JBA 2016)
- Framework for Biodiversity Assessment (FBA) offsetting calculations for proposed Horsley Drive Business Park Stage 2, Wetherill Park. Prepared for Western Sydney Parklands. (Ecoplanning 2016)
- Protected Matters Search Tool (Commonwealth Dept. of the Environment 2016)
- Native vegetation of the Cumberland Plain (NPWS 2002)
- Soil Landscapes of the Penrith 1:100,000 Sheet map and report, Soil Conservation Service of NSW, Sydney (Bannerman and Hazelton 1990)
- SIX Maps (LPI 2016)

Plot based vegetation survey data, which was collected in accordance with FBA (2014), were captured and used for this assessment.

1.2 Location and site identification

This development site covers a total area of 18.02 ha and consists of lots 17 - 23 // DP 13961, Trivet Street and Cowpasture Road, Wetherill Park. The development site is subject to the Western Sydney Parklands State Environmental Planning Policy (WSP SEPP), and the development application seeks consent to subdivide the site into four developable industrial lots, construct a new connection point to Cowpasture Road and provide relevant stormwater infrastructure (JBA 2016). The proposed future land use of the development site includes general industrial, light industrial and warehouse and distribution centre land uses (JBA 2016). The development site is bounded by Cowpasture Road to the east and Trivet Street to the north east.

The development site is situated approximately 60-76 metres above sea level (masl). The highest point of the site occurs on the northern and western boundaries. The site is predominantly mapped as the Luddenham soil landscape, which is characterised by undulating to rolling low hills on Wianamatta Group shales, often associated with Minchinbury Sandstone (Bannerman and Hazelton 1990). The far eastern part of the development site is mapped as the Blacktown soil landscape, which comprises gently undulating rises on Wianamatta Group shales (Bannerman and Hazelton 1990).

Regional scale geological mapping by Clark and Jones (1991) shows the site is drawn from Wianamatta Group (Rwb) geology, dominated by shale, carbonaceous claystone, claystone, laminate, fine to medium-grained lithic sandstone, rare coal and tuff. The location of the site is provided in **Figure 1.1** and the site map is shown in **Figure 1.2**. **Figure 1.3** contains the footprint of the proposed development.

1.3 Land use history

The development site consists of a mixture of cleared and/or exotic vegetation, with several small patches of remnant or regenerating native vegetation across the site. The most intact native vegetation is present in the north-western corner of the development site, with significant areas of non-native pasture grasses and blackberry present across the entire site. A number of farm dams are located across the development site, particularly in the eastern edge of the development site.

The land use surrounding the development site consists of industrial development directly to the east, construction of industrial warehouses to the south (Horsley Drive Business Park), and similar areas of mixed exotic and native pasture with small patches of native vegetation to the west and north.

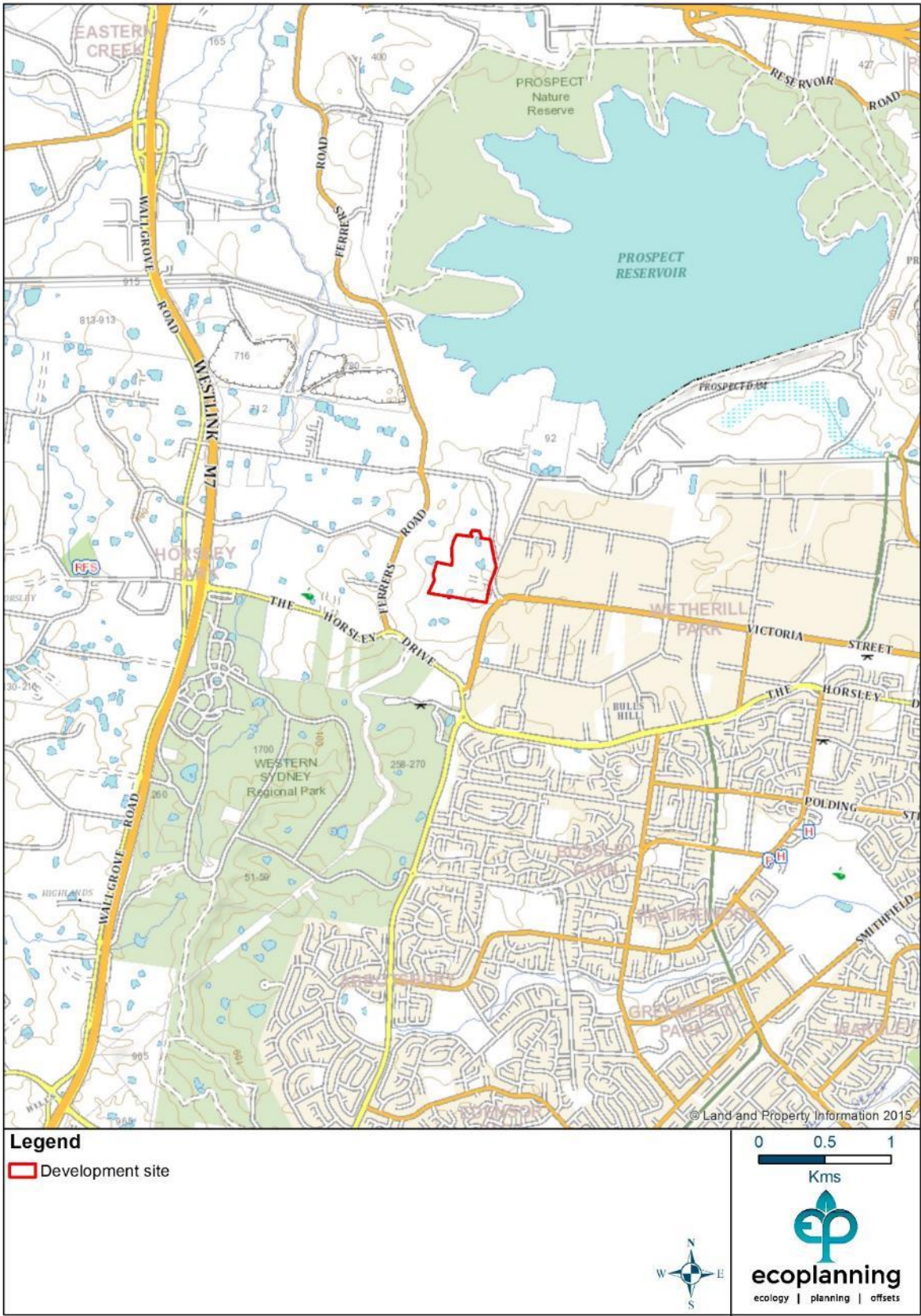


Figure 1.1: Development site location.



Figure 1.2: Site map.



Figure 1.3: Proposed development footprint.

2. Landscape features

In accordance with the FBA, a number of features are assessed within and surrounding the development site in order to describe the landscape features and to calculate the final landscape score. Provided below are details related to IBRA region and subregion, NSW landscape regions (Mitchell Landscapes), rivers, streams, estuaries and wetlands, surrounding native vegetation extent and the existence of state or regionally significant biodiversity values.

2.1.1 IBRA bioregions and IBRA subregions

The development site is located entirely within the Cumberland IBRA subregion (Version 7) and within the NSW Sydney Basin IBRA region (version 7). The outer assessment circle does not contain any other bioregion or subregion.

Cumberland IBRA subregion was entered into the credit calculator.

2.1.2 NSW landscape regions (Mitchell Landscapes)

The development site occurs in only one NSW Mitchell Landscape, being the '*Cumberland Plain*' landscape (Mitchell Landscapes V3).

The landscapes '*Cumberland Plain*', '*Sydney Basin Diatremes*' and '*Estuary/Water*' (Prospect Reservoir) also occur within the outer assessment circle. This is shown on the Locality Map (**Figure 2.1**) and area calculations for each landscape are shown in **Table 2.1**.

The Cumberland Plain Mitchell Landscape was entered into the credit calculator due to it being the dominant Mitchell Landscape within the development site – occupying 100.0% of the development site.

Table 2.1: Mitchell Landscapes and areas.

Mitchell Landscape (ML)	Area of ML within outer assessment circle (ha)*	Area of ML within development site (ha)	% of development site
Cumberland Plain	969.6	20.75	100.0
Sydney Basin Diatremes	0.6	0	0.0
Estuary/Water	29.8	0	0.0
Total	1000.0	20.75	100.0

* Rounding errors apply

2.1.3 Rivers, streams and estuaries

There are no rivers, streams or estuaries identified within the development site. A riparian assessment was conducted for the development site using both desktop and field based methods.

An initial desktop assessment of mapped waterways was conducted for the development site and surrounding lands. This assessment found that no mapped waterways are present on the subject site. The closest mapped waterway is approximately 425 m to the west of the site.

This waterway is a tributary of Eastern Creek, drains in a northerly direction and is a Strahler Stream Order 1 waterway. The closest waterway to the east of the subject site is a tributary of Prospect Creek. This waterway runs through the existing Wetherill Park industrial estate in a canal and drains in an easterly direction. It is also a Strahler Stream Order 1 waterway.

The site inspection identified three dams within the subject site, however only minor drainage swales and depressions exist within the subject site. The drainage swales and depressions present do not have a formed bed or bank and do therefore not constitute waterfront land under the *NSW Water Management Act 2000*. A further assessment of waterfront or riparian land is not required.

2.1.4 Local and important wetlands

There are no wetlands within the 1,000 ha assessment circle. Note that several farm dams occur within the development site, however they are not considered either local or important wetlands.

2.1.5 Native vegetation extent

A layer of native vegetation cover is required for each assessment circle (100 ha and 1,000 ha) to assess the impact of the development to native vegetation. The extent of native vegetation on the development site and immediate surrounds was mapped using the Cumberland Plain Vegetation Map (NPWS 2002), with vegetation extent updated using imagery obtained from LPI's SIX Viewer.

The native vegetation cover was mapped for both the 100 ha and 1,000 ha circles (**Figure 2.1**). The proposed footprint of the development will impact on 1.09 ha, and the calculations related to future native vegetation cover include this proposed impact.

2.1.6 State, regional and local biodiversity links

The site does not incorporate a state, regional or local biodiversity link.

2.1.7 Other landscape features

There are no other landscape features identified in the SEARs.

2.2 Landscape value score components

2.2.1 Percent native vegetation cover in the landscape

Consideration of the native vegetation within the inner and outer circles (**Figure 2.1**) and the impact of the development which would require the removal of 1.09 ha of native vegetation, Table 9 in FBA (OEH 2014) was used to determine current and future scores for the percent native vegetation cover component of the landscape score. The results of the analysis are shown in **Table 2.2**. Due to the relatively minor amount of clearing proposed, no change in future score is recorded for this variable.

Table 2.2: Estimates of native vegetation and scores in the inner and outer assessment circles.

Assessment circle	Current (ha)	Current (%)	Current (score)	Future (ha)	Future (%)	Future (score)
Inner (100 ha)	3.58	3.58 (<5)	0.75	2.49	2.5 (<5)	0.75
Outer (1000 ha)	168.54	16.8 (16-20)	5	167.45	16.5 (16-20)	5



Figure 2.1: Location map.

2.2.2 Connectivity value

The development site is not part of a State or Regionally Significant Biodiversity Link, as identified by the 'connectivity value classes' in Table 10 of Appendix 4 in the FBA.

Due to the isolated nature of the vegetation on the development site, and the fact that the closest adjoining vegetation off-site is separated by a distance of greater than 100 m, the vegetation on the development site is not considered to be part of a connected link.

No option within the credit calculator exists to enter 'no connecting link'. Therefore, the following was entered into the credit calculator:

- **Connectivity width:** 0 – 5 m before development and after development;
- **Connectivity over storey condition:** No native over-storey before development and after development;
- **Connectivity mid storey/ground cover condition:** No mid-storey/ground cover before development and after development.

As there was no change in the current or future connectivity scores, no score was recorded for this variable.

2.2.3 Patch size

Patch size as defined by the FBA as '*an area of native vegetation that:*

- a) Occurs on the development site or offset site, and*
- b) Is in moderate to good condition, and*
- c) Includes native vegetation that has a gap of <100 m from the next area of moderate to good condition native vegetation (or ≤ 30 m for non-woody vegetation)*

Patch size may extend onto adjoining land that is not part of the development site.'

Patch size was calculated for the vegetation on the development site using the field validated map of vegetation types identified. Due to the distance between some patches of vegetation on site (i.e. >100 m gap) the total patch size is calculated at 1.7 ha. Due to the clearing status of the Cumberland Plain Mitchell Landscape (70-90 % cleared), and consistent with Table 15 of the FBA, a score of **1** is recorded. NOTE: due to an error in the credit calculator a patch size of 2 ha was entered into the formal assessment for each vegetation zone (it appears the credit calculator cannot accept a patch size of < 2 ha). This had no impact on credit calculations.

2.3 Landscape value score

Using the above data, the final landscape score was calculated to be **1** (Table 2.3).

Table 2.3: Landscape score components.

Landscape score component	Score Awarded
Change in connectivity score	0
Decrease in native vegetation cover (inner assessment circle) score	0
Decrease in native vegetation cover (outer assessment circle) score	0
Patch size area score	1
Total	1

3. Native vegetation

3.1 Plant community types (PCTs) and threatened ecological communities

Desktop assessment determined that NPWS (2002) had mapped most of the small patches of vegetation on the site as 'Map Unit 9 - Shale Hills Woodland'. 'Map Unit 11 - Alluvial Woodland' and 'Map Unit 10 - Shale Plains Woodland' were also mapped within the development site by NPWS (2002). All vegetation was mapped in relatively poor condition ('Tx') (**Figure 3.1**). The remainder of the site was not mapped as native vegetation by NPWS (2002).

The field assessment confirmed the existence of Shale Hills Woodland and Alluvial Woodland, however the boundaries identified in NPWS (2002) underwent a minor revision based on the field data captured. No Shale Plains Woodland was identified. Other non-native vegetation types and features identified included 'Dam', 'Other vegetation- pasture grasses', 'Other vegetation- juncus' (*Juncus acutus**) and 'Other vegetation- blackberry' (*Rubus fruticosus**) (**Figure 3.2**).

Shale Hills Woodland is equivalent to the Plant Community Type (PCT), *Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion* (ME019; PCT850) (OEH 2016). The Shale Hills Woodland vegetation on site is consistent with the TSC Act definition of Cumberland Plain Woodland in the Sydney Basin Bioregion CEEC).

Two distinct condition classes of Shale Hills Woodland are present within the development site. The best example of the vegetation is located on the western side of the development site, and has been identified as 'Disturbed/shrubby'. Areas in poorer condition, or isolated individuals, have been identified as 'Scattered Paddock Trees'. Due the highly modified nature of the Shale Hills Woodland vegetation onsite, and the extremely small patch sizes, it does not comply with the EPBC Act definition of Cumberland Shale Plains and Shale Gravel Transition Forest (CEEC).

Alluvial Woodland is equivalent to the PCT, *Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin* (ME018; PCT835) (OEH 2016). The vegetation on site is consistent with River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions (NSW TSC Act - Endangered). Only one vegetation zone/condition state is identified on site, being 'Disturbed/shrubby'.

The total area of each vegetation type is displayed in **Table 3.1**. Other vegetation – pasture grasses dominates the development site, occupying 12.65 ha, or 70.2% of the development site. Other vegetation – blackberry occupies 3.64 ha (20.2% of the development site), with a further 0.37 ha (2.1% of the development site) mapped as Dam. Native vegetation occupies only 6.0% of the site, with Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion mapped over 0.76 ha (3.7% of the development site) and Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin mapped over 0.33 ha (1.8% of the development site). Additional information on both vegetation types on site is provided below.

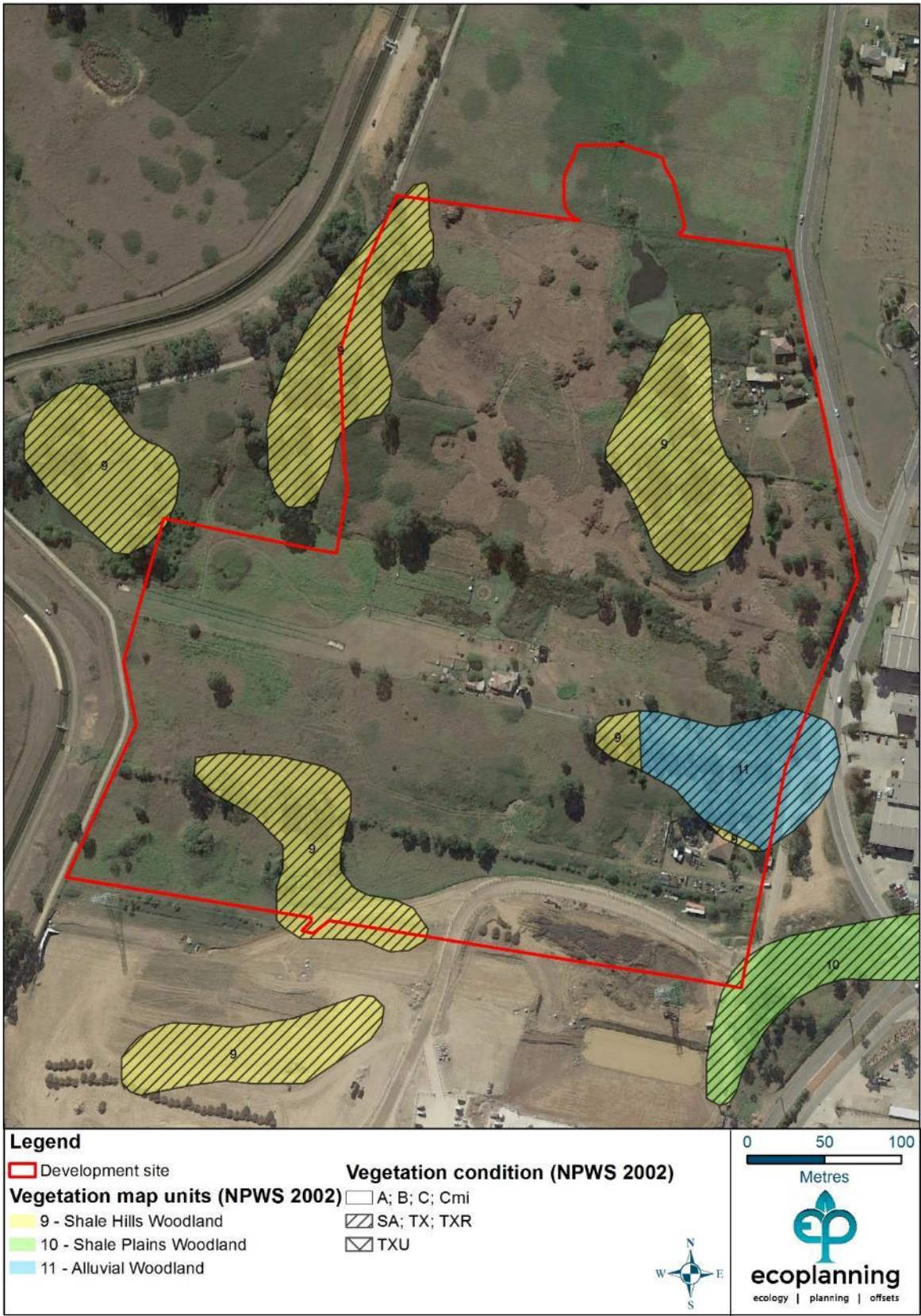


Figure 3.1: Vegetation types (NPWS 2002).

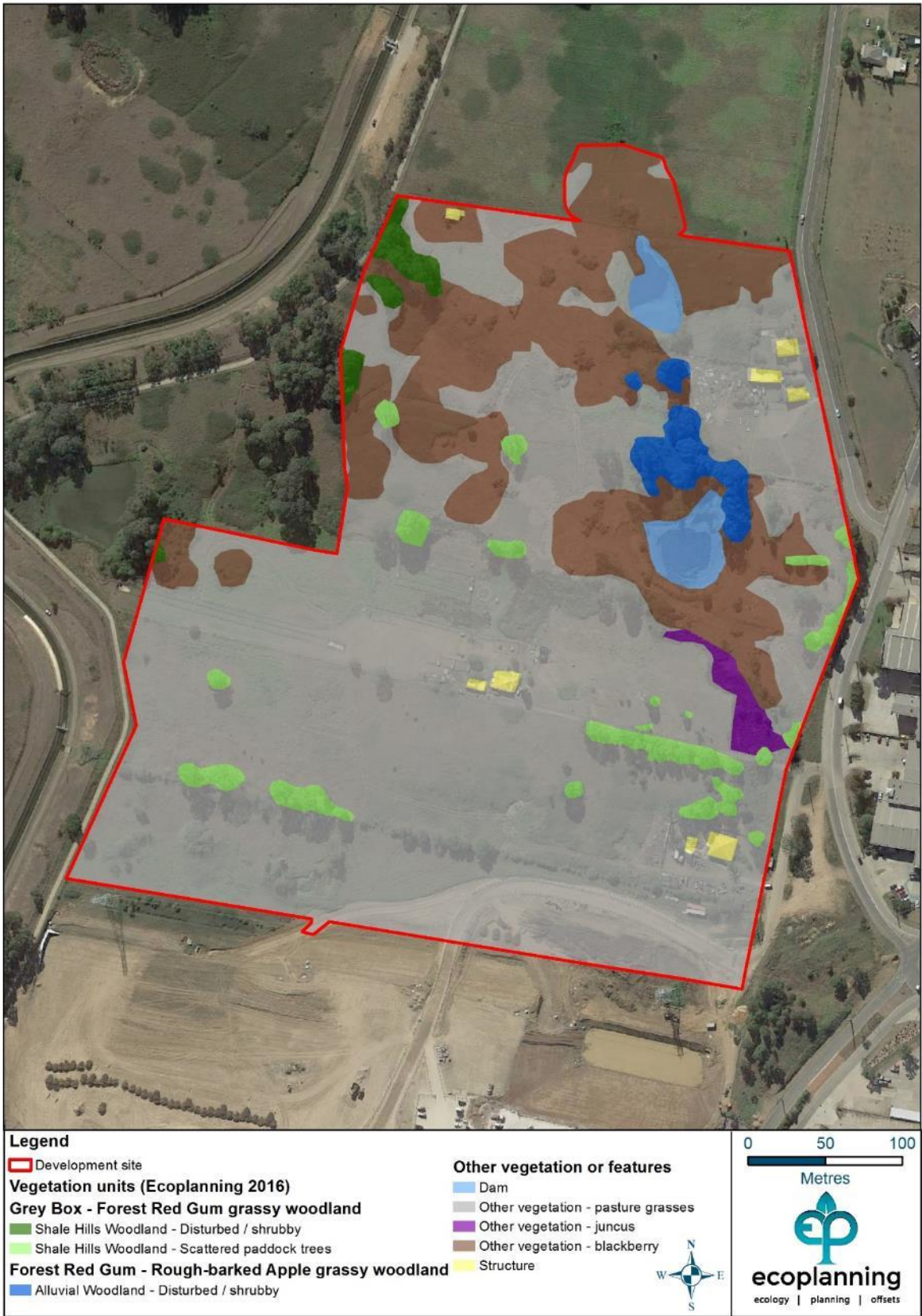


Figure 3.2: Field validated vegetation (Ecoplanning 2016).

Table 3.1: Vegetation types and zones, a description and the total area within the development site.

Vegetation type (NPWS 2002)	Plant community type (OEH 2016)	Threatened ecological communities	Condition	Area (ha)	Proportion of development site (%)
9 - Shale Hills Woodland	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	Cumberland Plain Woodland in the Sydney Basin Bioregion (CE – TSC Act and EPBC Act)	Disturbed / shrubby (Medium)	0.20	1.1
9 - Shale Hills Woodland	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion		Scattered paddock trees (Medium)	0.56	3.1
11 - Alluvial Woodland	Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (E – TSC Act only)	Disturbed / shrubby (Medium)	0.33	1.8
Dam	N/A	N/A	N/A	0.37	2.1
Other vegetation- pasture grasses				12.65	70.2
Other vegetation- <i>Juncus acutus</i>				0.16	0.9
Other vegetation- <i>Blackberry</i>				3.64	20.2
Structure				0.11	0.6
Total				18.02	100.0

3.1.1 Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion (ME019; PCT850)

This vegetation type is found in small patches throughout the development site. It is characterised by underscrubbed scattered paddock trees with little native midstorey or understorey in the southern, eastern and central parts of the development site, with more intact patches found in the western and north-western parts of the development site. These areas have a disturbed and shrubby understorey, with some significant areas of *Lantana camara** (Lantana) present.

It is distinguished from the other vegetation mapped on site (*Forest Red Gum – Rough-barked Apple grassy woodland on alluvial flats*) by the presence of *Eucalyptus moluccana* (Grey Box), although *E. tereticornis* (Forest Red Gum) individuals are present throughout all native vegetation within the development site. This vegetation is mostly regrowth <80 years of age, with no hollows observed in the remnants surveyed (**Figure 3.3**).

Groundcover vegetation is dominated by introduced and exotic grasses including *Chloris gayana** (Rhodes grass), *Eragrostis curvula** (African lovegrass) and *Cynodon dactylon** (Couch). *Cynodon dactylon* is a cosmopolitan species, with the species recorded onsite considered to most likely be an introduced form of the species due to the dense mat forming habit and association with other species common to pasture improved paddocks.

A number of exotic herbs/shrubs are also present such as, *Cirsium vulgare** (Spear Thistle), *Conyza* spp.* (Fleabane), *Hypochaeris radicata** (Catsear), *Taraxacum officinale** (Dandelion), *Stellaria media** (Chickweed), *Trifolium* spp.*, *Modiola caroliniana** (Red-flowered Mallow), and *Plantago lanceolata** (Lamb's Tongue).

A summary of the PCT profile for this vegetation type in the Vegetation Information System (VIS) (OEH (2015) is provided in

Table 3.2. Species recorded onsite within this patch are highlighted in **bold text**.



Figure 3.3: Grey Box – Forest Red Gum grassy woodland – disturbed/shrubby (left), near the eastern boundary of the subject site and along the fenceline in a predominately scattered paddock tree.

Table 3.2: VIS plant community type profile (OEH 2015) – 3.1.1.1 Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion (ME019; PCT850).

NPWS (2002) map unit	Shale Hills Woodland (MU9)
Plant community type (PCT)	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion
PCT and BioMetric veg type (BVT) ID	PCT 850 / BVT: HN529 and ME019
Vegetation formation	Grassy Woodlands
Vegetation class	Coastal Valley Grassy Woodlands
Upper stratum	Grey Box (<i>Eucalyptus moluccana</i>), Forest Red Gum (<i>Eucalyptus tereticornis</i>)
Middle stratum	Blackthorn (<i>Bursaria spinosa subsp. spinosa</i>) , Native Raspberry (<i>Rubus parvifolius</i>), <i>Clematis glycinoides</i>
Ground stratum	Kidney Weed (<i>Dichondra repens</i>) , <i>Brunoniella australis</i> , <i>Desmodium gunnii</i> , <i>Aristida ramosa</i> , <i>Microlaena stipoides var. stipoides</i> , <i>Carex inversa</i> , Kangaroo Grass (<i>Themeda australis</i>), <i>Cyperus gracilis</i> , <i>Dichelachne micrantha</i> , <i>Asperula conferta</i> , <i>Oxalis perennans</i> , <i>Cheilanthes sieberi subsp. sieberi</i> , <i>Desmodium brachypodium</i>
Landscape position	Occurs on undulating terrain on shale hills of the southern Cumberland Plain at altitudes from 50-300m.
Profile source	GW p28 (Tozer et al. 2006)
Full reference details	Tozer, M.G., Turner, K., Simpson, 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
Estimate remaining pre-European extent rounded to nearest 5%	90
TEC Name (Listing status)	TSC Act: Cumberland Plain Woodland (Critically Endangered) EPBC Act: Cumberland Shale Plains and Shale Gravel Transition Forest (Critically Endangered)

3.1.2 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin (ME018; PCT835)

This vegetation type is found in the central parts of the development site, surrounded by storage dams. The vegetation is dominated by a mixed canopy of *E. tereticornis* (Forest Red Gum) and *Eucalyptus amplifolia* (Cabbage Gum). As described above there is a complete absence of *E. moluccana* (Grey Box) and the patches containing *E. moluccana* (Grey Box) have been distinguished from this vegetation type as described above.

The mapped remnant within the development site is found in a degraded state, and occurs as disturbed/shrubby remnant with a limited number of native species in the mid- and understorey vegetation. The mid- and understorey are dominated by exotic species *L. camara** and *P. clandestinum** (**Figure 3.4**).



Figure 3.4: Forest Red Gum – Rough-barked Apple grassy woodland – disturbed shrubby, near the centre of the development site.

Table 3.3: VIS plant community type profile (OEH 2015) – Forest Red Gum – Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain (ME018; PCT835).

Plant community type (PCT)	Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin
PCT and BioMetric veg type (BVT) ID	PCT 835 / BVT: HN526 and ME018
Vegetation formation	Grassy Woodlands
Vegetation class	Coastal Valley Grassy Woodlands
Upper stratum	<i>Eucalyptus tereticornis</i> (Forest Red Gum) , <i>Angophora floribunda</i> (Rough-barked Apple), <i>Eucalyptus amplifolia</i> subsp. <i>amplifolia</i> (Cabbage Gum) , <i>Eucalyptus eugenioides</i> (Thin-leaved Stringybark), <i>Eucalyptus elata</i> (River Peppermint)
Middle stratum	<i>Acacia parramattensis</i> (Parramatta Wattle) <i>Bursaria spinosa</i> subsp. <i>spinosa</i> (Blackthorn) , <i>Sigesbeckia orientalis</i> (Indian Weed)
Ground stratum	<i>Microlaena stipoides</i> var. <i>stipoides</i> , <i>Oplismenus aemulus</i> (Basket Grass), <i>Dichondra repens</i> (Kidney Weed) , <i>Entolasia marginata</i> , <i>Solanum prinophyllum</i> , <i>Pratia purpurascens</i> (Whiteroot), <i>Echinopogon ovatus</i> (Forest Hedgehog Grass), <i>Desmodium gunnii</i> , <i>Commelina cyanea</i> (Native Wandering Jew), <i>Veronica plebeia</i> (Trailing Speedwell)
Landscape position	Occurs on stream banks and alluvial flats on the Cumberland Plain. Restricted to the Hawkesbury-Nepean and Georges River systems on alluvial soils derived from Wianamatta Shale. Woodland with an open shrub layer and a continuous groundcover of grasses and forbs.
Profile source	FoW p33 (Tozer et al. 2006)
Full reference details	Tozer, M.G., Turner, K., Simpson, 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
Estimate remaining pre-European extent rounded to nearest 5%	95
EEC Name (Listing status)	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

3.1.3 Other vegetation

Four other distinct vegetation assemblages are recorded within the development site, but none are remnant native vegetation types. These vegetation assemblages include:

- Dams
- Pasture grasses
- Juncus (*Juncus acutus**), and
- Blackberry. (*Rubus fruticosus* spp. agg. *)

The predominant vegetation across the development site are areas of cleared and pasture improved paddocks, with lower points of the site colonising with native rushes/sedges such as *Juncus* spp., *C. appressa*, and exotics *C. eragrostis** (**Figure 3.5**), and the drier areas dominated by native, exotic and introduced pasture grasses such as *A. fissifolius**, *C. gayana**, *C. dactylon**, *Ehrharta erecta**, *Eragrostis curvula**, *H. vulgare**, *Microlaena stipoides* subsp. *stipoides*, *Paspalum dilatatum**, *Pennisetum clandestinum**, *Phalaris aquatica** and large swathes of *Rubus fruticosus** spp. agg. (Blackberry) (**Figure 3.6**).

Two dams are found within the development site, with the larger dam having begun to colonise with native rushes and forbs such as, *Juncus* spp., *Eleocharis* spp., *Ludwigia peploides* (Water Primrose), *Azolla* spp. and *Lemna* spp.. (**Figure 3.7**). Both are constructed dams and are found in a degraded state with a number of noxious weeds also recorded across the site, such as *Alternanthera philoxeroides** (Alligator Weed), *Eichhornia crassipes** (Water Hyacinth) and *Salvinia molesta** (Salvinia). Several structures were also identified and mapped as part of the vegetation mapping (**Figure 3.2**).



Figure 3.5: Other vegetation – Juncus, at the development site.



Figure 3.6: Other vegetation – 'Blackberry' and 'grassland' at the development site.



Figure 3.7: Other vegetation – dams, within the development site.

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.

As described above, two vegetation zones were initially mapped for the *Grey Box – Forest Red Gum grassy woodland on shale of the Cumberland Plain* vegetation type. The two zones included areas of disturbed/shrubby vegetation, in the north-western corner of the development site, with scattered paddock trees distributed through the southern, eastern and central parts of the development site. An additional vegetation zone was identified for the *Forest Red Gum – Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain* vegetation type (disturbed/shrubby).

The impacts to the *Grey Box – Forest Red Gum grassy woodland on shale of the Cumberland Plain* (disturbed/shrubby) vegetation zone total only 0.20 ha. This small area makes assessment of the vegetation zone consistent with BBAM 2014 difficult, with no single remnant of this zone large enough to capture the required plot and transect data, even if alternative plot and transect configuration is considered. In addition, the vegetation zone is less than the 0.25 ha minimum identified to in the BioBanking Assessment Methodology and Credit Calculator Operational Manual (DECC 2008), which has been applied to previous FBA assessments (see Ecoplanning 2016a). For these reasons the *Grey Box – Forest Red Gum grassy woodland on shale of the Cumberland Plain* (disturbed/shrubby) was incorporated into the larger vegetation zone (0.56 ha) for the same vegetation type, being *Grey Box – Forest Red Gum grassy woodland on shale of the Cumberland Plain* (scattered paddock trees) for assessment under the FBA.

A total *Grey Box – Forest Red Gum grassy woodland on shale of the Cumberland Plain* (scattered paddock trees) vegetation zone area of 0.76 ha was therefore assessed, with a further 0.33 ha of *Forest Red Gum – Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain* (disturbed/shrubby) also assessed.

Figure 3.8 shows the spatial arrangement of the vegetation zones within the development site. **Table 3.4** describes the zone mapped and total impacts.

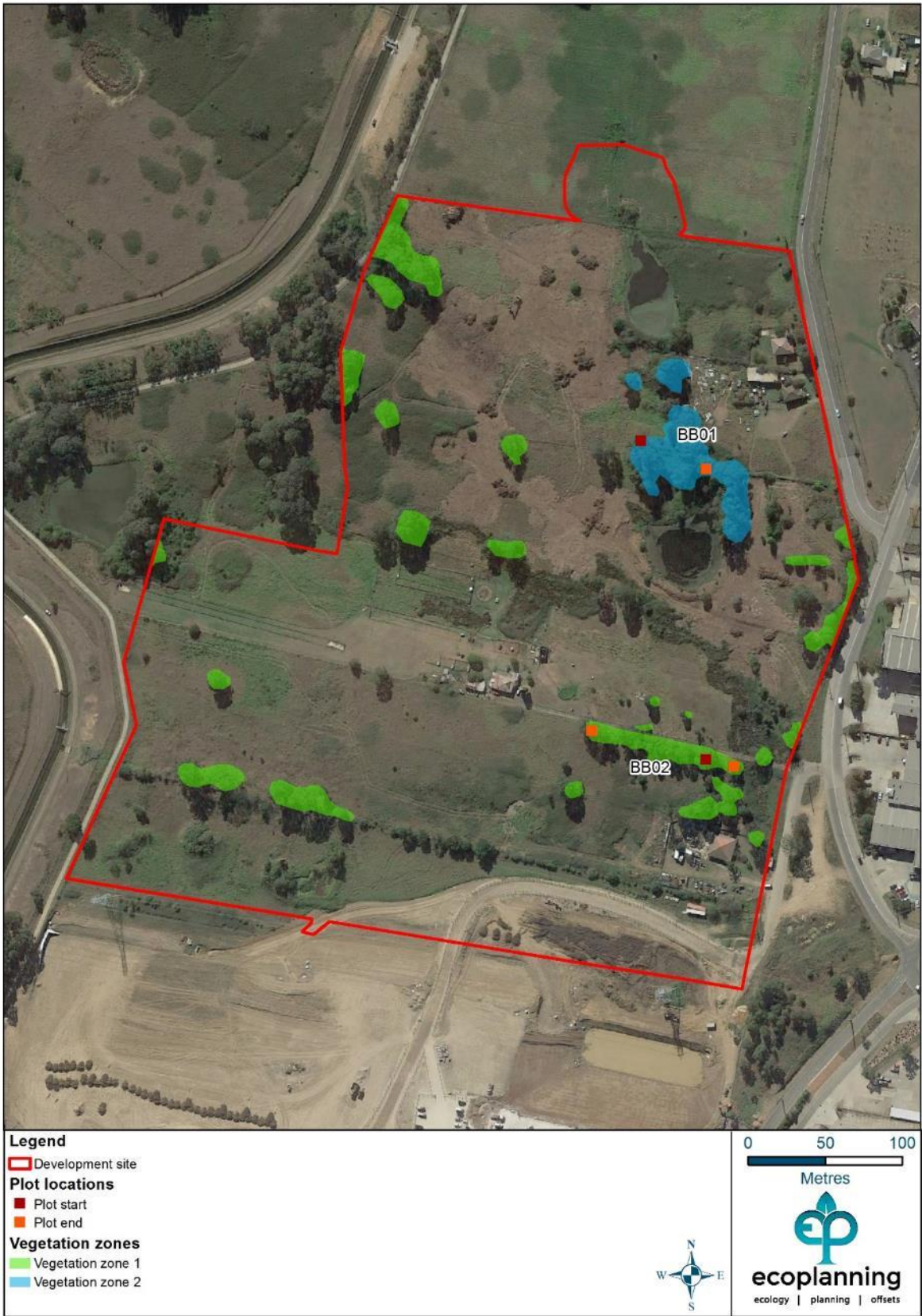


Figure 3.8: Vegetation zones and plot and transect locations.

Table 3.4: Vegetation zones.

Plant community type	Condition	Ancillary code	Total impact on vegetation zone (ha)	Vegetation zone code	Total impact entered into credit calculator (ha)
Grey Box – Forest Red Gum grassy woodland on shale of the Cumberland Plain	Moderate / Good_ Medium	Disturbed/ shrubby	0.20	1	0.76^
		SPT	0.56		
Forest Red Gum – Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain	Moderate / Good_ Medium	SPT	0.33	2	0.33
Total area of vegetation					1.09

^ Note: due to the area of Grey Box – Forest Red Gum grassy woodland on shale of the Cumberland Plain (disturbed/shrubby) being smaller than 0.25 ha (total impact is 0.20 ha) the area has been included into the *Grey Box – Forest Red Gum grassy woodland on shale of the Cumberland Plain* (SPT) vegetation zone for credit calculation purposes.

As noted previously, due to the isolated nature of the vegetation on site, a total patch size of 1.7 ha was calculated for entry into the credit calculator, and some difficulty was encountered when attempting to enter the patch size into the credit calculator.

Two pages of the credit calculator require patch size information. The first is the 'Assessment circle details' page, which calculates landscape score. For this page, a patch size of 1.7 ha could be entered. Patch size is also required in the 'Vegetation zone details' page. Unfortunately, a patch size less than 2 ha was not able to be entered into the credit calculator in the vegetation zone details page, therefore 2 ha was entered. This problem did not change the credit calculations in any way.

3.2.2 Survey effort

An initial field assessment was conducted by Lucas McKinnon and Darren James on 14 April 2016. During this field assessment, the vegetation present on the site was mapped and rapid assessments conducted to prepare a constraints layer for the proponent. The weather on the day was mild and dry (**Table 3.5**).

Plot based surveys (as per FBA 2014) were then undertaken by James Schlunke and Darren James on 7 September 2016. Weather conditions on the day of the flora were considered mild, windy and dry (**Table 3.5**).

Table 3.5: Daily weather observation at Horsley Park (1.5 km south-west).

Date	Temp (°C)		Rainfall (mm)	Max wind (gust)	
	Min	Max		Direction	Spd (km/h)
14 April 2016	12.8	23.1	0	E	11
7 September 2016	11.9	22.7	0.0	SE	28

3.2.3 Plots and transects

Two plot and transect surveys were required to satisfy the requirements of the FBA (see **Appendix A** for field data sheet).

One plot and transect was completed in a central patch of *Grey Box – Forest Red Gum grassy woodland on shale of the Cumberland Plain* (SPT vegetation zone) on the development site (**Figure 3.8**). Due to the small and linear nature of all Grey Box – Forest Red Gum grassy woodland on shale of the Cumberland Plain SPT vegetation zone patches on the development site, a 20 m x 50 m plot and transect fitting the requirements of the method was not achievable. Rather, a 10m x 40 m plot (0.04 ha) was completed to assess Native Plant Species richness, a 50 m transect was completed to assess structure and hollows / fallen logs were assessed in a 10 m x 100 m plot, rather than the standard 20 m x 50 m plot. The difference in approach is not considered significant in terms of the results achieved, and was the only approach available to assess the vegetation zone in accordance with the methodology. The plot is identified on the map with two end points, being the end points of the 100 m transect. The start point is identified as normal.

One plot was also completed for the *Forest Red Gum – Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain* SPT zone. This plot was conducted consistent with the method. The results obtained are provided in **Table 3.6**.

Table 3.6: Plot and transect results.

Plot ID	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Easting	Northing
BB01	13	19.5	0	6	0	4	77	0	1	5	303650	6253547
BB02	18	25	5.5	52	0	6	48.5	0	1	14	303694	6253339

3.2.4 Current and future site value scores

The site value score recorded for each vegetation zone (based on the plot data captured) are:

- *Grey Box – Forest Red Gum grassy woodland on shale of the Cumberland Plain* (SPT) - 51.56 / 100
- *Forest Red Gum – Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain* (SPT) – 36.98 / 100

Both site value scores, especially that of *Forest Red Gum – Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain* (SPT), are indicative of vegetation in a degraded state, with several of the ten attributes measured either not present or significantly below benchmark (a score of 1 out of 3).

As the proposed development requires the complete removal of native vegetation within each zone mapped, the default future site value score of 0 has been maintained.

Table 3.7: Site values before and after development.

Plant community type	Vegetation zone	Area impacted (ha)	Site value score before development	Site value score after development
Grey Box – Forest Red Gum grassy woodland on shale of the Cumberland Plain	SPT	0.76	51.56	0
Forest Red Gum – Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain	SPT	0.33	36.98	0

4. Threatened species

4.1 Identifying threatened species for assessment

4.1.1 Ecosystem credit species

Ecosystem credit species are predicted based on habitat surrogates, and a number of ecosystem credit species are predicted on site. The ecosystem credit species predicted on site are provided in **Table 4.1**.

Few of the predicted species are likely to occur onsite due to either lack of habitat or paucity of sightings in the locality. Ecoplanning (2016) considered the likelihood of occurrence of threatened species within a 5 km radius of the development site, with none of those identified as having a moderate or higher likelihood of occurrence identified (**Table 4.1**). None have been removed from the assessment as there would have been no change to the final ecosystem credit due to the presence of a CEEC and EEC in the development site (which ensures the maximum threatened species multiplier is applied).

Table 4.1: Ecosystem credit species predicted on site.

Common Name	Scientific Name	TSC Act Status*	EPBC Act Status*
Diamond Firetail	<i>Stagonopleura guttata</i>	V	-
Eastern Freetail-bat	<i>Mormopterus norfolkensis</i>	C	-
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	V	-
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>	V	-
Little Eagle	<i>Hieraaetus morphnoides</i>	V	-
Little Lorikeet	<i>Glossopsitta pusilla</i>	V	-
Painted Honeyeater	<i>Grantiella picta</i>	V	V
Spotted Harrier	<i>Circus assimilis</i>	V	-
Swift Parrot	<i>Lathamus discolor</i>	E	E
Yellow-bellied Sheath-tail-bat	<i>Saccolaimus flaviventris</i>	V	-

* 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 1,000 ha circle. **Table 4.2** provides the answer to each question for the development site. Where the answer is 'yes', the species is retained in the assessment.

Question: Do any of the following features occur on the area to be assessed? Tick the box wherever the feature occurs, or is likely to occur in the area to be assessed. Leave blank if the feature does not occur.

Table 4.2: Assessment of geographic/habitat features.

Common name	Scientific name	Feature	Impact?
Cumberland Plain Land Snail	<i>Meridolum corneovirens</i>	land containing bark or leaf litter accumulation	Yes
Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	land containing escarpments, cliffs, caves, deep crevices, old mine shafts or tunnels	No
Matted Bush-pea	<i>Pultenaea pedunculata</i>	land within 5 km of coast in South East Coastal Plains CMA subregion	No
Green and Golden Bell Frog	<i>Litoria aurea</i>	land within 100 m of emergent aquatic or riparian vegetation	Yes
<i>Hypsela sessiliflora</i>	<i>Hypsela sessiliflora</i>	Wet and damp areas only.	Yes
<i>Wahlenbergia multicaulis</i> (Tadgells Bluebell) population, Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield local government areas	<i>Wahlenbergia multicaulis</i> - endangered population	land situated in damp, disturbed sites	No
Eastern Osprey	<i>Pandion cristatus</i>	land within 40 m of fresh/brackish/saline waters of larger rivers or creeks; estuaries, coastal lagoons, lakes and/or inshore marine waters	No

Table 4.3 provides the list of species credit species identified by the Tool as 'candidate species'. In accordance with Section 6.5.1.3(a) of the FBA, each species was assessed to determine whether the species is likely to occupy the site based on habitat features and quality.

To do this threatened species, populations and migratory species recorded within 5 km of the development site (the locality) were obtained from a search of the Atlas of NSW Wildlife (OEH 2016) and their likelihood of occurrence was assessed by:

- review of location and date of recent (<5 years) and historical (>5-20 years) records
- review of available habitat within the development site 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 available habitat within the development site. The potential for species to utilise the site and to be affected directly or indirectly by the proposed action were considered as either:

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

The assessment concluded (**Appendix B**) that none of the candidate species in **Table 4.3** are likely to be present as the habitat is either absent or substantially modified, records are a long distance from the development site or are of such an age that these species are unlikely to utilise the site. Targeted surveys were therefore not conducted.

Table 4.3: Species credit species requiring further assessment.

Common name	Scientific name	TSC Act Status*	EPBC Act Status*
Cumberland Plain Land Snail	<i>Meridolum corneovirens</i>	E	-
Downy Wattle	<i>Acacia pubescens</i>	V	V
Eastern Pygmy-possum	<i>Cercartetus nanus</i>	V	-
Green and Golden Bell Frog	<i>Litoria aurea</i>	E	E
Hairy Geebung	<i>Persoonia hirsuta</i>	E	E
Hibbertia sp. Bankstown	<i>Hibbertia</i> sp. Bankstown	CE	CE
<i>Hypsela sessiliflora</i>	<i>Hypsela sessiliflora</i>	E	Ex
Koala	<i>Phascolarctos cinereus</i>	V	V
Netted Bottle Brush	<i>Callistemon linearifolius</i>	V	-
Regent Honeyeater	<i>Anthochaera phrygia</i>	CE	CE/M
Spiked Rice-flower	<i>Pimelea spicata</i>	E	E
Squirrel Glider	<i>Petaurus norfolcensis</i>	V	-
Thick Lip Spider Orchid	<i>Caladenia tessellata</i>	E	V
White-flowered Wax Plant	<i>Cynanchum elegans</i>	E	E

* CE- Critically Endangered; E- Endangered, Ex- Extinct; V- Vulnerable

5. Avoid and minimise impacts on biodiversity values

The following section sets out the assessment of direct and indirect impacts on biodiversity values at the development site. This is set out in accordance with Section 8 of the FBA (OEH 2014). The reporting requirements are set out in accordance to Appendix 9 of the FBA (OEH 2014).

5.1 Final project footprint

The lot layout proposed will result in impacts to native vegetation across the development site, however the siting of the development site did consider environmental constraint and has thus largely avoided the better condition vegetation in the vicinity. The vast majority of disturbed/shrubby vegetation occurs closer to the Sydney Water Canal, to the west of the development site, and as part of the planning process has been largely avoided.

The clearing of native vegetation for the proposed development totals 1.09 ha, or 6.0% of the development site, with much of the vegetation being cleared consisting of pasture grasses and Blackberry. Direct and indirect impacts are discussed further below.

5.2 Assessment of direct and indirect impacts

5.2.1 Direct impact – vegetation clearing

A direct impact of a total of 1.09 ha to native vegetation is proposed. As demonstrated by the low site value scores calculated through the plot and transect data, the native vegetation on the development site is significantly modified and degraded, with a significant number of the ten values collected being absent or outside benchmark. The proposed impact to native vegetation totals 6.0% of the development site (**Figure 5.1**).

The remaining 16.93 ha of the development site is described as 'other vegetation', and consists of a dam, pasture, *Juncus acutus** and Blackberry. **Table 5.1** summarises the total area (ha) impacting each of the vegetation types, which are described in **Section 3**.

Table 5.1 Area of each vegetation type and 'other' vegetation directly impacted within the development site.

Vegetation type	Vegetation zone (condition class)	Total area impacted on development site (ha)
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin	Disturbed/shrubby	0.20
	Scattered paddock trees	0.56
Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin	Scattered paddock trees	0.33
Other vegetation	Dam, pasture, Juncus, Blackberry	16.93
Total		18.02

Completely avoiding impacts to native vegetation within the development site is, in this case, not considered feasible. The proposed development consists of large warehouse and industrial structures, limiting the ability to redesign the proposed layout to completely avoid impacts. In addition, the vegetation within the development site is isolated, in small patches and is in poor condition, resulting in reduced viability, particularly when considering the current adjacent (and proposed future) industrial land uses.

As discussed above, the design of the proposed development footprint has predominantly avoided impacts to the vegetation to the west of the development site, which is in better condition.

An area for intermittent stormwater detention, located directly to the west of the development site, has been placed outside the direct footprint of the development. Project engineers (Costin Roe Consulting Pty Ltd) have advised that the vegetation within this already existing stormwater swale will not be impacted by the development, and the swale will act as it currently does, dry on most occasions however wet after heavy rainfall. It is anticipated that the area will only become saturated after a 1 in 20 or 1 in 100 year Average Recurrence Interval (ARI) storm, and would drain after 30-60 minutes. As the swale is already existing and the development is unlikely to impact on the vegetation present, credits have not been calculated for this area and the area has been excluded from the development site and associated credit calculations. It is noted this area is dominated by *E. tereticornis*, which is a species of Eucalypt that is tolerant to inundation, which often occurs in association with floodplains.

5.2.2 Direct impact – Loss of fauna habitat

The proposal will remove potential foraging and roosting/sheltering/breeding habitat (small tree hollows and stags) for fauna. The likelihood of threatened fauna utilising the study is low based on site assessment, expert opinion and analysis of the likelihood of occurrence from Atlas records over the past 20 years. (see **Section 4.1** and **Appendix B**).

5.2.3 Indirect impacts

It is difficult to quantify indirect impacts of the proposed development, but these may include impacts such as noise and/or erosion associated with the construction phase of the project. These impacts will be managed through the development of a Construction Environmental Management Plan.

Given the already highly modified nature and present surrounding land use of the development site, indirect impacts from the proposal are considered to be negligible or non-existent. This is particularly the case given the isolated nature of the native vegetation within the development site.

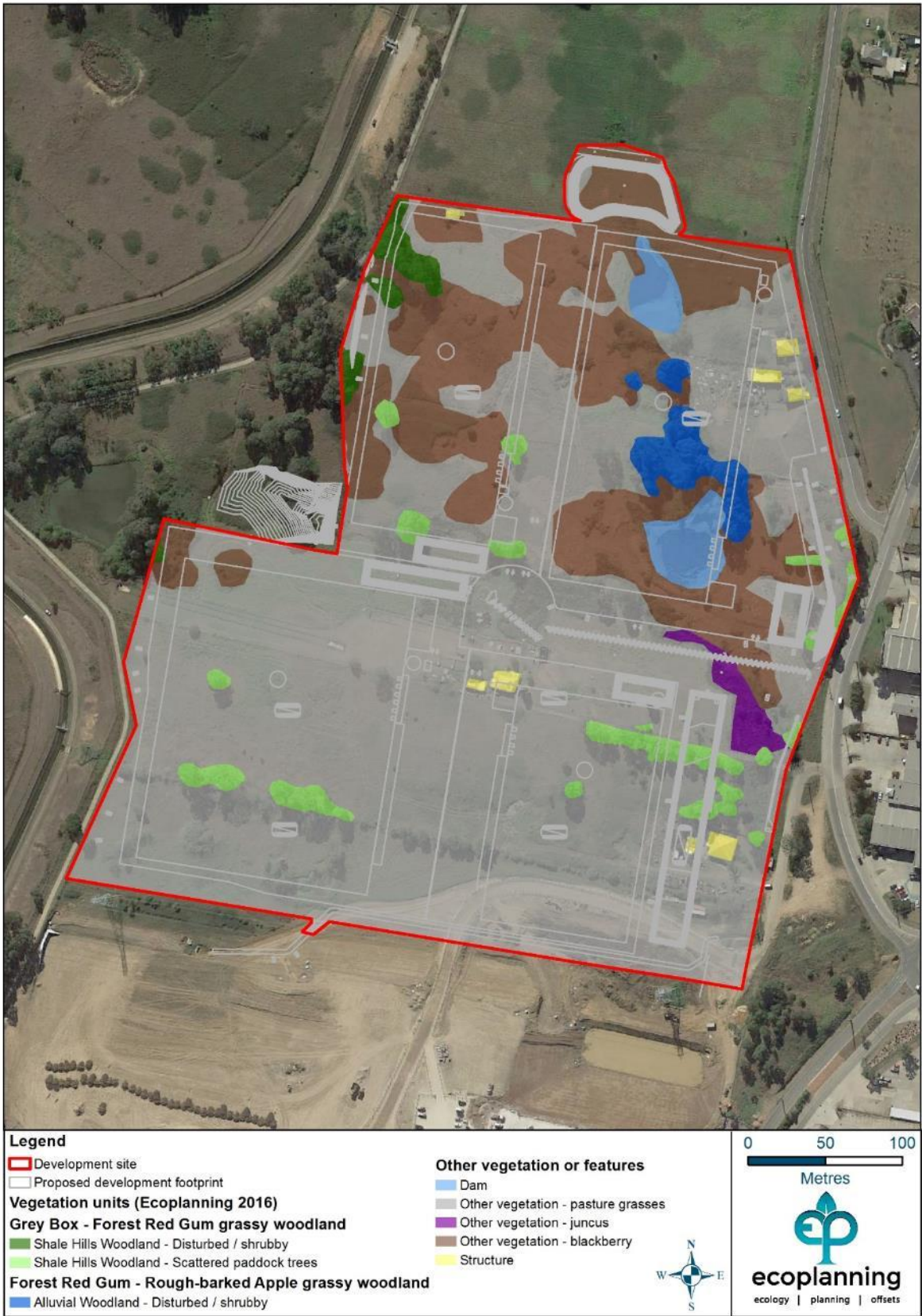


Figure 5.1: Field validated vegetation (Ecoplanning 2016) and proposed footprint.

5.3 Onsite measure to avoid and minimise direct and indirect impacts

As described above, the complete avoidance of impacts is considered impractical due to the nature of the development proposed (large warehouse and industrial structures), the location of the native vegetation on site and the isolated and degraded condition state of the native vegetation. Indirect impacts from the proposal are negligible or non-existent.

Several measures will be implemented to reduce impacts where possible. Details are provided below.

5.3.1 Loss of fauna habitat

A number of non-threatened fauna species such as birds, arboreal mammals and amphibians are 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 (see **Section 5.3.2**).

5.3.2 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. Impact summary

6.1 Thresholds for assessment and offsetting of unavoidable impacts of development

Section 9 of the FBA (OEH 2014) defines thresholds to be applied by the accredited assessor related to the assessment and offsetting of unavoidable impacts caused by development. A number of thresholds are defined, including:

1. impacts that the assessor is required to identify for further consideration by the consent authority;
2. impacts for which the assessor is required to determine an offset;
3. impacts for which the assessor is not required to determine an offset;
4. impacts that do not require further assessment by the assessor.

Due to the presence of a CEEC on site, point (1) above must be considered.

6.1.1 Impacts that require further consideration by the consent authority

The proposed impact to a CEEC on site (Cumberland Plain Woodland in the Sydney Basin Bioregion) requires the assessor to identify the impact for further consideration by the consent authority. The total impact proposed on Cumberland Plain Woodland in the Sydney Basin Bioregion is 0.76 ha, and is displayed in **Figure 6.1**. The impact includes 0.20 ha to the area mapped as disturbed/shrubby and 0.56 ha of scattered paddock trees.

The consent authority must determine if it is appropriate for these impacts to occur. In their consideration the consent authority is required to consider whether the impacts are likely to cause the extinction of the CEEC in the IBRA subregion or significantly reduce its viability (Section 9.2.1.3 of the FBA).

The proposed impacts to 0.76 ha of degraded Cumberland Plain Woodland in the Sydney Basin Bioregion will not cause the CEEC to become extinct within the IBRA subregion, and will also not reduce the community's viability, for the following reasons:

- The vegetation on site is in a degraded state, with a site value score of 51.56 / 100. Several of the ten attributes captured in the plot and transect are either non-existent or significantly below benchmark, including ground cover (shrubs), ground cover (other), exotic plant cover, hollows and fallen logs;
- No threat of extinction to the CEEC is caused by the proposed impact, nor is the viability of the community reduced. The most recent statistics on the area of Cumberland Plain Woodland within the Cumberland IBRA subregion is provided by OEH 2015 (Cumberland subregion Biodiversity Investment Opportunities Map report). OEH 2015 (Table 5) estimates that the combined area of PCT 849 and PCT 850 (which together form Cumberland Plain Woodland in the Sydney Basin Bioregion) is 22,501.3 ha. The proposed impact of 0.76 ha of degraded vegetation represents 0.003% of the total Cumberland Plain Woodland in the Sydney Basin Bioregion in the IBRA subregion;
- The on-going viability of the patches of native vegetation on the development site are questionable, given the degraded condition state and isolation, with a small patch size of 1.7 ha recorded for this assessment.

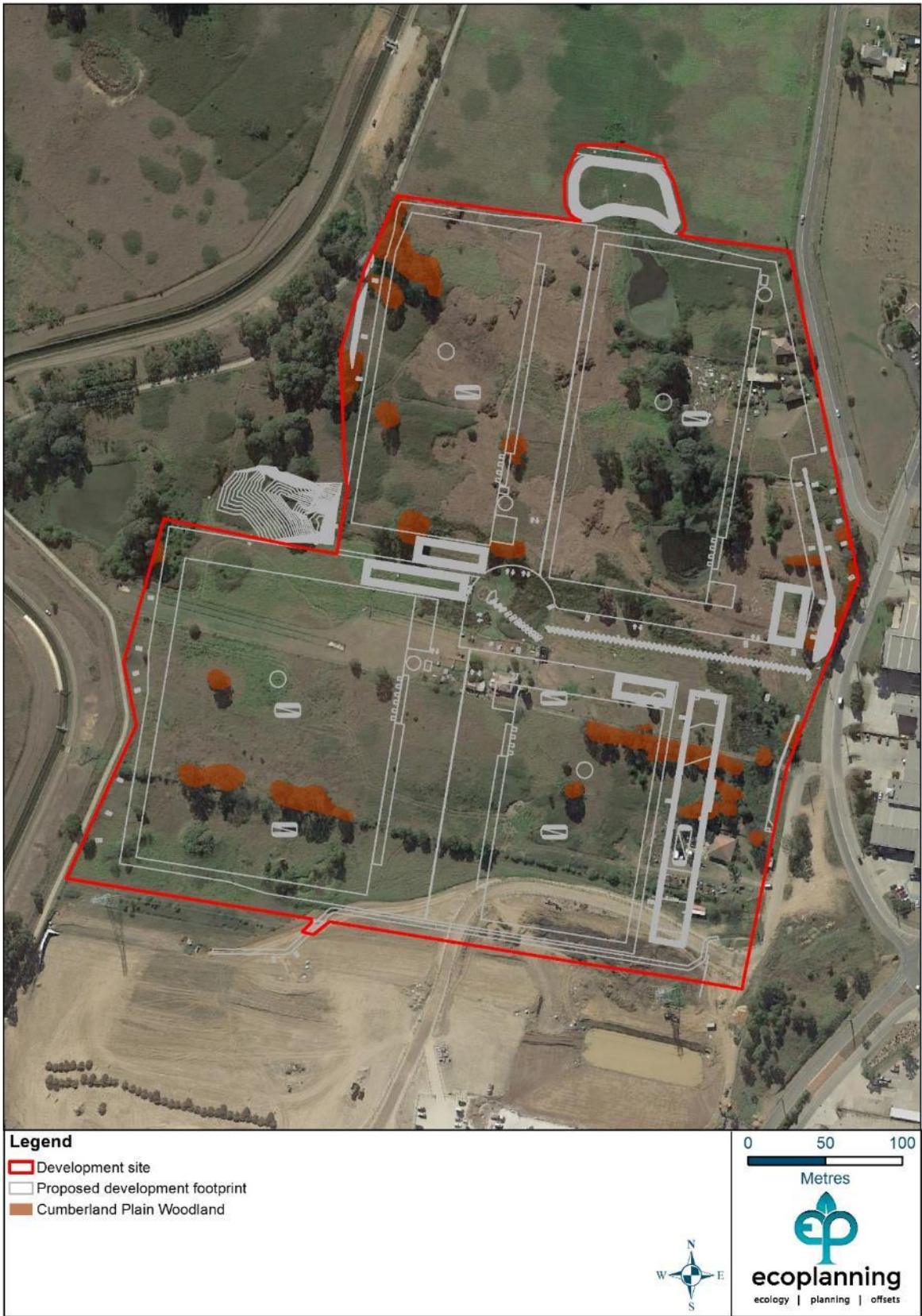


Figure 6.1: Proposed impact to Cumberland Plain Woodland in the Sydney Basin Bioregion - Impacts that require further consideration by the consent authority.

6.2 Ecosystem credits and species credits

6.2.1 Change in landscape value score

The loss in landscape score following the proposed development is **1** (**Table 6.1**). See **Section 2** for more information.

Table 6.1: Landscape score components.

Landscape score component	Score Awarded
Change in connectivity score	0
Increase in native vegetation cover (inner assessment circle) score	0
Increase in native vegetation cover (outer assessment circle) score	0
Patch size area score	1
Total	1

6.2.2 Current and future site value score

The current and future site value scores were calculated for the proposal. The plot and transect data collected was entered into the credit calculator, and a site value score of 51.56 was recorded for Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion and 36.98 for Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion. Proposed clearing of this vegetation results in a future site value score of 0 for both vegetation zones. See **Table 6.2** for details.

Table 6.2: Site values before and after development.

Plant community type	Vegetation zone	Area impacted (ha)	Site value score before development	Site value score after development
Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion (ME019)	SPT (Medium)	0.76	51.56	0
Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion (ME018)	Disturbed/shrubby (Medium)	0.33	36.98	0

6.2.3 Required ecosystem credits

The total number of ecosystem credits required is 39 credits.

6.2.4 Required species credits

There are no species credits required for the proposal.

7. Biodiversity Credit Report

7.1 Credit profiles

7.1.1 Ecosystem credits

The ecosystem credits required to offset the proposal are provided in **Table 7.1**. The final credit report produced by the credit calculator is provided in **Appendix C**.

Table 7.1: Ecosystem credits summary and credit profiles.

Plant community type (impact)	Vegetation zone (Condition Class)	Impact area (ha)	Credits required	Plant community type (offset options)	IBRA sub-region
Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	SPT (Moderate/ Good_ Medium)	0.76	30	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion, (ME019) Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion, (ME020)	Cumberland - Sydney Metro and any IBRA subregion that adjoins the IBRA subregion in which the development occurs
Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	SPT (Moderate/ Good_ Medium)	0.33	9	Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion, (ME018)	Cumberland - Sydney Metro and any IBRA subregion that adjoins the IBRA subregion in which the development occurs
Total		1.09	39	N/A	N/A

7.1.2 Species credits

No species credits were required for this assessment.

7.2 Biodiversity Offset Strategy

As described in **Section 7.1**, 39 credits are required to offset the proposed development. These credits will be purchased from the current credit market, with credits generated within the Western Sydney Parklands likely to be purchased and retired. It is notable that the development site is immediately adjacent to the Hawkesbury-Nepean (HN) catchment management area, with Western Sydney Parklands owning the equivalent HN ecosystem credits as those required for this BOS.

References

Bannerman S.M. and Hazelton P.A., (1990) Soil Landscapes of the Penrith 1:100,000 Sheet map and report, Soil Conservation Service of NSW, Sydney.

Clark N.R. and Jones D.C., 1991, Penrith 1:100 000 Geological Sheet 9030, 1st edition. Geological Survey of New South Wales, Sydney

Commonwealth Dept. of the Environment (DoE) (2015). Protected Matters Search Tool. Accessed at: <http://www.environment.gov.au/epbc/protected-matters-search-tool>

JBA Urban Planning Consultants (2016) Preliminary Environmental Investigation Report - Request for SEARs State Significant Development. Cowpasture Road, Wetherill Park Horsley Drive Business Park Stage 2. Submitted to Department of Planning & Environment on Behalf of Western Sydney Parklands Trust

Mitchell, P. (2002). NSW ecosystems study: Background and Methodology, prepared by Groundtruth Consulting, Gladesville, NSW.

NSW Dept. of Planning and Environment (DPE) (2016). NSW Planning Viewer Beta. NSW Government. Accessed at: <https://maps.planningportal.nsw.gov.au/Terms>

NSW Land and Property Information (LPI) (2016). SIX Maps. Accessed at: <https://maps.six.nsw.gov.au/>

NSW National Parks and Wildlife Service (NPWS) (2002). *Native Vegetation Maps of the Cumberland Plain, Western Sydney*. NSW NPWS, Hurstville.

NSW Office of Environment and Heritage (NSW OEH) (2014). *Framework for Biodiversity Assessment. NSW Biodiversity Offsets Policy for Major Projects*. NSW Office of Environment and Heritage, Sydney.

NSW Office of Environment and Heritage (NSW OEH) (2016a). BioNet Atlas of NSW Wildlife. Accessed at: http://www.environment.nsw.gov.au/atlaspublicapp/UI_Modules/ATLAS_/AtlasSearch.aspx

NSW Office of Environment and Heritage (NSW OEH) (2016b). 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>

Urbis (2016). Development Control Plan - Mamre West Precinct. Urbis Australia.

Appendix A: Field Data Sheets

BioMetric plots data sheet

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Site name	MORSEY PARK STONE 2	Recorders	DJ/TS.	Date	7/9/16.
Wapoint/ Plot ID	BB01	Easting*	St: End:	Northing*	St: End:
		Photo no. (Continent)	St: End:	Plot orient/ Slope/Aspect	95°

Plant Community Type	ALLuvial, woodland
Ancillary code	Disturbed / Shrubby
Condition (Low or Mod-Good)	M/G

20 x 20m Quadrat		Number of native plant species	13										(NPS)	
NATIVE	50m Transect - 10 Points	Native over- storey cover (%)	20	30	35	25	10	5	0	5	20	45	19.5% (NOS) Sum / 10	
		Native mid-storey cover (%)	0	0	0	0	0	0	0	0	0	0	6	0 % (NMS) Sum / 10
	50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses	111										6 % (NGCG) Double score out of 50 to get %	
		Native ground cover (hits/50 points) - Shrubs											% (NGCS) Double score out of 50 to get %	
		Native ground cover (hits/50 points) - other	11										4 % (NGCO) Double score out of 50 to get %	
EXOTIC	50m Transect - 10 points + 50 points	Overstorey (10 points)	0	0	0	0	0	0	0	0	0	0	0 (a) Sum/10	Sum exotic cover (a)+(b) +(c) 77 %
		Midstorey (10 points)	0	50	55	25	80	60	0	0	0	20	29 (b) Sum/10	
		Ground (50 points)	111 111 111 111 111										48 (c) Double score	
20m x 50m Quadrat	Number of trees with hollows	0		Total length fallen logs >10cm width (m)		111								
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone				Regen (Y/N) (indiv. <5cm?)		Proportion						
		FOREST RID Gum ✓						100%						
Strata	Form	Species				Height range		PFC						
Upper 1		Enc. Tree				20-25m		20%						
Upper 2														
Mid 1		Enc. Tree - regrowth				10-15m		5%						
Mid 2														
Lower 1		Coprosma dactylo						<5%						
Lower 2		Microdon						<5%						

Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Site name	Horsey Park Business R42	Plot no.	BB01	Date	7/7/16
PCT		Ancillary			

Natives (20m Quadrat)			F	C	A	Exotics (20m Quadrat)			F	C	A
OVERSTOREY											
1	Leptochloa canaliculata					Encalypta tetralix					
2	Chenopodium polycarpon										
3	Cynodon dactylon										
4	Leptochloa canaliculata										
5	Bidens pilosa										
6	Chenopodium polycarpon										
7	Vigna subterranea										
8	Encalypta tetralix	T 35	6								
MIDSTOREY											
1	Encalypta tetralix	T 35	3			Olea europaea cuspidata	T	1	3		
2		3				Lantana camara	S	30	50		
3						Lycium ferocissimum	S	21	3		
4						"Lycium" Eriobotrya japonica	T	21	1		
5						"Plectranthus/Peach" Plectranthus	T	2	4		
6						Cestrum glaberrimum	S	4	10		
7						Plum - Prunus sp.	S	2	4		
8						Ochna serrulata	S	21	2		
9											
10											
GROUND COVER / other											
1	Einadia paguensis nutans	F	21	3		Encalypta tetralix					
2	Einadia paguensis	R	21	2		Pennisetum clandestinum	Q	50	>100		
3	Microlaena stipoides	G	5	500		Cirsium vulgare	F	1	20		
4	Calcein taberna	L	21	3		Chloris gayana	G	53	100		
5	Hardenbergia violacea	L	21	1		Traxacum officinale	F	21	3		
6	Cynodon dactylon	D	5	500		Verbena bonariensis	F	21	3		
7	Dichondra repens	F	21	100		Rubus fruticosus	L	21	3		
8	Senecio sp. "decurrens"	F	21	4		Asparagus asparagoides	L	1	10		
9	Einadia hastata	F	21	1		Paspalum dilatatum	G	1	20		
10	Cyperus gracilis	V	21	20		Phalaris aquatica	G	1	10		
11	Wahlenbergia communis	F	21	5		Bromus catharticus	G	21	3		
12	Carex inuensa	V	21	3		Verbena bonariensis	F				
13	Calcein macrophylla	L	21	4		Senecio quadridentatus	F	1	20		
14						Asphodelus fistulosus	F	21	10		
15						Sida rhomboides	F	21	5		
16						Plantago lanceolata	F	21	5		
17						Bidens pilosa	F	21	10		
18						Avena barbata	G	1	20		
19						Amorpha sericeiform	L	1	20		
20						Hypochaeris radicata	F	21	5		
21						Freesia sp.	F	21	5		
22						Senecio pterophorus	F	21	4		
23											

* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%.

Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: * (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)

13 natives total

10x40
GC, + transect10x~100 Hollows /
Logs.

BioMetric plot data sheet

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Site name	HORSLEY STAGE 2	Recorders	DJ/JS.	Date	7/9/16
Wapoint/ Plot ID	BBO2	Easting *	St: End:	Northing*	St: End:
		Photo no. (Camera)	St: End:	Plot orient/ Slope/Aspect	270°.
Plant Community Type	SHALE HILLS				
Ancillary code	SPT				
Condition (Low or Mod-Good)	m/g.				

20 x 20m Quadrat	Number of native plant species	18 (NPS)											
NATIVE	50m Transect - 10 Points	Native over-storey cover (%)										50 5 30 35 35 40 30 15 5 5	25 % (NOS) Sum / 10
		Native mid-storey cover (%)										0 0 35 5 10 0 0 5 0 0	5.5 % (NMS) Sum / 10
	50m Transect - 50 Points	Native ground cover (hits/50 points) - Grasses										THH THH THH THH THH	52 % (NGCG) Double score out of 50 to get %
		Native ground cover (hits/50 points) - Shrubs											0 % (NGCS) Double score out of 50 to get %
		Native ground cover (hits/50 points) - other										THH	6 % (NGCO) Double score out of 50 to get %
	EXOTIC	50m Transect - 10 points + 50 points	Overstorey (10 points)										0 0 0 0 0 0 0 0 0 0
		Midstorey (10 points)										0 0 0 0 0 0 15 5 5 0	2.5 (b) Sum/10
		Ground (50 points)										THH THH THH THH THH	46 (c) Double score
20m x 50m Quadrat	Number of trees with hollows	0										Total length fallen logs >10cm width (m)	THH THH THH
Whole Veg. Zone	Over-storey regeneration	All canopy spp. in Veg Zone					Regen (Y/N) (indiv. <5cm?)		Proportion				
		FOREST RED GUM					✓						
		GREY BOX					✓		100%				
Strata	Form	Species					Height range		PFC				
Upper 1		FOREST RED GUM					15		20				
Upper 2		GREY BOX					15		15				
Mid 1		FOREST RED GUM					5-10		20				
Mid 2		GREY BOX					5-10		15				
Lower 1													
Lower 2													

Form: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restoid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

10 x 40m plot.

Site name	Horsley Park Bus. Park Stage 2	Plot no.	Btx-2	Date	7/9/16
PCT		Ancillary			

Natives (20m Quadrat)				Exotics (20m Quadrat)			
F	C	A		F	C	A	
OVERSTOREY							
1	Eucalyptus mollucanum	T	3	2			
2	Eucalyptus tereticornis	T	20	20			
3			35				
4							
5							
6							
7							
8							
MIDSTOREY							
1	Euc. mollucanum	T	1	2	Olea europaea cuspidata	T	10 20
2	Euc. tereticornis	T	20	20	Eriobotrya japonica	T	3 3
3	Banksia sp.	S	1	1	Lantana camara	S	2 20 10
4					Ocimum serotinum	S	1 3
5					Pear tree Pyrus sp.	T	1 1 3
6							
7							
8							
9							
10							
GROUNDCOVER / other							
1	Eriodictyon latifolium	F	1	1	Eragrostis curvata	G	10 100
2	Glycine microphylla	L	1	10	Chloris gayana	G	3 50
3	Cynodon dactylon	D	10	1000	Plantago lanceolata	F	3 500
4	Rumex crispus	S	1	3	Opuntia stricta	S	1 1
5	Panicum repens	F	3	1000	Taraxacum officinale	F	1 20 20
6	Microseris stipitata	G	10	1000	Pennisetum clandestinum	D	1000
7	Carex inversa	V	1	20	Senecio jacobinaefolius	F	1 50
8	Juncus acutatus	L	1	20	Paspalum dilatatum	G	5 100
9	Senecio dielschides	F	1	1	Vicia sativa	F	3 1000
10	Wahlenbergia gracilis	F	1	2	Conyza bonariensis	F	1 10
11	Aristida canescens	G	1	3	Verbena bonariensis	F	1 5
12	Glycine tomentosa	L	1	3	Taraxacum repens	F	1 50
13	Dianella longifolia	F	1	1	Arenaria serotina	L	1 10
14	Eriodictyon latifolium	F	1	2	Hypochaeris microcephala	F	1 10
15	Rumex crispus	F	1	5	Briza subaristata	G	5 50
16					Lolium sp.	G	1 20
17					Setaria gracilis	G	1 10
18					Asphodelus fistulosus	F	1 4
19					Asparagus asparagoides	L	1 3
20					Sida rhomboides	F	1 10
21					Rubus fruticosus agg.	L	4 20
22					Avena barbata	G	1 50
23					Hypochaeris radicata	F	1 50

* Cover (C): Estimate of the appropriate cover measure for each recorded species; from 1-5 and then to the nearest 5%.
Abundance (A): A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals, 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required.

Form: * (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (d) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad

Braun-blauquet: 1=<5% (rare, <3 individuals); 2=<5% (uncommon, scattered/localised); 3=<5% (common, consistent thru plot); 4a=<5% (very abundant, many individuals thru plot); 4b=5-25%; 5=25-50%; 6=50-75%; 7=75-100%

* Note: Cover and Abundance should be collected unless otherwise stated, as per Native Veg. Interim Type Standard (Sivertsen 2009)

18 natives total

Appendix B: Likelihood Table

Scientific Name	Common Name	TSC Act	EPBC Act	Number of records	Closest proximity and date	Most recent and proximity	Likelihood of occurrence
Amphibia							
<i>Litoria aurea</i>	Green and Golden Bell Frog	E	E	0	N/A	N/A	Not present
Aves							
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	CE/M	0	N/A	N/A	Not present
<i>Ardea ibis</i>	Cattle Egret		C,J	10	1936m 2/12/2001	25/05/2016 4567m	Moderate
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	V		4	1427m 2/12/1997	8/02/2016 4653m	Low
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V		1	3712m 20/03/2007	20/03/2007 3712m	Not present
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V		6	3213m 4/09/2007	17/03/2011 3381m	Low
<i>Gallinago hardwickii</i>	Latham's Snipe	0	C,J,K	2	4421m 10/12/2013	10/12/2013 4421m	Not present
<i>Glossopsitta pusilla</i>	Little Lorikeet	V		2	3712m 20/05/2007	24/05/2016 4131m	Low
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle		C	1	2317m 28/01/2003	28/01/2003 2317m	Not present
<i>Hieraaetus morphnoides</i>	Little Eagle	V		12	722m 26/02/2015	26/02/2015 751m	Moderate
<i>Lathamus discolor</i>	Swift Parrot	E	CE	2	4217m 24/09/2000	4/09/2007 4222m	Not present
<i>Lophoictinia isura</i>	Square-tailed Kite	V		1	3129m 11/06/2008	11/06/2008 3129m	Not present

Scientific Name	Common Name	TSC Act	EPBC Act	Number of records	Closest proximity and date	Most recent and proximity	Likelihood of occurrence
<i>Merops ornatus</i>	Rainbow Bee-eater		M	1	3712m 25/02/2007	25/02/2007 3712m	Low
<i>Tyto novaehollandiae</i>	Masked Owl	V		2	1853m 29/08/2008	1/04/2011 3697m	Low
Flora							
<i>Acacia pubescens</i>	Downy Wattle	V	V	55	1009m 28/02/1998	29/05/2015 4146m	Low
<i>Caladenia tessellata</i>	Thick Lip Spider Orchid	E	V	0	N/A	N/A	Not present
<i>Callistemon linearifolius</i>	Netted Bottle Brush	V		0	N/A	N/A	Not present
<i>Cynanchum elegans</i>	White-flowered Wax Plant	E	E	1	3616m 1/01/1993	1/01/1993 3616m	Not present
<i>Persoonia hirsuta</i>	Hairy Geebung	E	E	0	N/A	N/A	Not present
<i>Hibbertia</i> sp. Bankstown	Hibbertia sp. Bankstown	CE	CE	0	N/A	N/A	Not present
<i>Hypsela sessiliflora</i>	Hypsela sessiliflora	E	Ex	0	N/A	N/A	Not present
<i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i>	Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	E2		10	500m 2/11/2007	27/06/2012 1845m	Low
<i>Pimelea spicata</i>	Spiked Rice-flower	E1	E	79	1238m 21/08/2009	20/05/2013 4005m	Moderate
Gastropoda							
<i>Meridolum corneovirens</i>	Cumberland Plain Land Snail	E1		112	770m 20/08/2009	8/02/2016 4653m	Low
Mammalia							
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V		0	N/A	N/A	Not present

Scientific Name	Common Name	TSC Act	EPBC Act	Number of records	Closest proximity and date	Most recent and proximity	Likelihood of occurrence
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V		7	757m 11/01/2005	31/03/2011 3885m	Low
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V		25	1899m 23/04/2009	17/01/2013 3787m	Low
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	V		11	1899m 23/04/2009	31/03/2011 3885m	Low
<i>Myotis macropus</i>	Southern Myotis	V		6	3332m 17/03/2011	10/12/2013 4421m	Low
<i>Petaurus norfolcensis</i>	Squirrel Glider	V		0	N/A	N/A	Not present
<i>Phascolarctos cinereus</i>	Koala	V	V	0	N/A	N/A	Not present
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	40	757m 11/01/2005	30/09/2015 2821m	Low
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V		6	2646m 6/01/2003	10/12/2013 4421m	Low

Appendix C: Biodiversity Credit Report

Biodiversity credit report



This report identifies the number and type of biodiversity credits required for a major project.

Date of report: 17/11/2016

Time: 8:24:05PM

Calculator version: v4.0

Major Project details

Proposal ID:	0076/2016/3952MP
Proposal name:	Western Sydney Parklands Horsely Business Park Stage 2
Proposal address:	Trivet Street and Cowpasture Road Wetherill Park NSW 2164
Proponent name:	Western Sydney Parklands Trust
Proponent address:	PO Box 3064 PARRAMATTA NSW 2124
Proponent phone:	0403 234 066
Assessor name:	Lucas McKinnon
Assessor address:	29 Munni Street Newtown NSW 2042
Assessor phone:	0421 603 549
Assessor accreditation:	0076

Summary of ecosystem credits required

Plant Community type	Area (ha)	Credits created
Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	0.33	9.24
Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	0.76	29.58
Total	1.09	39

Credit profiles

1. Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion, (ME019)

Number of ecosystem credits created	30
IBRA sub-region	Cumberland - Sydney Metro

Offset options - Plant Community types	Offset options - IBRA sub-regions
Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion, (ME019)	Cumberland - Sydney Metro and any IBRA subregion that adjoins the IBRA subregion in which the development occurs
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion, (ME020)	

2. Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion, (ME018)

Number of ecosystem credits created	9
IBRA sub-region	Cumberland - Sydney Metro

Offset options - Plant Community types	Offset options - IBRA sub-regions
Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion, (ME018)	Cumberland - Sydney Metro and any IBRA subregion that adjoins the IBRA subregion in which the development occurs