327 – 335 Burley Road, Horsley Park
Biodiversity Stewardship Site Assessment Report

CSR Bricks Pty Ltd c/o Calibre Group

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Template 2.8.1

Executive Summary

Eco Logical Australia Pty Ltd (ELA) was commissioned by CSR Bricks Pty Ltd to prepare a Biodiversity Stewardship Site Assessment Report and Management Plan for the establishment of a Biodiversity Stewardship Agreement. The Stewardship Agreement site encompasses part of the land at 327 – 335 Burley Road, Horsley Park in the Fairfield City Council Local Government Area. The proposed Agreement site comprises part lot 103 DP 1214912.

This document is the Biodiversity Stewardship Site Assessment Report (BSSAR) for the Horsley Park Stewardship Site. It contains a detailed description of the Biodiversity Assessment, including the landscape features, and justification of the mapping of plant community types, vegetation zones and management zones. The credits generated and the credit profiles, are also outlined.

This report has been prepared to meet the requirements of the Biodiversity Assessment Method (BAM) (NSW Office of Environment and Heritage [OEH] 2017) stating that a BSSAR must be prepared, with the assessment made by an accredited BAM assessor. The accredited BAM assessor who prepared the assessment is Nicole McVicar (BAAS18077). The online BAM Calculator (BAMC) was used in the assessment.

The total area of the Horsley park Biodiversity Stewardship Site is 10.25 ha, which will generate 42 ecosystem credits with an average yield of 4 credits per hectare. No species credits will be generated as part of this Agreement.

Two plant community types (PCTs) occur on the Stewardship site which are sub-divided into three condition classes (vegetation zones).

One Threatened Ecological Community (TEC) is present in the Stewardship site. *Cumberland Plain Woodland in the Sydney Basin Bioregion*, listed as a critically endangered ecological community (EEC) under the NSW *Biodiversity Conservation Act 2016* (BC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (listed as Cumberland Plain Shale Woodlands and Shale Gravel Transition Forest).

Management of the Horsley Park Biodiversity Stewardship Site will involve the implementation of 'required' and 'active' restoration management actions and will include:

- the active management and reduction of high threat and other weeds
- the maintenance of 2602.95 m of existing boundary fence
- the application of fire, where appropriate, within two identified burn units
- targeted supplementary planting of native overstorey, midstorey and groundcover species in Vegetation Management Zone 2
- feral animal management
- the retention of regrowth/native vegetation, dead timber, and rocks.

Further details on the required and active restoration management actions are provided in the Management Action Plan (MAP) that accompanies this BSSAR.

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Abbreviations

Abbreviation	Description
BAM	Biodiversity Assessment Method
BAMC	Biodiversity Assessment Method Credit Calculator
BC Act	NSW *Biodiversity Conservation Act 2016*
BDAR	Biodiversity Development Assessment Report
BSSAR	Biodiversity Stewardship Site Assessment Report
CEEC	Critically Endangered Ecological Community
DNG	Derived Native Grassland
DoEE	Commonwealth Department of Environment and Energy
DPE	NSW Department of Planning and Environment
EEC	Endangered Ecological Community
ELA	Eco Logical Australia Pty Ltd
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
FM Act	NSW *Fisheries Management Act 1994*
GIS	Geographic Information System
GPS	Global Positioning System
IBRA	Interim Biogeographic Regionalisation for Australia
LGA	Local Government Area
LLS	Local Land Service
NSW	New South Wales
NOW	NSW Office of Water
OEH	NSW Office of Environment and Heritage
PCT	Plant Community Type
SEPP	State Environmental Planning Policy
SSD	State Significant Development
SSI	State Significant Infrastructure
TEC	Threatened Ecological Community
VIS	Vegetation Information System
WM Act	NSW *Water Management Act 2000*

1. Introduction

This Biodiversity Stewardship Site Assessment Report (BSSAR) has been prepared by Alex Gorey and Nicole McVicar, who is an Accredited Person under the NSW *Biodiversity Conservation Act 2016* (BC Act). This BSSAR has been prepared for CSR Bricks Pty Ltd for submission with a Biodiversity Stewardship Agreement (BSA) application. Definitions of the terms used in this BSSAR are provided in **Appendix A1**.

1.1 Location

The Stewardship site is located at 327 – 335 Burley Road, Horsley Park, in the Fairfield Local Government Area (LGA), approximately 58 km from the Sydney CBD and 20 km from Parramatta. The Stewardship site is bordered by industrial subdivision to the west and north and a power easement immediately to the east. Rural land and low density residential development border the site to the east (beyond the easement) and south.

The Stewardship site is located on the eastern boundary of the industrial subdivision and forms part lot 2 DP 1228114 and is 10.25 ha in size. It is located within the Sydney Basin Interim Biogeographic Regionalisation for Australia (IBRA) region and the Cumberland IBRA sub-region. The site is entirely within the Mitchell Landscape of the Cumberland Plain.

1.2 General description of the Stewardship site

The Stewardship site covers gently undulating to flat terrain and is one large patch of remnant *Cumberland Plain Woodland in the Sydney Basin Bioregion*, a critically endangered ecological community under the BC Act and EPBC Act. The site does not contain any riparian corridors mapped on the 1:25,000 topographical map. There is one artificial dam in the site. This is displayed on the Site Map (Figure 1)

and the Location Map (

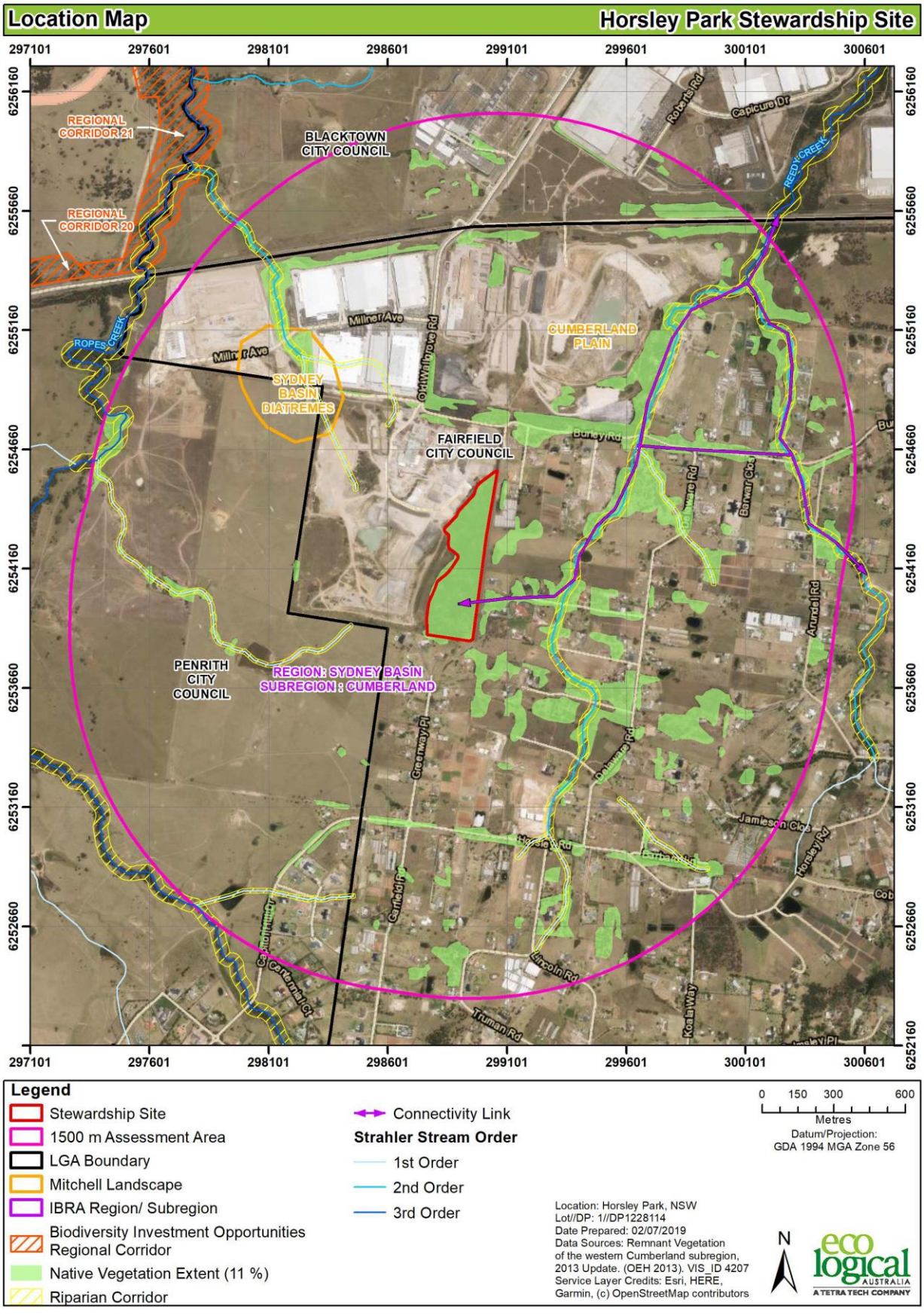

Figure 2: Location map

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1.3 Land Use Zoning and history

The Stewardship site is zoned E2 – Environmental Conservation under the *State Environmental Planning Policy (Western Sydney Employment Area) Amendment (Industrial Area) 2016*. The neighbouring industrial subdivision to the west is zoned as IN1 – General Industrial and the land to the east is zoned RU4 – Primary Production Small Lots. The *Cumberland Plain Woodland in the Sydney Basin Bioregion* in the site is in good condition, however it is likely this land has been subject to clearing and disturbance in the past. The south-east corner of the site shows a history of clearing most likely associated with the establishment of the power easement.

1.4 Sources of information used

The following data sources were reviewed as part of this report:

- BioNet Vegetation Classification (OEH 2019a)
- BioNet Atlas of NSW Wildlife (OEH 2019b)
- Threatened Biodiversity Data Collection (OEH 2019c)
- Vegetation Management Plan 327 – 335 Burley Road, Horsley Park (Travers Bushfire and Ecology 2017a)
- Flora and Fauna Assessment, CSR Brick Plant Lot 1 DP106143, 327 – 335 Burley Road Horsley Park (Travers Bushfire and Ecology 2017b)
- State Environmental Planning Policy (Western Sydney Employment Area) Amendment (Industrial Area) 2016.

Figure 1: Site Map

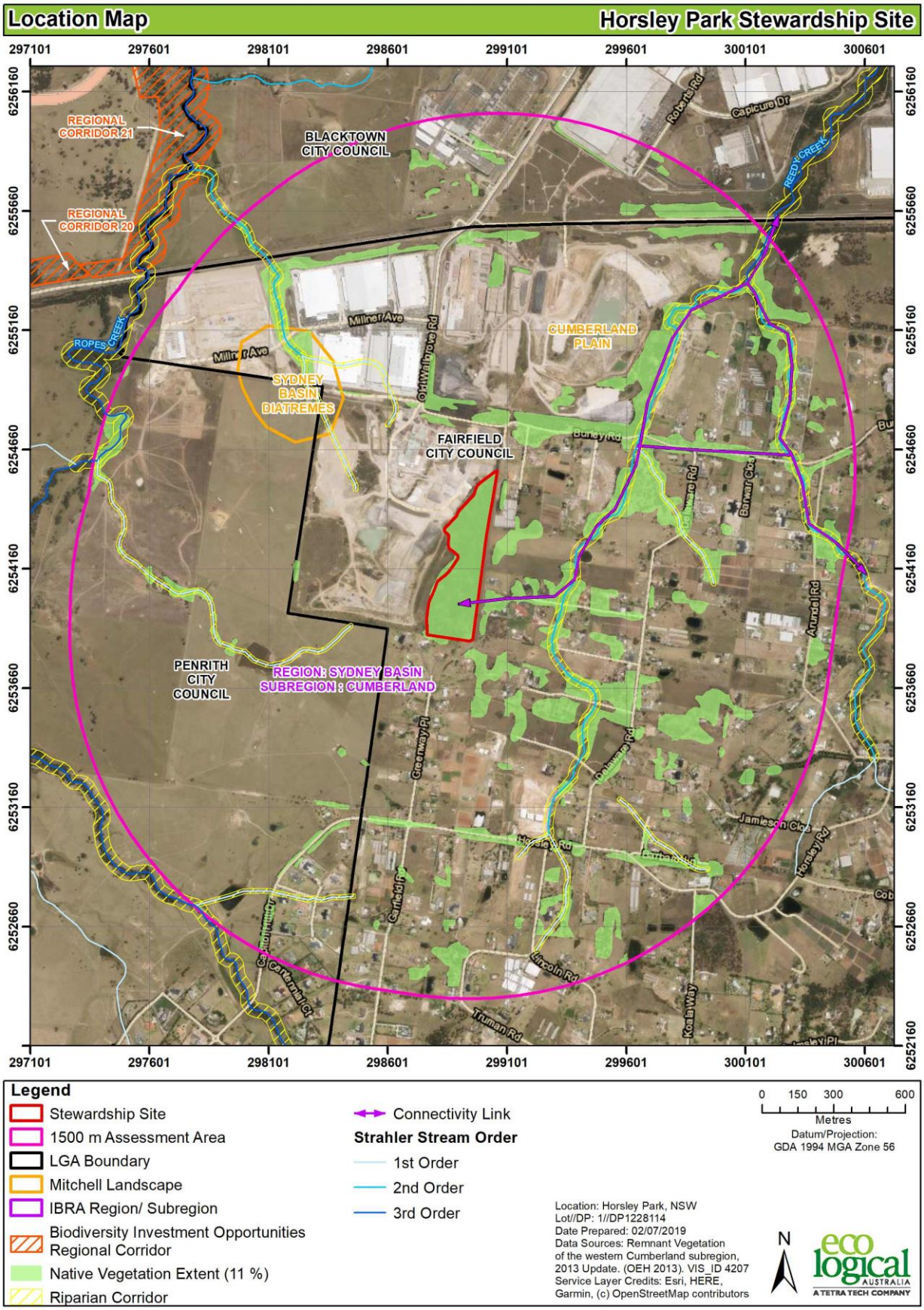

Figure 2: Location map

2. Stage 1: Biodiversity Assessment

2.1 Landscape features

The landscape features within the Stewardship site and within a 1,500 m buffer surrounding the Stewardship site (the Assessment Area) were identified and are detailed in Table 1 and shown on Figure 1.

Table 1. Landscape features of the Stewardship site

Landscape feature	Stewardship Site	Assessment Area
IBRA Region	Sydney Basin	Sydney Basin
IBRA Sub-region	Cumberland	Cumberland
LGA	Fairfield City Council	Fairfield City Council, Blacktown City Council, Penrith City Council
BioNet (Mitchell) Landscape (noting % cleared)	Cumberland Plain	Cumberland Plain, Sydney Basin Diatremes
Rivers and streams	None	None
10 m riparian buffer	None	First order - 10 m Second order - 20 m Third order - 30 m
Wetlands	None	None
Areas of geological significance	None	None

2.2 Native Vegetation

2.2.1 Native vegetation extent

Existing vegetation mapping of the site (OEH 2016) and previous vegetation mapping for the site (Travers Bushfire and Ecology Mapping 2017b) was reviewed to identify the extent of native vegetation mapping within the Stewardship site and assessment area prior to the field assessment. The previous mapping was then field validated to plant community types (PCTs) by two ELA ecologists, Nicole McVicar and Alex Gorey during the field survey on 15 and 16 April 2019.

There were small differences between the previously mapped vegetation (Travers Bushfire and Ecology 2017b) and the results of the field survey (ELA 2019). These differences were an increase in native species and condition in some areas mapped as poor, which is likely a result of the implementation of the Vegetation Management Plan since 2017. The extent of native vegetation within the Stewardship site and assessment area is outlined in Table 2.

Table 2: Native vegetation extent

Location	Area (ha)	Extent of Native Vegetation (ha)
Stewardship Site	10.25	10.25
Assessment Area	971.79	109.80

2.2.2 Percent native vegetation cover in the landscape

The current percent native vegetation cover in the landscape was assessed in a Geographic Information System (GIS) using aerial imagery sourced from NearMap. The percent native vegetation cover was assigned to one of four classes (1-10%, >10-30%, >30-70% and >70%). The assessment of the percent native vegetation cover in the assessment area has determined a percentage cover of 11.3%. This falls into the native vegetation cover class > 10% - 30%, consistent with Section 4.3.2.4 of the BAM. The results of this analysis are shown in Table 3.

Table 3: Percent native vegetation cover in the landscape

Native cover within the 1,500 m buffer zone (ha)	area within the 1,500 m buffer area (ha)	Cover in Stewardship site as % of buffer area
109.80	971.79	11.30

2.3 Plant Community Types

2.3.1 Survey effort

Vegetation survey was undertaken within the Stewardship site by Nicole McVicar and Alex Gorey on 15 and 16 April 2019 (Figure 5).

A total of five full-floristic vegetation plots were surveyed, consistent with BAM, to identify PCTs and TECs on the Stewardship site (Table 4). Plots were undertaken in conjunction with the vegetation integrity survey plots that were collected to stratify PCTs into vegetation zones.

All field data collected at full-floristic and vegetation integrity plots is included in **Appendix A2**.

Table 4: Full-floristic PCT identification plots

PCT ID	PCT Name	Number of plots
849	Grey-box Forest Red Gum grassy woodland on flats of the Cumberland Plain Sydney Basin Bioregion	4
1071	*Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	1

2.3.2 Plant Community Types present

Analysis of plot data collected during field survey was undertaken using the BioNet Vegetation Classification database (OEH 2017) to determine the best fit PCTs for the vegetation within the Stewardship site. The best fit PCTs were determined based on the species composition of the communities as well as the distribution and substrate upon which the community occurs. The best fit PCT are shown in Table 4 and Figure 3.

Two PCTs were identified on the Stewardship site and these shown in Table 5. Of these, PCT 849 *Grey-box Forest Red Gum grassy woodland on flats of the Cumberland Plain Sydney Basin Bioregion* is part of a threatened ecological community listed under the BC and EPBC Act as *Cumberland Plain Woodland in the Sydney Basin Bioregion* and *Cumberland Plain Shale Woodlands and Shale Gravel Transition Forest* respectively. Justification for the selection of PCTs occurring on the Stewardship site is based on a quantitative analysis of full-floristic plot data and is provided in in the sections below.

Table 5: Plant Community Types

PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Area	Percentage cleared	BC Act	EPBC Act
849	Grey-box Forest Red Gum grassy woodland on flats of the Cumberland Plain Sydney Basin Bioregion	Coastal Valley Grassy Woodland	Grassy Woodland	10.17	93%	CEEC	CEEC
1071	*Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	Coastal Freshwater Lagoons	Freshwater Wetlands	0.08	75%	-	-
			Total	**10.25**			

2.3.2.1 PCT 849 Grey-box Forest Red Gum grassy woodland on flats of the Cumberland Plain Sydney Basin Bioregion

Based on the landscape position, community structure and species composition, it was determined that PCT 849 - *Grey-box Forest Red Gum grassy woodland on flats of the Cumberland Plain Sydney Basin Bioregion* was present in the Stewardship site. This PCT forms part of the Coastal Valley Grassy Woodlands Keith Vegetation Classification and generally forms an open grassy woodland, with a canopy dominated by *Eucalyptus moluccana* (Grey Box), *Eucalyptus tereticornis* (Forest Red Gum) and *Eucalyptus crebra* (Narrow-leaved Ironbark) / *Eucalyptus fibrosa* (Red Ironbark). Localised patches of *Corymbia maculata* (Spotted Gum) may occur in the Fairfield LGA. The community is typified by a sparse to moderate cover of shrubs and a high cover of grasses and forbs.

The primary habitat for the community is elevations less than 150 m above sea level with some sites occurring at higher elevations where the landscape remains gently inclined. Rainfall is restricted to a narrow band between 750 and 950 mm per year (Tozer et al. 2010).

PCT 849 occurs across most of the Stewardship site with canopy heights ranging from 12 m to 35 m. The shrub layer varied in density from sparse and open to dense thickets of *Bursaria spinosa* (Native Blackthorn) while the groundcover was dominated by native grasses and forbs. Two condition states of this community were identified in the site:

- Grey-box Forest Red Gum Grassy Woodland – good condition
- Grey-box Forest Red Gum Grassy Woodland – poor condition.

Grey-box Forest Red Gum Grassy Woodland – good condition

This PCT in good condition was the dominant vegetation zone in the Stewardship site. The canopy was dominated by *Eucalyptus moluccana* (Grey Box), *Eucalyptus tereticornis* (Forest Red Gum) and *Eucalyptus crebra* (Narrow-leaved Ironbark). The midstorey was dominated by *Bursaria spinosa* (Native Blackthorn), *Daviesia ulicifolia* subsp. *ulicifolia* (Gorse Bitter Pea) and *Dillwynia sieberi*. Exotic midstorey

species were scattered and in low densities throughout this zone, and included *Lantana camara* (Lantana) and *Olea europaea* subsp. *cuspidata* (African Olive).

The groundcover contained a high diversity of native grasses and herbs including *Microlaena stipoides* var. *stipoides* (Weeping Grass), *Eragrostis brownii* (Brown's Lovegrass), *Fimbristylis dichotoma* (Common Fringe Sedge), *Glycine microphylla, Lomandra multiflora* subsp. *multiflora* (Many-flowered Mat-rush), *Plantago gaudichaudii* (Narrow Plantain), *Tricoryne elatior* (Yellow Autumn-lily), *Viola hederacea* (Ivy-leaved Violet), *Brunoniella australis* (Blue Trumpet), *Desmodium varians* (Slender Tick-trefoil) and *Dichondra repens* (Kidney Weed). Exotic groundcover species were sparse and included *Cirsium vulgare* (Spear Thistle), *Bidens subalternans* (Greater Beggar's Ticks), *Ehrharta erecta* (Panic Veldt Grass), *Eragrostis curvula* (African Lovegrass) and *Hypochaeris radicata* (Catsear) (Plate 1).

Grey-box Forest Red Gum Grassy Woodland – poor condition

This PCT in poor condition was present in three patches throughout the Stewardship site. These patches contained a high proportion of exotic species in the groundcover layer, and in some areas contained limited native canopy and midstorey species. The canopy contained scattered occurrences of *Eucalyptus tereticornis* and *Eucalyptus moluccana*. The midstorey was largely absent, with some regrowth *Bursaria spinosa* present. The groundcover was dominated by exotic species including *Paspalum dilatatum* (Paspalum), *Cenchrus clandestinus* (Kikuyu), *Setaria parviflora*, (Pigeon Grass) *Ehrharta erecta* (Panic Veldt Grass)and *Plantago lanceolata* (Plantain).

Plate 1: PCT 849 in good condition (vegetation zone 1) in the Stewardship Site

Plate 2: PCT 849 in poor condition (vegetation zone 2) in the Stewardship Site

2.3.2.2 PCT 1071 Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion

This PCT occurred in one small patch in the south-east corner of the Stewardship site as part of an artificial dam. This community was in moderate to good condition and was comprised primarily of *Typha orientalis* (Cumbungi), *Persicaria decipiens* (Slender Knotweed), *Juncus usitatus*, *Alternanthera denticulata* (Lesser Joyweed) and *Cyperus polystachyos*. Other species that occurred include *Alisma Plantago-aquatica* (Water Plantain), *Eleocharis gracilis, Paspalum distichum* (Water Couch) and *Ludwigia peploides* subsp. *montevidensis* (Water Primrose). Exotic species present included *Cyperus congestus, Cyperus brevifolius* and *Echinochloa crus-galli* (Barnyard Grass).

Plate 3: PCT 1071 (vegetation zone 3) in the Stewardship Site

Table 6: PCT selection justification

PCT ID	PCT Name	Selection criteria	Species relied upon for identification of vegetation type and relative abundance
849	Grey-box Forest Red Gum Grassy Woodland	Occurs in correct IBRA region (Sydney Basin) and IBRA sub region (Cumberland). Located on Wianamatta shale and on flats / gently undulating slopes. Contains species in each stratum in high abundance typical to the community. Quantitative evidence collected through plots determined the vegetation community to be consistent PCT 849.	*Eucalyptus tereticornis* *Eucalyptus moluccana* *Eucalyptus fibrosa* *Bursaria spinosa* *Microlaena stipoides* *Aristida ramosa* *Bothriochloa macra* *Cymbopogon refractus* *Hypoxis hygrometrica* var. *hygrometrica*
1071	Phragmites australis and Typha orientalis coastal freshwater wetlands	Occurs in correct IBRA region (Sydney Basin) and IBRA sub region (Cumberland). Occurs in the Stewardship site as a derived community as a man-made water body/depression on a modified drainage line and does not occur along a previously mapped stream or waterway. Contains species in each stratum in relatively high abundance typical to the community. Quantitative evidence collected through plots determined the vegetation community to be consistent PCT 1071.	*Alisma Plantago-aquatica* *Alternanthera denticulata* *Cyperus brevifolius* *Cyperus congestus* *Cyperus gracilis* *Eleocharis gracilis* *Ludwigia peploides* subsp. *montevidensis* *Typha orientalis*

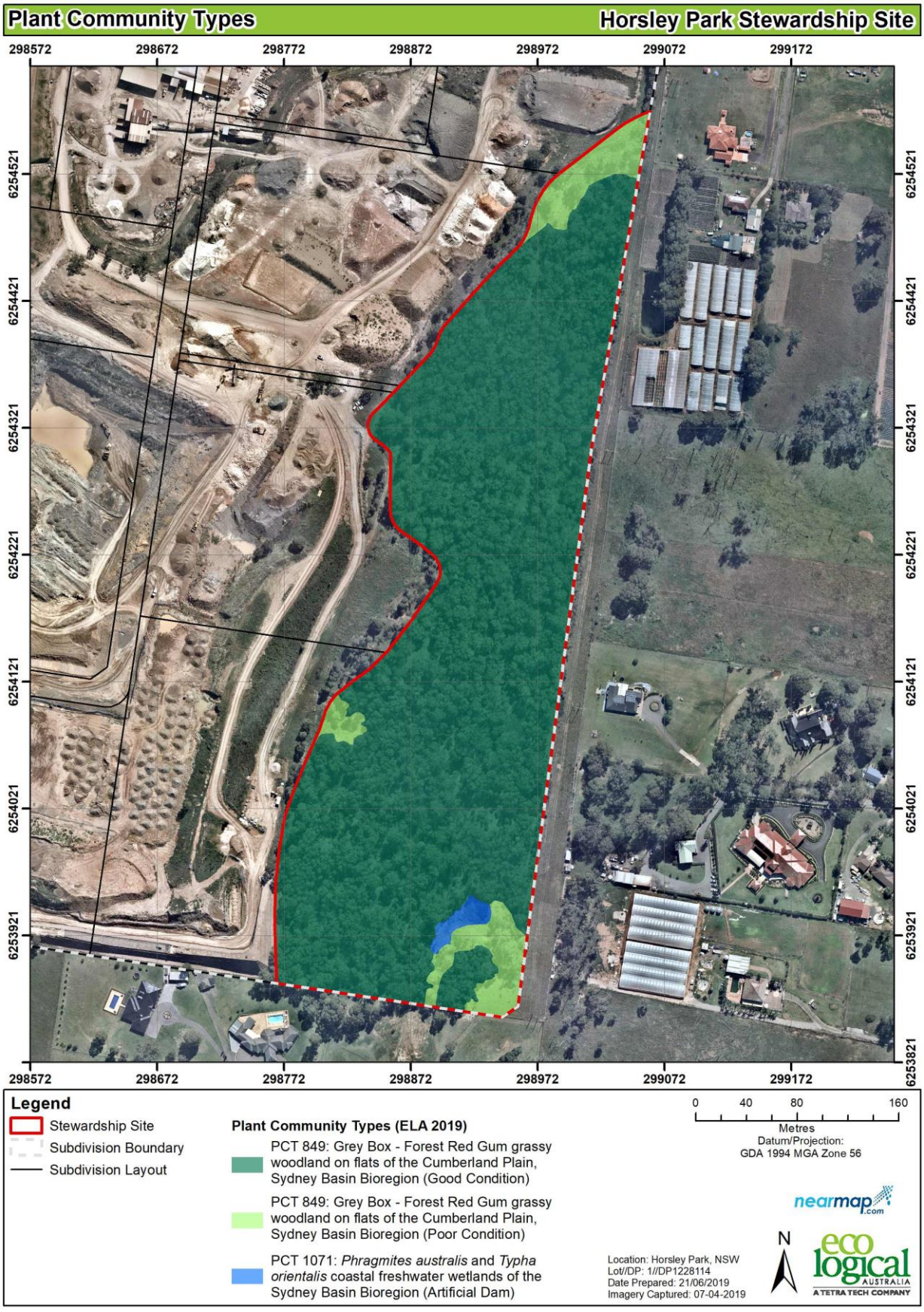

Figure 3: Plant Community Types and native vegetation extent

2.3.3 Threatened Ecological Communities

One threatened ecological community was identified on the Stewardship site. PCT 849 corresponds with the threatened ecological community *Cumberland Plain Woodland in the Sydney Basin Bioregion* which is listed as a critically endangered ecological community under the BC Act and listed as Cumberland Plain Shale Woodlands and Shale Gravel Transition Forest under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

PCT 849 in the Stewardship site was mapped as part of the threatened ecological community because of its geographic location, soil profile and flora species within the community. These factors were compared to the NSW Final Determination and the EPBC Act Conservation Advice and were found to be consistent with both descriptions of the community.

- PCT 1071 can form part of *Sydney Freshwater Wetlands in the Sydney Basin Bioregion* which is listed as endangered under the BC Act. PCT1071 does not meet the definition of a threatened ecological community for the following reasons: The occurrence of the PCT as a threatened ecological community is limited to freshwater swamps in swales and depressions on sand dunes and low nutrient sandplain sites in coastal areas
- The community only occurs on the Warriewood and Tuggerah Soil landscapes
- It is an artificial water body
- there are no drainage lines currently connected or previously connected to PCT 1071.

The patch of PCT 1071 in the Stewardship site does not occur on the correct soil landscape or geographical region, thus it does not form part of the threatened ecological community.

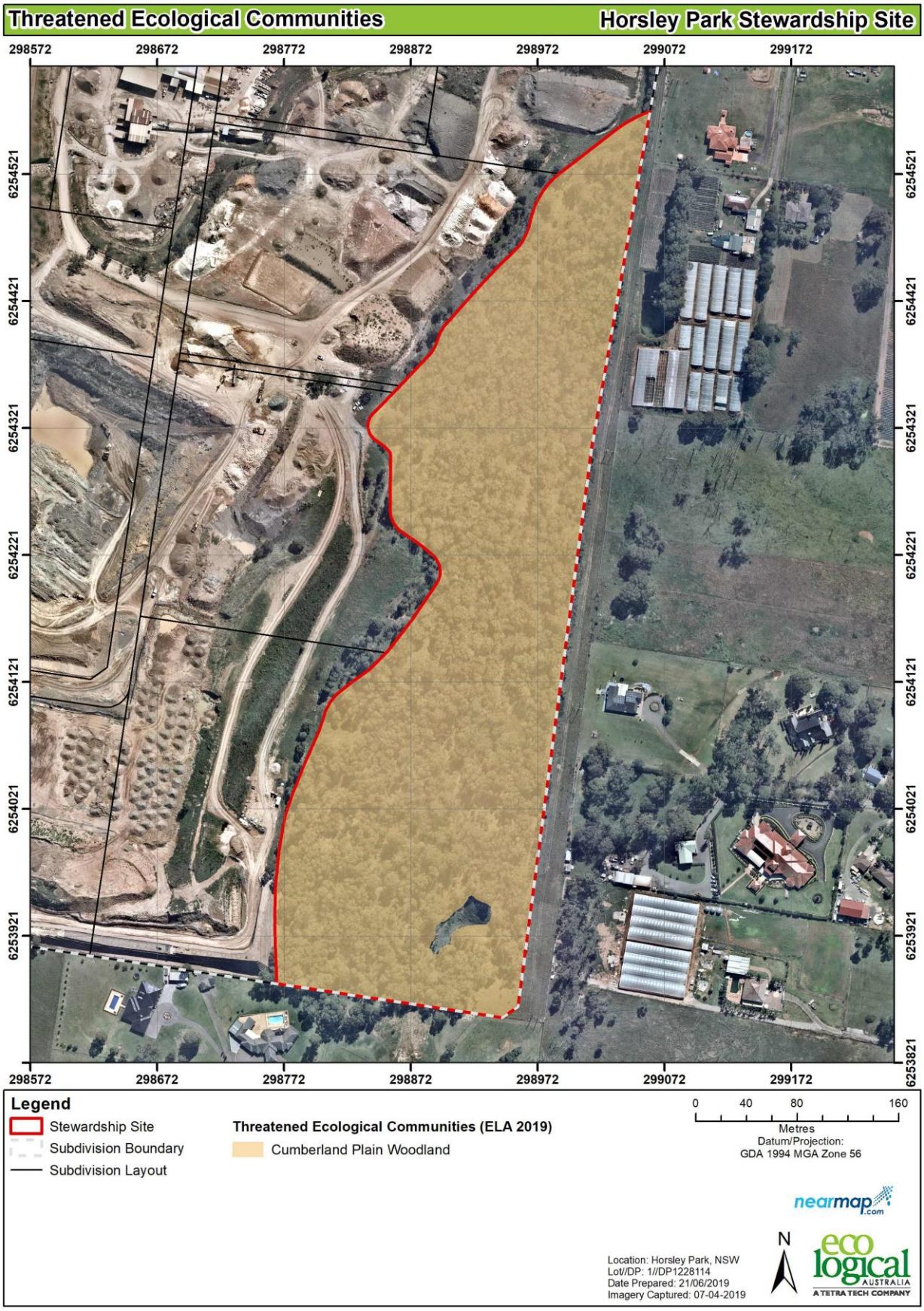

Figure 4: Threatened Ecological Communities

2.3.4 Vegetation integrity assessment

2.3.4.1 Vegetation zones

A total of three vegetation zones were identified on the site based on the broad condition state of the PCTs (Figure 3 and Figure 5). A total of five vegetation integrity survey plots were collected on the Stewardship site, consistent with BAM (Table 7 and Figure 5). A vegetation integrity assessment using the Credit Calculator (BAMC) was undertaken and the results are outlined in Table 8.

2.3.4.2 Patch size

Patch size was calculated using available vegetation mapping for all patches of intact native vegetation on and adjoining the Stewardship site (Figure 2**)**. Patch size was assigned to one of four classes (<5 ha, 5-24 ha, 25-100 ha or ≥100 ha). A patch size > 100 ha was determined for all vegetation zones in the Stewardship site.

Note: Patch size is calculated for each patch of vegetation that occurs on or adjoins the Stewardship site where there is a gap (<100 m woody, <30m non-woody) and the vegetation is intact.

2.3.4.3 Vegetation integrity survey plots

The BAM requires that vegetation integrity survey plots are collected to sample vegetation zones. The number of plots required, and number of plots collected for each vegetation zone is outlined in Table 7. The plots established, and information collected in the plots were consistent with BAM.

All plots within PCT 849 were permanently marked with two star-pickets to allow for the monitoring of vegetation condition in the future. A star-picket was placed at the beginning and end of the 50 m mid-line of each plot. The locations of star-pickets were recorded using handheld GPS units with coordinates in GDA94 datum. Two photographs were taken along each transect: one at the beginning of the transect and in the direction of the end of the transect, and one at the end of the transect in the direction of the start of the transect.

The plot conducted in PCT 1071 did not follow the typical plot format. Given the nature of the PCT, the entire boundary of the PCT was walked, with all flora species either within the water body or immediately adjacent counted as forming part of the PCT. The start point was marked spatially using a handheld GPS unit. This point was also marked as the end point. The location of vegetation integrity survey plots is shown on **Figure 5**. All field data collected in full-floristic and vegetation integrity survey plots is included in **Appendix A2** and **Appendix A3**.

Table 7: Vegetation zones and vegetation integrity survey plots collected within the Stewardship site

Vegetation Zone	PCT ID	PCT Name	Condition	Area (ha)	Patch Size (ha)	Plots required	Plots surveyed
1	849	Grey-box Forest Red Gum Grassy Woodland	Good	9.42	101	3	3
2	849	Grey-box Forest Red Gum Grassy Woodland	Poor	0.75	101	1	1
3	1071	Phragmites australis and Typha orientalis coastal freshwater wetlands	Good_Moderate	0.08	101	1	1

Table 8: Vegetation integrity

Veg Zone	PCT ID	Condition	Area (ha)	Composition Condition Score	Structure Condition Score	Function Condition Score	Current vegetation integrity score
1	849	Good	9.42	78	67.8	67.2	70.8
2	849	Poor	0.75	66.8	38.5	36.2	45.3
3	1071	Moderate	0.08	64.3	45.8	-	54.2

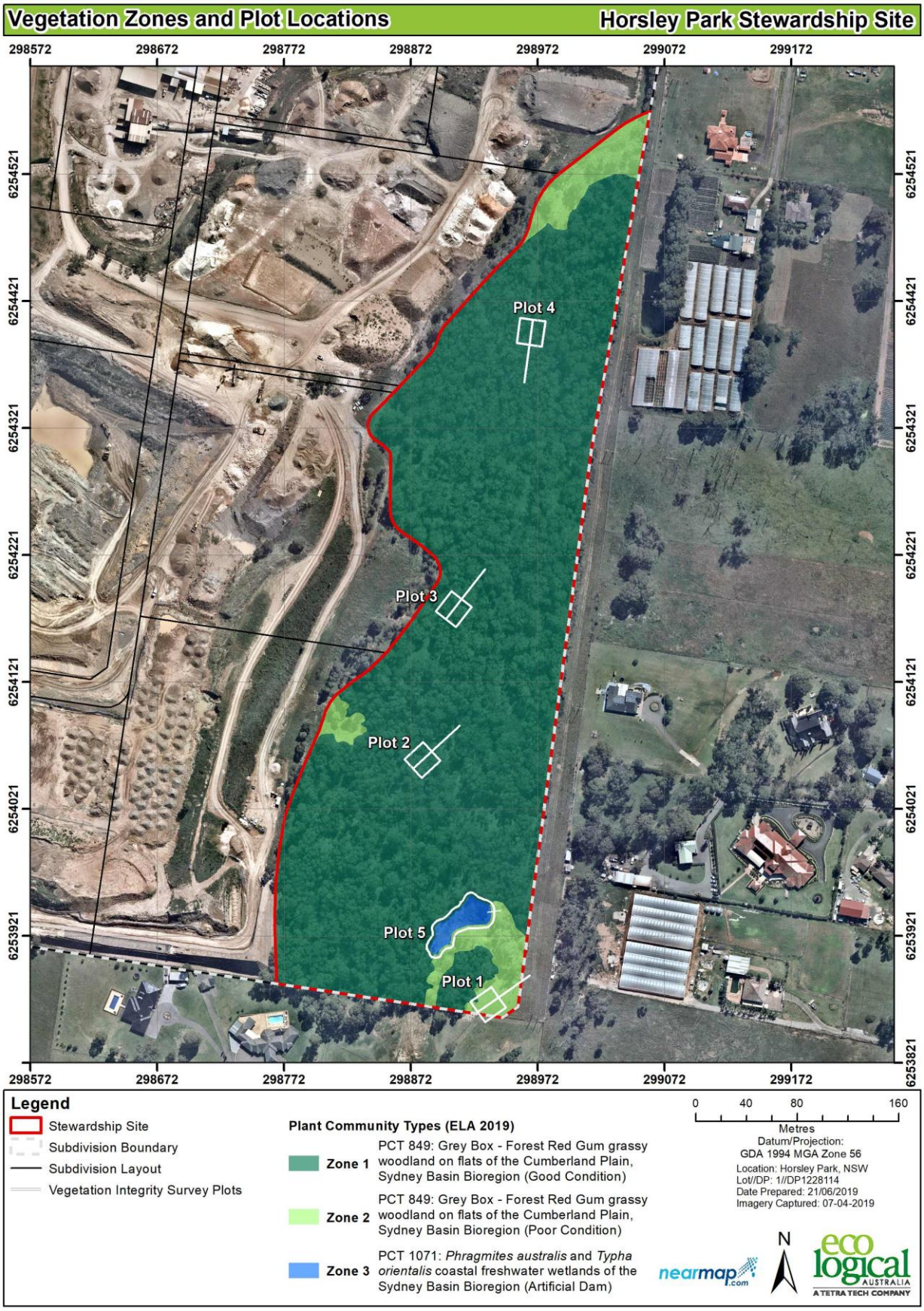

Figure 5: Plot locations

2.4 Threatened species

2.4.1 Ecosystem credit species

The habitat suitability for ecosystem credit species on the site was assessed consistent with Section 6.2 of BAM. Ecosystem credit species predicted to occur, their associated habitat constraints, geographic limitations and sensitivity to gain class is included in Table 9.

Table 9: Predicted ecosystem credit species

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act status	EPBC Act status
Anthochaera phrygia	Regent Honeyeater (Foraging)	-	-	High	CE	CE
Artamus cyanopterus cyanopterus	Dusky Woodswallow	-	-	Moderate	V	-
Callocephalon fimbriatum	Gang-gang Cockatoo (Foraging)	-	-	Moderate	V	-
Chthonicola sagittata	Speckled Warbler	-	-	High	V	-
Circus assimilis	Spotted Harrier	-	-	Moderate	V	-
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	-	-	High	V	-
Daphoenositta chrysoptera	Varied Sittella	-	-	Moderate	V	-
Glossopsitta pusilla	Little Lorikeet	-	-	High	V	-
Grantiella picta	Painted Honeyeater	Mistletoes present at a density of greater than five mistletoes per hectare	-	Moderate	V	V
Haliaeetus leucogaster	White-bellied Sea-Eagle (Foraging)	-	-	High	V	-
Hieraaetus morphnoides	Little Eagle (Foraging)	-	-	Moderate	V	-
Lathamus discolor	Swift Parrot (Foraging)	-	-	Moderate	E	CE
Lophoictinia isura	Square-tailed Kite (Foraging)	-	-	Moderate	V	-

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act status	EPBC Act status
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	-	-	Moderate	V	-
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	-	-	Moderate	V	-
Miniopterus australis	Little Bentwing-bat (Foraging)	-	-	High	V	-
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat (Foraging)	-	-	High	V	-
Mormopterus norfolkensis	Eastern Freetail-bat	-	-	High	V	-
Neophema pulchella	Turquoise Parrot	-	-	High	V	-
Ninox connivens	Barking Owl (Foraging)	-	-	High	V	-
Ninox strenua	Powerful Owl (Foraging)	-	-	High	V	-
Pandion cristatus	Eastern Osprey (Foraging)	-	-	Moderate	V	-
Petroica boodang	Scarlet Robin	-	-	Moderate	V	-
Petroica phoenicea	Flame Robin	-	-	Moderate	V	-
Pteropus poliocephalus	Grey-headed Flying -fox (Foraging)	-	-	Moderate	V	-
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	-	-	High	V	-
Stagonopleura guttata	Diamond Firetail	-	-	Moderate	V	-
Tyto novaehollandiae	Masked Owl (Foraging)	-	-	High	V	-

2.5 Species credit species

No candidate species credit species was identified for further survey on the Stewardship site.

2.5.1 Targeted surveys

Targeted surveys for species credit species were not conducted as part of this assessment.

3. Stage 3: Improving biodiversity values

3.1 Improvement in biodiversity values at the Stewardship Site

3.1.1 Management Plan

A Management Action Plan (MAP) for the Horsley Park Stewardship Site has been prepared consistent with BAM, that describes the locations of the required and active management actions that will be undertaken on the Stewardship site. It also details the timing and duration of these management actions over a 20-year period, as well as the ongoing maintenance beyond this in perpetuity. Performance indicators for each of the required management actions and active restoration management actions have also been included in the MAP.

The MAP is provided as a separate document to this BSSAR as part of the BSA application.

3.1.2 Management actions to improve biodiversity values

3.1.2.1 Required management actions

The required management actions that will be undertaken on the Stewardship site (as per Section 13.3 of the BAM) are detailed in the MAP and summarised in Table 10 below. These actions must be undertaken to create the biodiversity credits (see Section 3.2) on the Stewardship site and are managed in perpetuity.

Table 10. Required management actions at the Horsley Park Stewardship Site

Required management actions	Management activities to be undertaken for the management of ecosystem credits
Preparation of a management plan	Preparation of the MAP for the Horsley Park Stewardship Site.
Fire management	Undertake ecological burning activities.
Grazing management	Fencing to exclude stock.
Native vegetation management	Restore/rehabilitate native vegetation. Retain and manage regrowth.
Threatened species habitat management	Protection of breeding habitat features such as hollow-bearing trees, fallen timber, etc.
Integrated Pest animal control	Undertake feral pest management including control for foxes, cats, rabbits, etc as required.
Integrated weed management and control of high threat weeds	Undertake weed management and activities to control high threat exotic and other exotic vegetation. Fine-scale intensive removal of high-threat exotic and other exotic vegetation.
Management of human disturbance	Exclude development and clearing activities except those listed as permissible in the BSA. Undertake rubbish removal. Implement measures to restrict access to the site where necessary (vehicles, etc).
Monitoring	Assessment of the management plan and activities against the performance measures detailed in the MAP.

Required management actions	Management activities to be undertaken for the management of ecosystem credits
	Establishment of permanent plots to provide a baseline for assessing biodiversity outcomes.
	Establishment of 360° photo monitoring points.
	Periodic review of the management plan and management activities.

3.1.2.2 Active restoration management actions

Active restoration management actions (Section 13.3.3 of the BAM), in addition to the required management actions, can be included to further increase the vegetation integrity scores and the number of credits generated on the Stewardship site. The Stewardship Agreement describes the active restoration management actions that are proposed to be undertaken on the Horsley Park Stewardship Site. **Table 11** provides the active restoration management actions that are proposed to be undertaken on the Stewardship site.

3.1.3 Future vegetation integrity scores

Current vegetation integrity scores were calculated by the BAMC using the vegetation integrity survey plot data, as detailed in Section 2.3.4. Future vegetation integrity scores were calculated for the Stewardship site where required management actions will be carried out under the BSA (Table 10). Additional gain in future vegetation integrity score was also calculated as a result of active restoration management actions proposed for the Horsley Park Stewardship Site and are presented in Table 10.

The composition and structure attributes for groundcover growth form groups were increased to benchmark values with active restoration management actions for Vegetation Zone 2, where benchmark is expected to be reached with targeted supplementary planting of groundcover species. Native shrub and groundcover species of local provenance will be planted, with protection for native shrub species using suitable robust guards and feral herbivore (rabbit) control to ensure the establishment and survival of planted individuals. Further details on the species planted, planting schedule and methods are described further in the MAP.

The remaining growth form groups had attributes for composition and structure increased to between 50-80% of the benchmark value. With the planting of tree and shrub species it is anticipated that additional groundcover species from adjacent areas will subsequently colonise vegetation zones, increasing the species composition and cover. Further details on the management and performance indicators for groundcover species attributes are described in the MAP.

Increases to the function score for Vegetation Zone 2 was applied for the litter cover and stem diversity attributes. Litter cover was increased as a result of the targeted supplementary planting actions proposed to be undertaken. Additional plantings are expected to increase the amount of litter cover with the presence of trees and shrubs that produce leaf and branch/twig litter. No fallen timber is proposed to be brought onto the Stewardship site.

No active restoration management actions are proposed for Vegetation Zones 1 and 3 with the gain calculated for these zones based on the required management actions. Further detailed descriptions of the active management actions proposed to be undertaken on the Stewardship site to achieve the additional gain in vegetation integrity scores are provided in the MAP.

3.1.3.1 Change (gain) in vegetation integrity score

Without the required and active restoration management actions undertaken as part of the BSA, the vegetation integrity of the Stewardship site will decline. The change (gain) in vegetation integrity score is determined from the difference between the vegetation integrity score without management and the vegetation integrity score with management.

The vegetation integrity values for composition, structure and function were predicted to increase by a score of 16.5 for Vegetation Zone 1, 5.5 for Vegetation Zone 2, and 18.37 for Vegetation Zone 3 based on the application of required management actions. The implementation of the active restoration management actions summarised in **Table 11** and detailed in the MAP resulted in a further increase in vegetation integrity values and score for Vegetation Zone 2 with a gain of 6 in the Vegetation Integrity Score. The future vegetation integrity scores calculated in the BAMC without management, with required management and with active management and the change (gain) in vegetation integrity score for each vegetation zone are shown in Table 12.

A security benefit score of 3.2 was applied to Vegetation Zone 1 where the current vegetation integrity score for these zones was ≥60, consistent with Section 13.7 of the BAM.

Table 11. Active restoration management actions to be undertaken on the Horsley Park Stewardship Site

Type of Active Restoration Management Actions	Type of management activities undertaken	Vegetation Zone	Vegetation attributes applicable	Constraint likely to affect reaching restoration target	How constraint addressed in MAP
Native vegetation and habitat management and augmentation	Targeted supplementary planting where natural regeneration is not sufficient to: • increase native plant species richness and cover for tree and shrub growth forms to 30-40% cover typical for PCT 849 • increase native plant species richness and cover to 100% of benchmark values for grass, forb, fern and other growth forms • restore and enhance the condition and species composition of the PCT Improve the habitat suitability for threatened species predicted to occur.	Zone 2	*Composition* Supplementary planting of: • tree species in Zone 2 require planting of three canopy species to reach 75% of benchmark. • shrub species in Zone 2 require planting of 3 shrub species at 0.25 per $1m^2$ to reach 50% of benchmark value • Groundcover is expected to regenerate and increase in species diversity and percent foliage cover with the replanting of trees. Weeding and natural gaps within the groundcover will allow for recruitment, given the relatively intact seed bank and dominance of native species present in the surrounding vegetation zone. • Supplementary planting of groundcover species in Zone 2 require planting of 11 groundcover species at 0.5 per $1m^2$ to reach 10% of benchmark value *Structure* • Trees: expected to reach cover of 30-40% in Zone 2, typical for this PCT with planting of additional species. • Shrubs: expected to reach 50% of benchmark values with planting of additional species in Zone 2. • Ground layer growth forms expected to reach a PFC 100% of benchmark values. *Function* • Litter cover expected to increase to ≥80% of benchmark value with targeted supplementary planting of trees and shrubs and groundcovers in Zone 2. Stem size diversity expected to increase with targeted supplementary planting of trees.	• weed invasion • over-abundant native and/or feral herbivore grazing • weather conditions below optimal for the germination and survival of seeds and saplings • disturbance of planted seedlings by feral animals (i.e. European Reabbit)	• planting at appropriate times to increase survival • continuing weed maintenance to increase success of replanting • control of over-abundant native and/or feral herbivores • appropriate seedling protective measures in place such as installation of tree guards • watering of seeds/saplings to increase survival rate • control of feral animals (and other pests) through opportunistic shooting
Monitoring	Assessment of performance measures of outcomes related to active restoration components such as persistence and abundance of species targeted by supplementary planting or sowing.	All	• Species richness increased per growth form • Percent foliage cover increased for each growth form. • Litter cover increased • Increase in stem size class diversity	• Introduction of weeds by birds and other fauna • inappropriate application of fire management • weather conditions below optimal for the germination and survival of seeds and saplings • grazing by native herbivores • disturbance of planted seedlings by feral rabbits	• as above • periodic review of management plan to modify management actions as needed to reach monitoring outcomes and achieve performance indicators.

Table 12: Future and change (gain) in vegetation integrity scores

Veg Zone	PCT ID	Composition Condition Score			Structure Condition Score			Function Condition Score			Vegetation integrity score				
		Current	Future without management	Future with management	Current	Future without management	Future with management	Current	Future without management	Future with management	Current	Future without management	Future with management	Security Benefit	Gain in VIS
1	849_good	78	77.8	83	67.8	66.2	83	67.2	63.8	80.8	70.8	69	82.3	3.2	16.4
2	849_poor	66.8	66.3	72.4	38.5	37.1	50.3	36.2	36.1	48.6	45.3	44.6	56.1	0	11.5
3	1071_mod to good	64.3	64.3	67.5	45.8	45	77.8	NA	NA	NA	54.2	53.8	72.5	0	18.7

3.2 Credits created

3.2.1 Ecosystem credits

A total of 42 ecosystem credits are created for vegetation zones within the Stewardship Site (Table 13).

Table 13: Ecosystem credits created

Zone	PCT ID	PCT Name	Condition	Area (ha)	Credits created	Credits/ha
1	849	Grey-box Forest Red Gum Grassy Woodland	Good	9.4	39	4.15
2	849	Grey-box Forest Red Gum Grassy Woodland	Poor	0.8	2	2.5
3	1071	Phragmites australis and Typha orientalis coastal freshwater wetlands	Moderate-good	0.1	1	10

3.2.2 Species credits

No species credits have been generated as part of this Stewardship Site Agreement.

3.3 Existing management obligations

The Stewardship Agreement site is currently being managed as part of a Vegetation Management Plan (VMP) (Travers Bushfire and Ecology 2017). The implementation of the VMP commenced in March 2018 and is being implemented by Eco Logical Australia Pty Ltd. The preparation of the VMP was conditioned in the Court Order (CSR Building Products Ltd v Fairfield City Council, file number 10634 of 2014) and its implementation was conditioned through both the Court Order and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Approval (EPBC 2017/7744 - condition 5). Consistent with the conditions of approval, implementation of the VMP will cease once the Stewardship Agreement has been approved and implementation of the management actions commence.

The VMP does not meet the definition of an existing conservation obligation, consistent with Section 13.11 of BAM as it is not restricted under, or form an agreement under the *Crown Lands Act 1989, Crown Land Management Act 2016, National Parks and Wildlife Act 1974, Nature Conservation Trust Act 2001,* conservation agreement / Stewardship Agreement under Part 5 of the BC Act, *Native Vegetation Act 2003* or *Threatened Species Conservation Act 1995*. Therefore, there is no requirement to 'discount' the number of credits generated.

3.4 Incumbencies and easements

ELA has reviewed the titles for all lots considered for the Stewardship site. There are no incumbencies or easements within the Stewardship site. The Stewardship site is adjacent to an Endeavour Energy easement on the eastern boundary and a bushfire Asset Protection Zone on the western boundary.

3.5 Other Rights to land

3.5.1 Mining and resources leases

The Stewardship site is currently under a mining licence (ML 1636) issued to CSR Building Products Pty Ltd for mining of structural clay. The licence covers an area of 62.31 ha which encapsulates and extends

beyond the Stewardship Agreement site (DP&E 2019). The Stewardship Agreement site, although covered under the mining licence, has not been historically mined. A perimeter bund was established to serve as a boundary between the Stewardship Site and the area proposed for excavation. Extra protection was also placed over the site in the form of E2 – Environmental Conservation zoning under the *State Environmental Planning Policy (Western Sydney Employment Area) Amendment (Industrial Area) 2016*.

CSR is currently in the process of removing this licence.

3.5.2 Native title claims and cultural heritage considerations

The proposed Stewardship Site is not crown land and is unlikely to be subject to native title claim. No ground disturbance is proposed for the Stewardship Site. Kelleher Nightingale Consulting Pty Ltd completed an Aboriginal Heritage Due Diligence Assessment and found one Aboriginal archaeological site (PGH3 AHIMS #45-5-3095) artefact scatter) was identified in the BSSAR site. The works required around the registered AHIMS site are passive and include weeding through spraying. Limited to no groundcover disturbance is expected within this area. It is recommended that the AHIMS site be fenced to prevent any access to this area.

3.5.3 Dial before you dig

No ground disturbance (new roads, fire breaks etc) is proposed for the Stewardship Site and as such no other considerations are required.

3.6 Consistency with legislation and policy

3.6.1 State Environmental Planning Policy (Western Sydney Employment Area) Amendment (Industrial Area) 2016

The Stewardship Site is mapped as E2 – Environmental Conservation under the SEPP. The application of a Stewardship Agreement over the site is consistent with the aims of this zoning.

3.6.2 State legislation

A Development Application (DA 893/2013) for the proposed 14 lot industrial subdivision was submitted to Fairfield City Council which became the subject of a court case. CSR Building Products was the applicant and appealed the Conditions of Consent issued by Fairfield City Council on 10 September 2015. The appeal was upheld and the Court Judgement contained the conditions of consent that must be adhered to. The Judgement does not include conditions relating to the implementation of the Stewardship Agreement but does require the implementation of the Vegetation Management Plan (Travers Bushfire and Ecology 2017).

3.6.3 Federal legislation

This Stewardship Agreement has been prepared to satisfy conditions of approval issued by Department of Environment and Energy (DotEE) for the proposed industrial subdivision of 14 lots at 327 – 335 Burley Road, Horsley Park (EPBC 2017/7744). Condition 5 of the conditions of approval state that the conservation area (Stewardship Site) must be legally secured through an offset mechanism for the life of the approval. The offset mechanism chosen was a Section 88B which DotEE agreed to, provided a Biodiversity Stewardship Agreement was established over the site prior to the completion of the 10 year VMP period. It is expected that this Agreement will replace the Section 88B once it has been approved.

4. References

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A1 Definitions

Terminology	Definition
Biodiversity credit report	The report produced by the Credit Calculator that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity Stewardship site.
BioNet Atlas	The BioNet Atlas (formerly known as the NSW Wildlife Atlas) is the OEH database of flora and fauna records. The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails) and some fish
Broad condition state:	Areas of the same PCT that are in relatively homogenous condition. Broad condition is used for stratifying areas of the same PCT into a vegetation zone for the purpose of determining the vegetation integrity score.
Connectivity	The measure of the degree to which an area(s) of native vegetation is linked with other areas of vegetation.
Credit Calculator	The computer program that provides decision support to assessors and proponents by applying the BAM, and which calculates the number and class of biodiversity credits required to offset the impacts of a development or created at a biodiversity Stewardship site.
Development	Has the same meaning as development at section 4 of the EP&A Act, or an activity in Part 5 of the EP&A Act. It also includes development as defined in section 115T of the EP&A Act.
Development footprint	The area of land that is directly impacted on by a proposed development, including access roads, and areas used to store construction materials.
Development site	An area of land that is subject to a proposed development that is under the EP&A Act.
Ecosystem credits	A measurement of the value of EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur with a PCT. Ecosystem credits measure the loss in biodiversity values at a development site and the gain in biodiversity values at a biodiversity Stewardship site.
High threat exotic plant cover	Plant cover composed of vascular plants not native to Australia that if not controlled will invade and outcompete native plant species.
Hollow bearing tree	A living or dead tree that has at least one hollow. A tree is considered to contain a hollow if: (a) the entrance can be seen; (b) the minimum entrance width is at least 5 cm; (c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance); (d) the hollow is at least 1 m above the ground. Trees must be examined from all angles.
Important wetland	A wetland that is listed in the Directory of Important Wetlands of Australia (DIWA) and SEPP 14 Coastal Wetlands
Linear shaped development	Development that is generally narrow in width and extends across the landscape for a distance greater than 3.5 kilometres in length
Local population	The population that occurs in the study area. In cases where multiple populations occur in the study area or a population occupies part of the study area, impacts on each subpopulation must be assessed separately.
Local wetland	Any wetland that is not identified as an important wetland (refer to definition of Important wetland).
Mitchell landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000.
Multiple fragmentation impact development	Developments such as wind farms and coal seam gas extraction that require multiple extraction points (wells) or turbines and a network of associated development including roads, tracks, gathering systems/flow lines, transmission lines

Terminology	Definition
Operational Manual	The Operational Manual published from time to time by OEH, which is a guide to assist assessors when using the BAM
Patch size	An area of intact 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 100 m from the next area of native vegetation (or ≤30 m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the development site or Stewardship site..
Proponent	A person who intends to apply for consent to carry out development or for approval for an activity.
Reference sites	The relatively unmodified sites that are assessed to obtain local benchmark information when benchmarks in the Vegetation Benchmarks Database are too broad or otherwise incorrect for the PCT and/or local situation. Benchmarks can also be obtained from published sources.
Regeneration	The proportion of over-storey species characteristic of the PCT that are naturally regenerating and have a diameter at breast height <5 cm within a vegetation zone.
Remaining impact	An impact on biodiversity values after all reasonable measures have been taken to avoid and minimise the impacts of development. Under the BAM, an offset requirement is calculated for the remaining impacts on biodiversity values.
Retirement of credits	The purchase and retirement of biodiversity credits from an already-established biobank site or a biodiversity Stewardship site secured by a biodiversity Stewardship agreement.
Riparian buffer	Riparian buffers applied to water bodies in accordance with the BAM
Sensitive biodiversity values land map	Development within an area identified on the map requires assessment using the BAM.
Site attributes	The matters assessed to determine vegetation integrity. They include: native plant species richness, native over-storey cover, native mid-storey cover, native ground cover (grasses), native ground cover (shrubs), native ground cover (other), exotic plant cover (as a percentage of total ground and mid-storey cover), number of trees with hollows, proportion of over-storey species occurring as regeneration, and total length of fallen logs.
Site-based development	a development other than a linear shaped development, or a multiple fragmentation impact development
Species credits	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection.
Subject land	Is land to which the BAM is applied in Stage 1 to assess the biodiversity values of the land. It includes land that may be a development site, clearing site, proposed for biodiversity certification or land that is proposed for a biodiversity Stewardship agreement.
Threatened Biodiversity Data Collection	Part of the BioNet database, published by OEH and accessible from the BioNet website.
Threatened species	Critically Endangered, Endangered or Vulnerable threatened species as defined by Schedule 1 of the BC Act, or any additional threatened species listed under Part 13 of the EPBC Act as Critically Endangered, Endangered or Vulnerable.
Vegetation Benchmarks Database	A database of benchmarks for vegetation classes and some PCTs. The Vegetation Benchmarks Database is published by OEH and is part of the BioNet Vegetation Classification.
Vegetation zone	A relatively homogenous area of native vegetation on a development site, land to be biodiversity certified or a biodiversity Stewardship site that is the same PCT and broad condition state.

Terminology	Definition
Wetland	An area of land that is wet by surface water or ground water, or both, for long enough periods that the plants and animals in it are adapted to, and depend on, moist conditions for at least part of their life cycle. Wetlands may exhibit wet and dry phases and may be wet permanently, cyclically or intermittently with fresh, brackish or saline water
Woody native vegetation	Native vegetation that contains an over-storey and/or mid-storey that predominantly consists of trees and/or shrubs

A2 Vegetation plot data

Scientific Name	Common Name		Plot 1		Plot 2		Plot 3		Plot 4		Plot 5	
		Growth form	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance
Alisma plantago-aquatica	Water Plantain	FG									1	100
Alternanthera denticulata	Lesser Joyweed	FG									2	1000
Lysimachia arvensis	Scarlet Pimpernell	-	0.1	5								
Araujia sericifera	Moth Vine	-					0.1	1				
Aristida ramosa	Three-awned Spear Grass	GG	1	50	10	500	1	50	10	1000		
Aristida vagans	Purple Wiregrass	GG	1	50			0.1	10	0.1	50		
Arthropodium milleflorum	Pale Vanilla Lily	FG			0.1	1						
Asparagus asparagoides	Bridal Creeper	-					0.1	5				
Asperula conferta	Common Woodruff	FG	0.1	100	0.1	20	0.1	20				
Axonopus fissifolius	Narrow-leaved Carpet Grass	GG	10	1000								
Bidens pilosa	Beggar's Ticks	-	0.1	2	0.1	20	0.2	50	0.1	50		
Bidens subalternans	Greater Beggar's Ticks	-					0.1	20	0.1	1		
Bossiaea prostrata	-	FG			0.1	10	0.1	1				
Bothriochloa macra	Red Grass	GG			0.1	1						
Briza subaristata	-	-	5	500								
Brunoniella australis	Blue Trumpet	FG	0.1	20	1	500	1	500	3	500		
Bursaria spinosa subsp. *spinosa*	Native Blackthorn	SG	4	8	10	50	30	1000	30	100		
Caesia parviflora var. *parviflora*	Pale Grass Lily	FG					0.1	4	0.1	10		
Carex inversa	-	GG			0.1	1	0.1	4	0.1	50		
Centella asiatica	Pennywort	FG	0.1	20			0.1	50				
Cestrum parqui	Green Cestrum	-					0.1	1				
Cheilanthes sieberi subsp. *sieberi*	Poison Rock Fern	EG			0.2	500			0.1	50		
Chloris ventricosa	Plump Windmill Grass	GG			0.1	20	0.1	1	0.5	50		
Cirsium vulgare	Spear Thistle	-	0.1	1					0.1	1		
Conyza bonariensis	Flax-leaf Fleabane	-	0.1	20								
Cymbopogon refractus	Barbed Wiregrass	GG	0.2	20	0.2	50	0.1	20				
Cynodon dactylon	Couch	GG	2	1000							0.5	100
Cyperus brevifolius	Mullumbimby Couch	GG									0.1	50
Cyperus congestus	-	GG									0.1	10
Cyperus gracilis	Slender Flat-sedge	GG					0.1	1				
Cyperus polystachyos	-	GG									0.1	50
Daviesia ulicifolia subsp. *ulicifolia*	Gorse Bitter Pea	SG	0.1	1								
Desmodium varians	Slender Tick-trefoil	OG	0.1	10	0.1	50	0.1	20	0.1	50		

Scientific Name	Common Name		Plot 1		Plot 2		Plot 3		Plot 4		Plot 5	
Dianella longifolia var. *longifolia*	Blueberry Lily	FG	0.1	1					0.1	50		
Dichelachne micrantha	Shorthair Plumegrass	GG							1	100		
Dichondra repens	Kidney Weed	FG	0.1	20	0.2	500	0.2	1000	0.2	100		
Dillwynia sieberi	-	SG							3	20		
Echinochloa crus-galli	Barnyard Grass	-									0.1	50
Echinopogon caespitosus var. caespitosus	Tufted hedgehog Grass	GG			0.1	1						
Echinopogon ovatus	Forest Hedgehog Grass	GG							1	500		
Ehrharta erecta	Panic Veldt Grass	-					0.1	20				
Eleocharis gracilis	-	GG									0.1	100
Eragrostis brownii	Brown's Lovegrass	GG	0.1	10								
Eragrostis curvula	African Lovegrass	GG	10	1000	0.1	5	0.1	1				
Eragrostis leptostachya	Paddock Lovegrass	GG			2	100	0.1	10				
Eremophila debilis	Winter Apple	SG			0.1	50	0.1	20				
Eucalyptus crebra	Narrow-leaved Ironbark	TG			3	3	25	7				
Eucalyptus moluccana	Grey Box	TG			3	2	2	2	1	1		
Eucalyptus tereticornis	Forest Red Gum	TG	2	4	20	20	7	5	25	20		
Fimbristylis dichotoma	Common Fringe-sedge	-	0.1	20					0.1	50		
Galium gaudichaudii	Rough Bedstraw	FG	0.1	50					0.1	10		
Gamochaeta spp.	-	-	0.1	20								
Glycine microphylla	Small-leaf Glycine	OG	0.1	50	0.2	100	0.1	50	0.1	100		
Glycine tabacina	-	OG	0.2	100	0.3	500	0.3	500	0.1	100		
Goodenia hederacea subsp. *hederacea*	Ivy Goodenia	FG			0.1	50	0.1	100				
Hypericum gramineum	Small St John's Wort	FG					0.1	1				
Hypochaeris glabra	Smooth Catsear	-							0.1	1		
Hypochaeris radicata	Catsear	-	0.1	50								
Hypoxis hygrometrica var. *hygrometrica*	Golden Weather-grass	FG	0.1	4	0.1	20	0.1	1	0.1	100		
Juncus usitatus	-	GG									1	500
Lagenophora stipitata	Blue Bottle-daisy	FG					0.1	2				
Lantana camara	Lantana	-			0.1	1	0.2	5	1	2		
Ligustrum sinense	Small-leaved Privet	-					0.1	1				
Lomandra filiformis subsp. *coriacea*	-	GG	0.1	20	0.1	10	0.1	20	0.1	100		
Lomandra filiformis subsp. *filiformis*	Wattle Mat-rush	GG					0.2	100	0.1	100		
Lomandra longifolia	Spikey-headed Mat-rush	GG					0.1	1				

Scientific Name	Common Name		Plot 1		Plot 2		Plot 3		Plot 4		Plot 5	
Lomandra multiflora subsp. *multiflora*	Many-flowered Mat-rush	GG			0.1	3	0.1	6	0.1	100		
Ludwigia peploides subsp. *montevidensis*	Water Primrose	FG									3	500
Lycium ferocissimum	African Boxthorn	-					0.1	1				
Mentha diemenica	Slender Mint	FG							0.2	500		
Microlaena stipoides var. *stipoides*	Weeping Grass	GG			20	2000	20	1000	15	1000		
Modiola caroliniana	Red-flowered Mallow	-	0.1	1								
Ochna serrulata	Mickey Mouse Plant	-					0.1	5				
Olea europaea subsp. *cuspidata*	African Olive	-					0.1	3	0.1	1		
Opercularia diphylla	-	FG			0.1	50	0.1	50	0.1	10		
Orchidaceae spp.	-	-					0.1	1				
Orchidaceae spp.	-	-							0.1	1		
Oxalis perennans	-	FG			0.1	20	0.1	100	0.1	50		
Oxalis spp.	-	FG	0.1	10								
Panicum simile	Two-coloured Panic	GG			0.1	2						
Parsonsia straminea	Common Silkpod	OG					0.1	1				
Paspalum dilatatum	Paspalum	-	20	2000	0.8	100	0.3	50	2	100		
Paspalum distichum	Water Couch	GG									0.2	100
Persicaria decipiens	Slender Knotweed	FG									0.5	100
Phyllanthus virgatus	-	FG	0.1	20	0.1	5	0.1	1	0.1	50		
Plantago gaudichaudii	Narrow Plantain	FG					0.1	50				
Plantago lanceolata	Plantain	-	0.1	50	0.1	1	0.1	5	0.1	20		
Poa labillardierei var. *labillardierei*	Tussock	GG			0.1	10						
Polygala japonica	Dwarf Milkwort	FG					0.1	1	0.1	10		
Pomax umbellata	-	FG					0.2	500				
Rumex spp.		FG									0.1	1
Scaevola albida var. *albida*	Pale Fan-flower	FG					0.1	20				
Senecio madagascariensis	Fireweed	-	0.2	100	0.1	10	0.1	4	0.1	10		
Senecio diaschides	-	FG			0.1	20						
Setaria parviflora	Pigeon Grass	-	0.1	100	0.1	10	0.2	50	0.5	50		
Sida rhombifolia	Paddy's Lucerne	-	0.1	1	0.1	2			0.1	20		
Solanum prinophyllum	Forest Nightshade	FG					0.1	2				
Solanum spp.	-	FG	0.1	1	0.1	1						
Solenogyne bellioides	-	FG	0.1	4								
Sonchus oleraceus	Common Sowthistle		0.1	1			0.1	2	0.1	1		

Scientific Name	Common Name		Plot 1		Plot 2		Plot 3		Plot 4		Plot 5	
Sporobolus creber	Rats Tail	GG	0.1	1			0.1	1	0.1	10		
Stackhousia viminea	Slender Stackhousia	FG			0.1	5	0.1	2	0.1	10		
Themeda triandra	Kangaroo Grass	GG	35	2000	10	500	1	100	10	1000		
Tricoryne elatior	Yellow Autumn-lily	FG	0.1	2	0.1	1	0.1	2	0.1	100		
Triglochin spp.	-	FG									0.1	100
Typha orientalis	Broadleaf Cumbungi	GG									50	1000
Verbena officinalis	Common Verbena	-	1	100					0.1	1		
Vernonia spp.	-	-			0.1	4						
Viola hederacea	Ivy-leaved Violet	FG	0.1	5								
Wahlenbergia gracilis	Sprawling Bluebell	FG	0.1	5								
Vittadinia cuneata var. *cuneata*	-	FG	0.1	1								
Indigofera spp.	-	SG					0.1	5				

A3 Modifications to Vegetation Integrity Score Attributes

Table 14: VZ1: changes to vegetation integrity score attributes for assessment future composition, structure and function scores

		Tree	Shrub	GG	Forb	Fern	Other
Composition	Benchmark	5	8	12	15	2	5
	Current	2.7	2.3	13.3	15.7	0.7	3.3
	Future (required)	2.7	2.4	13.3	15.7	0.7	3.3
	Future (active)	3	4	12	15	2	5
	Weighted future condition with offset	7.4	5.5	25.5	31.9	2.8	9.9
Structure	Benchmark	52	18	61	10	1	5
	Current	28.7	24.4	34.8	3.3	0.1	0.5
	Future (required)	29.3	24.4	36.2	3.4	0.1	0.5
	Future (active)	40	18	60	10	1	5
	Weighted future condition with offset	28	12.2	36.8	4.5	0.2	1.2
		Large Tree	**Litter**	**Fallen Logs**	**Regen**	**Stem diversity**	
Function	Benchmark	3	35	40	present	4	
	Current	1.3	49.3	13	1	4	
	Future (required)	1.3	49.3	27.8	1	4	
	Future (active)	-	35	40	-	-	
	Weighted future condition with offset	17	15	18.8	15	15	

Table 15: VZ2 changes to vegetation integrity score attributes for assessing the future composition, structure and function scores

		Tree	Shrub	GG	Forb	Fern	Other
Composition	Benchmark	5	8	12	15	2	5
	Current	1	2	9	15	0	3
	Future (required)	1	2	9	15	0	3
	Future (active)	3	4	12	15	2	5
	Weighted future condition with offset	2.7	3.8	24.3	31.9	0.5	9.2
Structure	Benchmark	52	18	61	10	1	5
	Current	2	4.1	39.6	1.5	0	3
	Future (required)	2.1	4.1	39.7	1.5	0	3
	Future (active)	40	10	60	10	1	5
	Weighted future condition with offset	5.6	2.7	37.2	1.9	0.1	2.9

		Tree	Shrub	GG	Forb	Fern	Other
		Large Tree	Litter	Fallen Logs	Regen	Stem diversity	
Function	Benchmark	3	35	40	present	4	
	Current	0	15	5	1	3	
	Future (required)	0	35	20	0	0	
	Future (active)	-	28.9	12.4	-	3.3	
	Weighted future condition with offset	0	14.4	4.8	15	14.4	

Table 16: VZ3 changes to vegetation integrity score attributes for assessing future composition, structure and function scores

		Tree	Shrub	GG	Forb	Fern	Other
Composition	Benchmark	1	2	5	4	1	1
	Current	0	0	6	6	0	0
	Future (required)	0	0	6	6	0	0
	Future (active)	0	0	6	6	1	1
	Weighted future condition with offset	0	0	35.7	28.6	1.7	1.6
Structure	Benchmark	0	0	122	2	0	0
	Current	0	0	51.9	6.7	0	0
	Future (required)	0	0	54.5	6.7	0	0
	Future (active)	0	0	122	2	0	0
	Weighted future condition with offset	0	0	76.2	1.6	0	0
		Large Tree	Litter	Fallen Logs	Regen	Stem diversity	
Function	Benchmark	NA	NA	NA	NA	NA	
	Current	NA	NA	NA	NA	NA	
	Future (required)	NA	NA	NA	NA	NA	
	Future (active)	NA	NA	NA	NA	NA	
	Future values	NA	NA	NA	NA	NA	

A4 Biodiversity credit report

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00015525/BAAS18077/19/00015526	327_335 Burley Road Horsley Park Biodiversity Stewardship Site Assessment	12/06/2019
Assessor Name	**Report Created**	**BAM Data version ***
Nicole Helen McVicar	01/07/2019	11
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.	
BAAS18077		
Revision No		
0		

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

Zone	Vegetation zone name	Vegetation integrity loss / gain	Area (ha)	Constant	Ecosystem credits
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion					
1	849_Poor	11.5	0.8	0.25	2
2	849_Good	16.4	9.4	0.25	39

BAM Credit Summary Report

				Subtotal	**41**
Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion					
3	1071_Good	2.8	0.1	0.25	1
				Subtotal	**1**
				Total	**42**

Species credits for threatened species

Vegetation zone name	Habitat condition (HC)	Area (ha) / individual (HL)	Constant	Species credits

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