Parramatta Eels Centre of Excellence and Community Facility, Kellyville

Biodiversity Development Assessment Report

Parramatta National Rugby League Club Pty Ltd

29 July 2022

Final

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Report No. 21246RP1

The preparation of this report has been in accordance with the brief provided by the Client and has relied upon the data and results collected at or under the times and conditions specified in the report. All findings, conclusions or commendations contained within the report are based only on the aforementioned circumstances. The report has been prepared for use by the Client and no responsibility for its use by other parties is accepted by Cumberland Ecology.

Version	Date Issued	Amended by	Details
1	5/04/2022	CEP, KW, MP	Final report
2	29/07/2022	MF, KW	Final report_v2

Approved by:	**Matthew Freeman**
Position:	Senior Project Manager/Ecologist
Signed:	
Date:	29 July, 2022

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Glossary

Term / Abbreviation	Definition
Assessment area	Area of land within a 1500 m buffer around the outer boundary of the subject land
BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method Calculator
BC Act	NSW *Biodiversity Conservation Act 2016*
BC Regulation	NSW *Biodiversity Conservation Regulation 2017*
BDAR	Biodiversity Development Assessment Report
Biosecurity Act	NSW *Biosecurity Act 2015*
BOS	Biodiversity Offset Scheme
C	Celsius
CEEC	Critically Endangered Ecological Community
Council	The Hills Shire Council
DA	Development Application
DAWE	Commonwealth Department of Agriculture, Water and the Environment
DBH	Diameter at Breast Height
DPIE	NSW Department of Planning, Industry and Environment
EES	Environment, Energy and Science Group
EP&A Act	NSW Environmental Planning and Assessment Act 1979
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
GIS	Geographic Information System
ha	Hectares
IBRA	Interim Biogeographic Regionalisation for Australia
LEP	Local Environment Plan
LGA	Local Government Area
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
PCT	Plant Community Type
PJRL	Parramatta Junior Rugby League
PNRL	Parramatta National Rugby League Club Pty Ltd
SAII	Serious and Irreversible Impact
SSD	State Significant Development
Study area	Lot 1 DP167535 and Lot 60 DP10702, also known as 6-8 Memorial Avenue, Kellyville
Subject land	The land proposed as a development site (see **Figure 1**)
TBDC	Threatened Biodiversity Data Collection

Term / Abbreviation	Definition
TEC	Threatened Ecological Community
the 'client'	Parramatta National Rugby League Club Pty Ltd
the 'project'	Proposal to construct the Parramatta Eels Centre of Excellence and Community Facility, Kellyville

1. Introduction

Cumberland Ecology was commissioned by the Parramatta National Rugby League Club Pty Ltd (the 'client'/ PNRL) to prepare a Biodiversity Development Assessment Report (BDAR) for the proposed Parramatta Eels Centre of Excellence and Community Facility, Kellyville (the 'project'). The project involves the construction of a Centre of Excellence and Community Facilities, including associated carpark, ancillary infrastructure, and landscaping, at Kellyville Park, Kellyville. This BDAR will form part of the documentation to support a State Significant Development (SSD) application for Development Consent under Part 4 of the New South Wales (NSW) *Environmental Planning and Assessment Act 1979* (EP&A Act).

1.1. Requirement for BDAR

The project is classified as a Stage Significant Development under Section 4.36 of the EP&A Act, as the capital investment value of the project exceeds $30 million and involves the development of a 'recreation facility (major)' under Schedule 1, Clause 13 of the *State Environmental Planning Policy (State and Regional Development) 2011*.

Section 7.9 of the NSW *Biodiversity Conservation Act 2016* (BC Act) requires all SSD applications for Development Consent to be accompanied by a BDAR unless both the Planning Agency Head and the Environment Agency Head determine that the proposed development is not likely to have any significant impact on biodiversity values.

Secretary's Environmental Assessment Requirements (SEARs) were issued for the project on 18 August 2021, which specified the requirement for a BDAR. The SEARs stated that the following requirement applied to biodiversity:

"The EIS must assess any biodiversity impacts associated with the proposal in accordance with the Biodiversity Conservation Act 2016 and the Biodiversity Assessment Method 2020, including the preparation of a Biodiversity Development Assessment Report, unless a waiver is granted."

A waiver has not been sought for the project, and therefore this BDAR has been prepared.

Under the BAM, a development can be assessed using the Streamlined Assessment Module - a small area development if it involves impacts to biodiversity below a prescribed area threshold as set out in Table 12 of Appendix C of the BAM. The minimum lot size associated with the project is 0.07 ha (700m^2); therefore, the maximum area clearing limit for the application of the small area development module is ≤1 ha. As the project will only result in the clearance of approximately 0.14 ha of native vegetation (including planted native vegetation), it qualifies for the small area development module. Therefore, the project is being assessed under the small area development module in accordance with Appendix C of the BAM.

Furthermore, parts of the site consist of native vegetation of planted origin as part of the landscaping within Kellyville Park. The impacts on the planted native vegetation within the site has therefore been assessed under the streamlined assessment module for planted native vegetation in accordance with Appendix D of the BAM.

This assessment has been prepared in accordance with BAM 2020. Any reference to the BAM in the following report refers to the BAM 2020, unless stated otherwise.

In addition to the SEARs, a number of recommended Environmental Assessment Requirements in relation to biodiversity were received from the Environment, Energy and Science (EES) group (now the Environment and Heritage Group (EHG)) of the Department of Planning and Environment in July 2021. The Environmental Assessment Requirements are detailed in **Table 1** below, as well as comments regarding how each requirement has been addressed.

Table 1 EES Environmental Assessment Requirements for biodiversity

EES Environmental Assessment Requirement	Location Addressed in BDAR
Biodiversity impacts related to the proposed development are to be assessed in accordance with Section 7.9 of the *Biodiversity Conservation Act 2016*, the Biodiversity Assessment Method 2020 and documented in a Biodiversity Development Assessment Report (BDAR). The BDAR must include information in the form details in the *Biodiversity Conservation Act 2016 (*s 6.12), *Biodiversity Conservation Regulation 2017* (s 6.8) and Biodiversity Assessment Method.	This BDAR has been prepared in accordance with all relevant requirements under the BC Act, BAM, and *Biodiversity Conservation Regulation 2017*.
The BDAR must document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the Biodiversity Assessment Method 2020.	The following chapters/sections address the requirements in accordance with the BAM: • **Chapter 7**: Avoidance and minimisation measures; • ***Section 8.1***: Direct impacts; • ***Section 8.3***: Indirect impacts; • ***Section 8.4*****:** Prescribed impacts; • ***Section 8.5*****:** Mitigation measures; and • ***Section 9.6*****:** Credit offset requirements.
The BDAR must include details of the measures proposed to address the offset obligation as follows: a. The total number and classes of biodiversity credits required to be retired for the development; b. The number and classes of like-for-like biodiversity credit proposed to be retired; c. The number and classes of biodiversity credits proposed to be retired in accordance with the variation rules; d. Any proposal to fund a biodiversity conservation action; e. Any proposal to make a payment to the Biodiversity Conservation Fund. If seeking approval to use the variation rules, the BDAR must contain details of the reasonable steps that have been taken to obtain requisite like-for-like biodiversity credits.	**Table 19** of ***Section 9.6*** details the total number and classes of biodiversity credits required to be retired for the development. As stated in ***Section 9.6***, the entire offset obligation is proposed to be met through a payment to the Biodiversity Conservation Fund.

EES Environmental Assessment Requirement	Location Addressed in BDAR
The BDAR must be submitted with all spatial data associated with the survey and assessment as per Appendix 11 of the BAM.	Due to an error in the BAM-C, spatial data files cannot be submitted through the BAM-C. All spatial data files for this BDAR have been submitted to the consent authority separately with the SSD application.
The BDAR must be prepared by a person accredited in accordance with the *Accreditation Scheme for Application of the Biodiversity Assessment Method Order 2017* under s.6.10 of the *Biodiversity Conservation Act 2016*.	As detailed in ***Section 1.5***, this BDAR has been prepared and certified by Cecilia Eriksson Pinatacan, BAM Accredited Assessor No BAAS19052.

Furthermore, this BDAR has been updated to address comments by the EHG in regard to the assessment of threatened species that have previously been recorded within a 5km radius of the subject land as well as the reuse of native vegetation for habitat within landscaped areas.

1.2. Purpose

The purpose of this BDAR is to document the findings of an assessment undertaken for the project in accordance with Stage 1 (Biodiversity Assessment) and Stage 2 (Impact Assessment) of the BAM. Specifically, the objectives of this BDAR are to:

- Identify the landscape features and site context (native vegetation cover) within the subject land and assessment area;
- Assess native vegetation extent, plant community types (PCTs), threatened ecological communities (TECs) and vegetation integrity (site condition) within the subject land;
- Provide a justification for the use of the streamlined module for planted native vegetation and evidence for the planted origin of the native vegetation within the subject
- Assess habitat suitability for threatened species that can be predicted by habitat surrogates (ecosystem credits) and for threatened species that cannot be predicted by habitat surrogates (species credit species);
- Assess habitat suitability of the planted native vegetation for use by threatened species;
- Identify potential prescribed biodiversity impacts on threatened species;
- Describe measures to avoid and minimise impacts on biodiversity values and prescribed biodiversity impacts during project planning;
- Describe impacts to biodiversity values and prescribed biodiversity impacts and the measures to mitigate and manage such impacts;
- Identify the thresholds for the assessment and offsetting of impacts, including:
    - Impact assessment of potential entities of serious and irreversible impacts (SAII);

- Impacts for which an offset is required;
- Impacts for which no further assessment is required; and

- Describe the application of the no net loss standard, including the calculation of the offset requirement.

1.3. Project Description

1.3.1. Location

The project is located at 6-8 Memorial Avenue, Kellyville, NSW, also known as Lot 1 DP167535 and Lot 60 DP10702, within Kellyville Park (hereafter referred as the 'study area'). The study area is approximately 7.51 ha and occurs in The Hills Shire Local Government Area (LGA). The study area is zoned RE1 – Public Recreation under *The Hills Local Environmental Plan 2019*. The study area is generally surrounded by residential properties, and is bounded by Memorial Avenue to the north, Stone Mason Drive to the east, continuation of Kellyville Park to the south, and a small patch of bushland to the west in association with the riparian corridor of Strangers Creek.

A site map and location map have been prepared in accordance with the BAM and are presented in **Figure 1** and **Figure 2**, respectively.

1.3.2. Project Overview

The proposed development will provide state of the art facilities which enable physical recreation opportunities in conjunction with improved facilities for staff, players and existing users of the site. The proposed development will be integrated with the existing recreational landscape of the site and complement the upgrades to the existing playing fields being undertaken by Council. The proposed development is defined as a Recreation facility (major), and includes the following components:

- Construction of high-performance Centre of Excellence in the north east of the site adjacent to Training Field 2: – Elite level gymnasium.
  - Medical and rehabilitation facilities.
  - Aquatic recovery and rehabilitation pools.
  - Lecture theatre and meeting rooms.
  - Player education and study areas.
  - Administration offices for the Parramatta Eels.
  - New female facilities including a dedicated female change room, cubicle toilets and showers.
  - Balcony and terrace area.
  - End of Trip Facilities and bicycle parking.
  - Refuse Area.

- Construction of a Community Facility, including a grandstand with approximately 1,500 seats in the centre of the site adjacent to the Main Playing Field 3:
    - Unisex changerooms and amenities.
    - Referee changeroom and amenities.
    - First Aid/Medical room.
    - Community gymnasium.
    - Café/kiosk.
    - Concourse terrace.
    - Multipurpose community function room with kitchen and amenities.
    - Refuse Area.
    - Bicycle parking.
- Solar arrays will be included on the roof of both the Centre of Excellence and Community Facility.
- Additional 40 car parking spaces for the proposed facility to operate in conjunction with existing at grade car parking already constructed by Council.
- Additional landscaping throughout the development footprint.
- Removal of a small number of trees internal to the site, however noting perimeter trees will be retained where not affected by the proposed building footprints.
- Hours of operation for the Centre of Excellence and Community Facility are 5:00am to 12:00am, however the following key times are likely:
    - Centre of Excellence: 7.00am - 7.00pm
    - Community Facility: 7.00am - 10.00pm

The layout of the project is shown in **Figure 3**.

1.3.3. Identification of the Development Site Footprint

The layout of the project is shown in **Figure 3**. The development site footprint comprises 1.77 ha of land directly impacted by the project and is referred to within this BDAR as the subject land. All temporary/ancillary construction facilities and infrastructure will be contained within the operational footprint. Therefore, for the purposes of this assessment, the subject land comprises both the construction footprint and the operational footprint of the project.

1.3.4. General Description of the Subject Land

The subject land has been modified as a result of previous land disturbance. Vegetation within the subject land mainly consists of planted native trees and shrubs surrounded by exotic dominated lawns, as part of the landscaping of the existing Kellyville Park, as well as limited patches of remnant vegetation.

Historical aerial imagery held within the Historical Imagery Viewer (Spatial Services NSW Goverment 2021) indicates that almost the entirety of the subject land was cleared prior to 1943 for agricultural purposes, with only small areas of remnant trees remaining. Planting of new trees are evident between 1978-1984 and into the 1990s, whilst the exotic dominated grassland and cleared areas within the subject land have been maintained as cleared since this time.

The subject land is relatively flat, gently sloping from the eastern boundary (approximately 68 m Australian Height Datum) towards the existing playing fields on the border of the western boundary of the subject land with a topographic low of 62 m.

The majority of the subject land falls within the Luddenham soil landscape, which is described as occurring on undulating to rolling low hill, underlain by Wianamatta Group Ashfield Shale and Bringelly Shale formations. The south-western portion of the subject land falls within the Blacktown soil landscape, which is characterised by gently undulating rises on Wianamatta Group shales and Hawkesbury shale (Bannerman and Hazelton 1990).

1.4. Information Sources

1.4.1. Databases

A number of databases were utilised during the preparation of this BDAR, including:

- Environment, Energy and Science (EES) BioNet Atlas (EES 2022a);
- EES Threatened Biodiversity Data Collection (TBDC) (EES 2022c);
- EES BioNet Vegetation Classification database (EES 2022b);
- Commonwealth Department of Agriculture, Water and the Environment (DAWE) Species Profile and Threat Database (DAWE 2022c);
- DAWE Protected Matters Search Tool (DAWE 2022b); and
- DAWE Directory of Important Wetlands in Australia (DAWE 2022a).

1.4.2. Literature

This BDAR has utilised the results and/or spatial data from the following documents:

- Remnant vegetation of the western Cumberland subregion, 2013 Update. VIS_ID 4207 (OEH 2013); and
- NSW Critically Endangered Ecological Community Map. Version 6.0. February 2020 (DPIE 2020).

Other sources of information have been referenced throughout this BDAR.

1.4.3. Aerial Photography

The aerial imagery utilised in this BDAR is sourced from NearMap and is dated 7 August 2021. Additional aerial images available on NearMap and SixMaps were also consulted.

1.5. Authorship and Personnel

This document has been certified by Matthew Freeman (BAM Accredited Assessor No: BAAS19019) as being prepared in accordance with the BAM as at 29 July 2022.

This BDAR, and associated field surveys and Geographic Information Systems (GIS) mapping, was prepared with the assistance of additional personnel as outlined in **Table 2**.

Table 2 Personnel

Name	Tasks	Relevant Qualifications / Training	BAM Accredited Assessor No.
Cecilia Eriksson Pinatacan	Project management, document preparation, credit calculations, field surveys, GIS mapping	Master of Science (Major in Marine Science and Management). University of Technology, Sydney, 2013 Bachelor of Science (Honours) in Marine Biology. University of Technology, Sydney, 2008 BAM Accredited Assessor Training. Muddy Boots, 2017	BAAS19052
Matthew Freeman	Document preparation, credit calculations	Bachelor of Natural Science (Nature Conservation) University of Western Sydney, 2012 BAM Accredited Assessor Training. Muddy Boots, 2018	BAAS19109
Katrina Wolf	Document review	Bachelor of Science (Environmental). The University of Sydney, 2007 BAM Accredited Assessor Training. Muddy Boots, 2017	BAAS18010
Mikael Peck	Document review	Master of Marine Science and Management. Macquarie University, 2013 Bachelor of Science. Washington State University, 2005 BAM Accredited Assessor Training. Muddy Boots, 2017	BAAS19002
Jesse Luscombe	GIS mapping	Bachelor of Marine Science. Macquarie University, 2013	-

Name	Tasks	Relevant Qualifications / Training	BAM Accredited Assessor No.
		Certificate III in Conservation and Land Management. TAFE NSW, 2016 BAM Accredited Assessor Training. Muddy Boots, 2018	
Bryan Furchert	Field surveys, document preparation (PCTs)	Bachelor of Biodiversity and Conservation. Macquarie University, 2012 Diploma of Conservation and Land Management. TAFE NSW, 2008 BAM Accredited Assessor Training. Muddy Boots, 2017	BAAS18095

2. Methodology

2.1. Review of Existing Data

Existing information on biodiversity values within the assessment area was reviewed, which includes:

- Species data that is held in the BioNet Atlas; and
- Vegetation mapping contained within the Remnant vegetation of the western Cumberland subregion, 2013 Update. VIS_ID 4207 (OEH 2013).

This existing information was considered and included, where appropriate, into survey design, vegetation mapping and reporting.

2.2. Landscape Features

2.2.1. Landscape Features

Landscape features requiring consideration were initially determined via desktop assessment. Field surveys undertaken on 28 September 2021 sought to verify the following landscape features:

- Rivers, streams and estuaries;
- Important and local wetlands;
- Karsts, caves, crevices, cliffs and areas of geological significance; and
- NSW BioNet Landscapes.

No amendments were required to be made to any of these landscape features following field surveys.

2.2.2. Native Vegetation Cover

The native vegetation cover within the assessment area was determined through the use of existing vegetation mapping data, review of recent aerial imagery and field surveys within the subject land. The existing vegetation mapping data utilised was the *Remnant vegetation of the western Cumberland subregion, 2013 Update. VIS_ID 4207* (OEH 2013). The polygons of native vegetation within this dataset were revised following review of aerial imagery from NearMap dated 7 August 2021. Amendments were also made within the subject land following field surveys undertaken on 28 September 2021 (see ***Section 2.3.1***).

2.3. Native Vegetation Survey

2.3.1. Vegetation Mapping

Broad scale vegetation mapping prepared by OEH (2013) exists for the subject land and surrounds and was reviewed prior to field surveys. Cumberland Ecology conducted additional vegetation surveys on 28 September 2021 to verify and update the vegetation extent and PCT mapping. The vegetation within the subject land was ground-truthed to examine and verify the mapping of the condition and extent of the different plant communities. Mapping of plant communities within the subject land was undertaken by random meander surveys through patches of vegetation, noting key characteristics of areas in similar broad condition states such as similar tree cover, shrub cover, ground cover, weediness or combinations of these. Vegetation

within the subject land was assessed as native vegetation for the purpose of this assessment if it contained any native vegetation.

Records of plant community boundaries were made using a hand-held Global Positioning System and mark-up of aerial photographs. The resultant information was synthesised using GIS to create a spatial database that was used to interpret and interpolate the data to produce a vegetation map of the subject land.

2.3.2. Plot-based Vegetation Survey and Vegetation Integrity Assessment

A plot-based vegetation survey and vegetation integrity assessment was undertaken concurrently within the subject land and adjoining area in accordance with the BAM (hereafter referred to as 'BAM plots'). These BAM plots were undertaken in accordance with Section 4.2.1 and Section 4.3.2 of the BAM.

A total of two BAM plots (P1-P2) were undertaken within the subject land on 28 September 2021, and their locations are shown in **Figure 4**. The BAM plots required the establishment of a 20 x 50 m plot with an internal 20 m x 20 m plot. The following data was collected within each of the plots:

- Composition for each growth form group by counting the number of native plant species recorded for each growth form group within a 20 m x 20 m floristic plot;
- Structure of each growth form group as the sum of all the individual projected foliage cover estimates of all native plant species recorded within each growth form group within a 20 m x 20 m floristic plot;
- Cover of 'High Threat Exotic' weed species within a 20 m x 20 m floristic plot;
- Assessment of function attributes within a 20 x 50 m plot, including:
    - Count of number of large trees;
    - Tree stem size classes, measured as 'diameter at breast height over bark' (DBH);
    - Regeneration based on the presence of living trees with stems <5 cm DBH;
    - The total length in metres of fallen logs over 10 cm in diameter;
- Assessment of litter cover within five 1 m x 1 m plots evenly spread within the 20 x 50 m plot; and
- Number of trees with hollows that are visible from the ground within the 20 x 50 m plot.

Table 3 summarises the plot requirements based on the size and number of vegetation zones in the subject land. As shown in this table, the minimum number of plots has been completed for the single vegetation zone. One additional plot (P2) was surveyed for the purpose of supplementary information only, to verify the exotic species dominance of the grassland/lawn areas. Hence, plot P2 has not been further used in this assessment.

Table 3 BAM plot survey requirements

Vegetation Zone	PCT	Condition Name	Area (ha)	Minimum Number of Plots Required	Number of Plots Completed	Plot Name
1	849	Modified	0.08	1	1	P1

2.4. Threatened Flora Species Survey

2.4.1. Habitat Constraints

Desktop assessments and field surveys within the subject land included assessment of habitat constraints and microhabitats for predicted species credit flora species.

2.4.2. Targeted Species Survey

Two species credit flora species have been assessed as candidate species credit species for further assessment (see ***Section 5.3***). This includes *Eucalyptus sp. Cattai* and *Persoonia hirsuta* (Hairy Geebung). Based on the nature of the subject land, with a highly modified and degraded understory that is regularly mown and managed as part of an existing park and sports field, it is highly unlikely that any threatened flora species would be present within the subject land due to the absence or degradation of suitable microhabitats. Nonetheless, threatened flora surveys were undertaken within the site, through the completion of random meander surveys and plot-based surveys. The locations of the targeted flora species surveys are shown in **Figure 4**.

A random meander survey and plot survey was undertaken within the subject land on 28 September 2021. Due to the small area of potential habitat within the subject land, a random meander was deemed appropriate for the survey, and was supplemented with the required plot survey. The TBDC indicates that both *Eucalyptus sp. Cattai* and *Persoonia hirsuta* can be surveyed all year round and therefore the surveys undertaken within the subject land are considered suitable for both of these species credit flora species.

2.5. Threatened Fauna Species Survey

2.5.1. Habitat Constraints

Desktop assessments and field surveys within the subject land included assessment of habitat constraints and microhabitats for predicted species credit fauna species. This included desktop assessment of proximity of the subject land to features such as caves and waterways and field inspection of microhabitats including leaf litter, rocky outcrops and hollow-bearing trees.

2.5.2. Threatened Fauna Species Survey

No predicted threatened fauna species were assessed as candidate species credit species requiring further assessment (see ***Section 5.3***), therefore no targeted threatened fauna surveys were required to be undertaken within the subject land.

2.6. Weather Conditions

Weather conditions during the field survey was appropriate for detection of a range of flora and fauna species. A summary of weather conditions in the wider locality of the subject land (BOM Weather Station 067109 – Baulkham Hills Eucalyptus Ct for rainfall; BOM Weather Station 066124 – Parramatta for temperature) leading up to and during the field survey is provided in **Table 4**.

Table 4 Weather conditions leading to and during field surveys

Date	Temperature Minimum (°C)	Temperature Maximum (°C)	Rainfall (mm)
Preceding Months*			
June 2021	7.2	17.7	43.5
July 2021	6.9	17.7	17.0
August 2021	8.3	20.4	62.5
During Surveys			
28 September 2021	8.8	23.5	0

** For preceding months values, temperatures are provided as a mean value, and rainfall is provided as a total.*

2.7. BAM-C

Due to the limitations in the BAM Calculator (BAM-C) in relation to completing an assessment using the small area streamlined assessment module for a major project, the decision was made to select the Part 4 option for a small area assessment in the BAM-C instead of the Major Projects option.

Furthermore, it should also be noted that for the purpose of the calculations in the BAM-C, it has been assumed that all vegetation within the subject land will be cleared. However, as reflected in **Chapter 7** of this BDAR and within the project's Arboricultural Impact Assessment (Earthscape Horticultural Services. 2022), a number of trees within the subject land will be retained and incorporated into the proposed landscaping for the project.

3. Landscape Features

3.1. Assessment Area

The subject land is approximately 1.77 ha in size and is shown in **Figure 1**. As the project is being assessed as a site-based project, the assessment area comprises the area of land within a 1,500 m buffer around the outer boundary of the subject land. The assessment area is approximately 826 ha in size and is shown in **Figure 2**.

3.2. Landscape Features

Landscape features identified within the subject land and assessment area are outlined below. The extent of these features within the subject land is shown in **Figure 1** and the extent within the assessment area is shown in **Figure 2**.

3.2.1. IBRA Bioregions and IBRA Subregions

The subject land and assessment area occur within the Sydney Basin Interim Biogeographic Regionalisation for Australia (IBRA) Bioregion and within the Cumberland Subregion.

3.2.2. Rivers, Streams and Estuaries

The subject land and assessment area occur within the Hawkesbury River catchment. No mapped watercourses occur within the subject land. Several streams occur within the assessment area ranging from first to third order streams, including Strangers Creek and Elizabeth Macarthur Creek. In accordance with Appendix 3 of the BAM, a riparian corridor of 10 m, 20 m and 30 m either side of the waterway applies to first, second and third order streams within the assessment area, respectively.

3.2.3. Important and Local Wetlands

No important wetlands listed in the Directory of Important Wetlands in Australia or wetlands mapped under the *State Environmental Planning Policy (Resilience and Hazards) 2021* are present in the subject land and/or assessment area. However, several artificial dams are located in the assessment area, mainly in association with the Castle Hill Country Club and Golf Course, which occurs to the south of the subject land.

3.2.4. Habitat Connectivity

The subject land does not form part of a regional biodiversity corridor, flyway for migratory species, riparian buffer or estuary, or a local corridor.

The subject land occurs within a highly urbanised areas and is surrounded by residential developments and roads. The existing small remnant and planted areas of trees and shrubs within the subject land are likely to mainly function as stepping-stone habitat that provides connectivity between larger habitat corridors and bushland areas in the wider landscape, including the riparian corridor along Strangers Creek to the west of the subject land as well as the reserves surrounding Cattai Creek approximately 2 km east of the subject land.

3.2.5. Karsts, Caves, Crevices, Cliffs and Areas of Geological Significance

No karsts, caves, crevices, cliffs or areas of geological significance have been identified within the assessment area based on searches of available aerial imagery from NearMap, or topographic data available from SixMaps.

3.2.6. Areas of Outstanding Biodiversity Value

No Areas of Outstanding Biodiversity Value have been mapped within the subject land and assessment area.

3.2.7. NSW (Mitchell) Landscapes

The subject land is located within the 'Cumberland Plain' NSW (Mitchell) Landscape. Most of the study area is also located within the Cumberland Plain NSW (Mitchell) Landscape, with the exception of the north-eastern portion which occurs in the Blaxlands Ridge NSW (Mitchell) Landscape.

3.2.8. Soil Hazard Features

Soil hazard features have not been identified as the project does not comprise a vegetation clearing proposal.

3.3. Native Vegetation Cover

The native vegetation cover was determined through the use of GIS. To map native vegetation cover within the subject land and assessment area, this assessment utilised the detailed vegetation mapping prepared by Cumberland Ecology in conjunction with broadscale mapping by OEH (2013). The native vegetation cover within the assessment area is shown in **Figure 2**. The assessment area is approximately 826 ha in size, of which approximately 89 ha comprises native vegetation cover, which represents 11% of the assessment area. Therefore, the native vegetation cover value is assigned to the cover class of >10-30%.

The remaining land within the assessment area comprises cleared land, exotic vegetation and dams. No significant differences between the aerial photographs used in this assessment and the native vegetation cover shown in **Figure 2** have been identified.

4. Native Vegetation

4.1. Native Vegetation Extent

The subject land has been subject to detailed surveys by Cumberland Ecology for the purpose of this BDAR. The native vegetation extent within the subject land was determined through a combination of aerial photograph interpretation and field surveys. This native vegetation extent is shown in **Figure 5** and occupies approximately 0.14 ha, which represents 7% of the subject land. This includes approximately 0.08 ha of remnant native vegetation and 0.06 ha of planted native vegetation.

The remaining land within the subject land comprises cleared land (1.01 ha) and exotic woody vegetation and grasslands (0.62 ha), totalling an area of approximately 1.63 ha.

No differences between the aerial photographs used in this assessment and the native vegetation extent shown in **Figure 5** have been identified.

4.2. Plant Community Types

4.2.1. Overview

The analysis determined that the remnant native vegetation within the subject land aligned with one PCT held within the BioNet Vegetation Classification database. **Table 5** provides a summary of the PCT identified within the subject land, whilst the distribution of this PCT is shown in **Figure 6**. Details of the vegetation within the subject land are outlined below, including justification for PCT selection.

Table 5 Plant community types within the subject land

PCT #	PCT Name	Subject Land (ha)
849	Cumberland Shale Plains Woodland	0.08

4.2.2. PCT 849 - Cumberland Shale Plains Woodland

Vegetation Formation: Grassy Woodlands

Vegetation Class: Coastal Valley Grassy Woodlands

Percent Cleared Value: 93

4.2.2.1. General Description

This community within the subject land consists of a small stand of remnant *Eucalyptus moluccana* (Grey Box), and *Eucalyptus tereticornis* (Forest Red Gum) trees in the central area, and a single *Eucalyptus tereticornis* individual in the north. A shrub layer is completely absent from the community, with the trees occurring over a ground layer of predominately exotic species, maintained by mowing.

The dominant species in the ground layer is the exotic grass *Cenchrus clandestinus* (Kikuyu). Other exotic grasses present include *Cynodon dactylon* (Couch), *Lolium perenne* (Ryegrass), *Bromus catharticus* (Prairie Grass), and *Vulpia bromoides* (Squirrel-tail Fescue). Exotic forbs are common and include *Bidens pilosa* (Cobbler's Pegs), *Taraxacum officinale* (Dandelion), and *Cirsium vulgare* (Spear Thistle).

Native species present are limited to scattered occurrences of the common native forbs *Dichondra repens* (Kidney Weed), and *Wahlenbergia gracilis* (Native Bluebell). An example of PCT 849 in the subject land is shown in **Photographs 1-2**.

Photograph 1 Isolated *Eucalyptus tereticornis* individual in the northern part of the subject land

Photograph 2 Patch of PCT 849 in the centre of the subject land

4.2.2.2. Justification of PCT Selection

Identification of this PCT within the subject land was guided by review of existing data, and the results of the surveys undertaken by Cumberland Ecology. The data collected during surveys of the subject land was analysed in conjunction with a review of the PCTs held within the BioNet Vegetation Classification database. In selecting searching for suitable PCT, consideration was initially given to the following:

- IBRA subregion: Cumberland;
- Vegetation formation: Grassy Woodlands;
- Alignment with TEC: Cumberland Plain Woodland; and
- Canopy species: *Eucalyptus moluccana* and *Eucalyptus tereticornis*.

PCTs that were associated with these aforementioned parameters include PCT 830, PCT 849 and PCT 850. Review of the landscape position of these PCTs ruled out both PCT 830 and PCT 850 as both occurs on higher elevations of hills and rises, whilst the subject land occurs on relatively flat land on a lower elevation. Furthermore, the *Remnant vegetation of the western Cumberland subregion (OEH 2013)* maps 'Cumberland Shale Plains Woodland' (PCT 849) in areas surrounding the subject land on similar topographies. Cumberland

Plain Woodland is described as occurring on Wianamatta Shale derived soils (NSW Scientific Committee 2009), which matches the soil landscape matching of the subject land as containing both the Blacktown and Luddenham soils landscapes, both consisting of Wianamatta Group shales.

Within the subject land, the vegetation exists as a degraded occurrence consisting mostly of trees only over exotics, however both tree species present *Eucalyptus moluccana* and *Eucalyptus tereticornis* are consistent with assigning PCT 849 to the vegetation. The location in Western Sydney on the Cumberland Plain is also consistent with the description of this PCT (NSW Scientific Committee 2009).

Species recorded within the subject land that align with the description of PCT 849 within the BioNet Vegetation Classification database include: *Eucalyptus moluccana, Eucalyptus tereticornis, Dichondra repens,* and *Oxalis perennans*.

Therefore, based on the existing available information of the subject land and surrounds, it was determined that the vegetation within this community aligns with PCT 849.

4.2.2.3. Alignment with Threatened Ecological Communities

Within the BioNet Vegetation Classification, PCT 849 is associated with the following TEC:

- Cumberland Plain Woodland in the Sydney Basin Bioregion.

The entire occurrence of PCT 849 within the subject land is considered to be consistent with the Cumberland Plain Woodland TEC as described in the final determination (NSW Scientific Committee 2009) for the community as listed under the BC Act, due to the presence of the characteristic species *Eucalyptus moluccana* and *Eucalyptus tereticornis* and the associated landform.

The occurrence of PCT 849 within the subject land does not conform to the EPBC Act listed community as it does not meet the condition thresholds described in the Listing Advice (Threatened Species Scientific Committee 2009) for the community, due to having patch sizes of less than 0.5 ha.

4.3. Other Vegetation Types

4.3.1. Planted Native Vegetation

4.3.1.1. General Description

This vegetation type consists of a strip of planted native trees along the eastern boundary of the subject land and study area, and as scattered trees elsewhere, and garden vegetation within the parking lot area in the south-east. Planted trees are predominately eucalypt species and include species both indigenous and not indigenous to the Sydney Region. Species include *Corymbia eximia* (Yellow Bloodwood), *Corymbia maculata* (Spotted Gum), *Eucalyptus grandis* (Flooded Gum), *Eucalyptus microcorys* (Tallowwood), *Eucalyptus botryoides* (Bangalay), and *Eucalyptus scoparia* (Wallangarra White Gum). Non-eucalypt species include *Callistemon viminalis* (Weeping Bottlebrush), *Cupaniopsis anacardioides* (Tuckeroo), and *Casuarina cunninghamiana* (River Oak). Planted native shrubs include *Callistemon citrinus* (Crimson Bottlebrush), and *Waterhousea floribunda* (Weeping Lilly Pilly), which is commonly planted in the car park gardens.

A ground layer is mostly absent in the strip of trees in the east, and limited to scattered weeds such as the grasses *Avena barbata* (Wild Oats) and *Lolium perenne* (Rye Grass), and forbs such as *Modiola caroliniana* (Red-flowered Mallow) and *Polycarpon tetraphyllum* (Four-leaf All-seed). A small number of native species are present with a scattered distribution. These include the grass *Microlaena stipoides* var. *stipoides* (Weeping Grass), and the forb *Einadia nutans* subsp. *nutans* (Climbing Saltbush). Garden beds within the parking lot have a dense ground layer of planted natives. Species include the graminoid *Lomandra hystrix* (Mat Rush), and the sedge *Ficinia nodosa* (Club Rush).

An example of this community is shown in **Photograph 5**.

Photograph 3 Planted native vegetation along Stone Mason Drive

4.3.1.2. Justification of PCT Selection

BAM includes a streamlined assessment module for "planted native vegetation". This module simplifies the assessment of impacts on planted native vegetation within a development site. The decision-making key outlined in Section D.1 of Appendix D of the BAM provides a framework to determine whether the streamlined assessment module for planted native vegetation can be applied to a site.

An assessment against the decision-making key in Appendix D of the BAM was undertaken and it was determined that Planted Native Vegetation in the subject land did not need to be assigned to a PCT. **Table 6** provides an assessment against the decision-making key.

The planted origin of this vegetation community in the subject land and study area is evident when reviewing historical aerial imagery, held within the Historical Imagery Viewer (Spatial Services NSW Goverment 2021). The historical imagery indicates that almost the entirety of the subject land was cleared prior to 1943 for agricultural purposes, with only small areas of remnant trees remaining. Planting of new trees are evident between 1978-1984 and into the 1990s, whilst the exotic dominated grassland and cleared areas within the subject land have been maintained as cleared since this time. Furthermore, the species composition of the trees and shrubs and the existing use of the site (existing park) also further supports the planted origin of the vegetation classified in this BDAR as Planted Native Vegetation.

Table 6 Decision-making key to determine the application of the streamlined assessment module for planted native vegetation

Decision-Making Key	Response
1. Does the planted native vegetation occur within an area that contains a mosaic of planted and remnant native vegetation and which can be reasonably assigned to a PCT known to occur in the same IBRA subregion as the proposal?	No – scattered planted native species do not form a mosaic with remnant native vegetation.
2. Is the planted native vegetation: *a. planted for the purpose of environmental rehabilitation or restoration under an existing conservation obligation listed in BAM Section 11.9(2.), and* *b. the primary objective was to replace or regenerate a plant community type or a threatened plant species population or its habitat?*	No – native species have not been planted for the purposes of environmental rehabilitation or restoration, or to replace or regenerate a PCT or threatened species population or habitat.
3. Is the planted/translocated native vegetation individuals of a threatened species or other native species planted/translocated for the purpose of providing threatened species habitat under one of the following: *a. a species recovery project* *b. Saving our Species project* *c. other types of government funded restoration project* *d. condition of consent for a development approval that required those species to be planted or translocated for the purpose of providing threatened species habitat* *e. legal obligation as part of a condition or ruling of court. This includes regulatory directed or ordered remedial plantings (e.g. Remediation Order for clearing without consent issued under the BC Act or the Native Vegetation Act)* *f. ecological rehabilitation to re-establish a PCT or TEC that was, or is carried out under a mine operations plan, or*	No – although there are four individuals of the threatened *Eucalyptus scoparia* occurring within the subject land (see ***Section 5.3.3***), these individuals have not been planted to provide habitat for threatened species under any of options a-f.

Decision-Making Key	Response
g. approved vegetation management plan (e.g. as required as part of a Controlled Activity Approval for works on waterfront land under the NSW Water Management Act 2000)?	
4. Was the planted native vegetation (including individuals of a threatened flora species) undertaken voluntarily for revegetation, environmental rehabilitation or restoration without a legal obligation to secure or provide for management of the native vegetation?	No – planted native vegetation was not undertaken for the purposes of revegetation, rehabilitation or restoration.
5. Is the native vegetation (including individuals of a threatened flora species) planted for functional, aesthetic, horticultural or plantation forestry purposes? This includes examples such as: windbreaks in agricultural landscapes, roadside plantings (including street trees, median strips, roadside batters), landscaping in parks, gardens and sport fields/complexes, macadamia plantations or teatree farms?	Yes – native species have been planted for aesthetic purposes as part of the landscaping within the existing Kellyville Park. Native vegetation has been considered for use by threatened species within **Chapter 5** of this BDAR (The use of Chapters 4 and 5 of the BAM are not required to be applied).
6. Is the planted native vegetation a species listed as a widely cultivated native species on a list approved by the Secretary of the Department (or an officer authorised by the Secretary)?	N/A

4.3.2. Exotic Woody Vegetation and Grassland

The remaining vegetation within the subject land consists of exotic species, including some planted trees/shrubs, but predominately consisting of open areas of exotic dominated grassland. Trees include *Lagerstroemia indica* (Crepe Myrtle), and *Cinnamomum camphora* (Camphor Laurel). Grassland areas are dominated by mostly *Cenchrus clandestinus,* with *Cynodon dactylon* also occurring commonly. Other exotic grasses present include *Sporobolus africanus* (Parramatta Grass), *Bromus catharticus* (Prairie Grass), and *Eragrostis curvula* (African Lovegrass). Exotic forbs are common and include *Hypochaeris radicata* (Catsear), *Veronica arvensis* (Common Speedwell), and *Sonchus oleraceus* (Milk Thistle). Native species are extremely uncommon and limited to isolated occurrences of species such as *Oxalis perennans* and *Geranium solanderi* (Native Geranium).

An example of this community is provided in **Photographs 4-5**.

Photograph 4 Exotic *Lagerstromia indica* tree in the north of the subject land

Photograph 5 Exotic dominated grassland in the southern portion of the subject land

4.4. Threatened Ecological Communities

The entire occurrence of PCT 849 identified within the subject land has been assessed as being associated with a TEC. No other vegetation within the subject land conforms to a TEC under the BC Act and/or EPBC Act. **Table 7** summarises the TEC identified within the subject land and its distribution is shown in **Figure 7**.

Table 7 Threatened ecological communities within the subject land

TEC Name	BC Act Status	EPCB Act Status	Associated PCT	Associated Vegetation Zone	Subject Land (ha)
Cumberland Plain Woodland in the Sydney Basin Bioregion	CEEC	Not listed	849 - Cumberland shale plains woodland	1_Modified	0.08

4.5. Vegetation Integrity Assessment

The native vegetation identified within the subject land was assigned to one vegetation zone based on PCT and broad condition states. A patch size was subsequently assigned for the single vegetation zone. The extent of this vegetation zone and associated patch size class within the subject land are shown in **Figure 8**.

The vegetation zone was assessed using survey BAM plots (see ***Section 2.3.2***) to determine the vegetation integrity score. BAM plot data utilised within the BAM-C to determine the vegetation integrity score is provided in **Appendix A**, whilst scans of field datasheets are provided in **Appendix C**. The vegetation integrity assessment utilised the benchmark data held within the BAM-C (as derived from the BioNet Vegetation Classification). Therefore, this assessment did not utilise local benchmarks.

Vegetation zones, patch sizes and vegetation integrity scores for the subject land are summarised in **Table 8**.

Table 8 Vegetation zones within the subject land

Vegetation Zone	PCT	Condition Name	Area (ha)	Patch Size Class	Vegetation Integrity Score	Hollow-bearing Trees Present?
1	849 - Cumberland shale plains woodland	Modified	0.08	≥100	26.1 (Composition = 13.1, Structure = 34.5, Function = 39.3)	No

5. Threatened Species

5.1. Identifying Threatened Species for Assessment

The BAM-C generates a list of threatened species requiring assessment utilising a number of variables. The following criteria have been utilised to predict the threatened species requiring further assessment:

- IBRA subregion: Cumberland;
- Associated PCT: 849;
- Percent native vegetation cover in the assessment area: 11%;
- Patch size: ≥100 ha; and
- Credit type: Ecosystem and/or species.

Based on the above variables, the BAM-C generated a list of 30 ecosystem credit species and six species credit species. Furthermore, a search was undertaken on the NSW Department of Planning and Environment BioNet Atlas to identify additional threatened flora and fauna species previously recorded within a 5km radius of the subject land. The BioNet Atlas search identified an additional seven ecosystem credit species and three species credit species. Note that one species identified by EHG as occurring within a 5km radius of the subject land was the Fork-tailed Swift (*Apus pacificus*). This species is listed as migratory species and not a threatened species. This species does not breed within the subject land, although may forage aerially above the subject land, however, would not rely on the habitat within the subject land. As such the Fork-tailed Swift has not been considered further within this assessment. Ecosystem credit species and species credit species are assessed further in ***Section 5.2*** and ***Section 5.3***, respectively.

5.2. Ecosystem Credit Species

5.2.1. Overview

A total of 37 ecosystem credit species are predicted by the BAMC and BioNet Atlas, including 15 dual credit species which are considered as ecosystem credit species for their foraging habitat. **Table 9** lists the predicted ecosystem credit species for the vegetation zones within the subject land, and whether they have been retained within the assessment following consideration of habitat constraints, geographic limitations, vagrancy and quality of microhabitats. Three ecosystem species have been removed from the assessment and justification for their removal is provided in ***Section 5.2.2***.

Table 9 Predicted ecosystem credit species

Scientific Name	Common Name	Source	Relevant PCT	Relevant Vegetation Zones	Suitable Habitat within Planted Native Vegetation?	Sensitivity to Gain Class	Retained in Assessment?
Anthochaera phrygia	Regent Honeyeater (Foraging)	BAMC	849	1	No	High	Yes
Artamus cyanopterus cyanopterus	Dusky Woodswallow	BAMC, BioNet	849	1	No	Moderate	Yes
Callocephalon fimbriatum	Gang-gang Cockatoo (Foraging)	BAMC, BioNet	849	1	No	Moderate	Yes
Calyptorhynchus lathami	Glossy Black-Cockatoo (Foraging)	BioNet	849	1	No	High	No
Chthonicola sagittata	Speckled Warbler	BAMC, BioNet	849	1	No	High	Yes
Circus assimilis	Spotted Harrier	BAMC, BioNet	849	1	No	Moderate	Yes
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	BAMC, BioNet	849	1	No	High	Yes
Daphoenositta chrysoptera	Varied Sittella	BAMC, BioNet	849	1	No	Moderate	Yes
Dasyurus maculatus	Spotted-tailed Quoll	BAMC, BioNet	849	1	No	High	Yes
Falsistrellus tasmaniensis	Eastern False Pipistrelle	BioNet	849	1	Yes	High	Yes
Glossopsitta pusilla	Little Lorikeet	BAMC, BioNet	849	1	No	High	Yes
Ixobrychus flavicollis	Black Bittern	BioNet	849	1	No	Moderate	No
Grantiella picta	Painted Honeyeater	BAMC	849	1	No	Moderate	Yes
Haliaeetus leucogaster	White-bellied Sea-Eagle (Foraging)	BAMC	849	1	No	High	Yes
Hieraaetus morphnoides	Little Eagle (Foraging)	BAMC	849	1	No	Moderate	Yes
Hirundapus caudacutus	White-throated Needletail	BAMC, BioNet	849	1	No	High	Yes
Lathamus discolor	Swift Parrot (Foraging)	BAMC, BioNet	849	1	No	Moderate	Yes

Scientific Name	Common Name	Source	Relevant PCT	Relevant Vegetation Zones	Suitable Habitat within Planted Native Vegetation?	Sensitivity to Gain Class	Retained in Assessment?
Lophoictinia isura	Square-tailed Kite (Foraging)	BAMC, BioNet	849	1	No	Moderate	Yes
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	BAMC	849	1	No	Moderate	Yes
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	BAMC, BioNet	849	1	No	Moderate	Yes
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	BAMC, BioNet	849	1	Yes	High	Yes
Miniopterus australis	Little Bent-winged Bat (Foraging)	BAMC, BioNet	849	1	Yes	High	Yes
Miniopterus orianae oceanensis	Large Bent-winged Bat (Foraging)	BAMC, BioNet	849	1	Yes	High	Yes
Neophema pulchella	Turquoise Parrot	BAMC, BioNet	849	1	No	High	Yes
Ninox connivens	Barking Owl (Foraging)	BAMC, BioNet	849	1	Yes	High	Yes
Ninox strenua	Powerful Owl (Foraging)	BAMC, BioNet	849	1	Yes	High	Yes
Pandion cristatus	Eastern Osprey (Foraging)	BioNet	849	1	Yes	Moderate	Yes
Petaurus australis	Yellow-bellied Glider	BioNet	849	1	Yes	High	No
Petroica boodang	Scarlet Robin	BAMC	849	1	No	Moderate	Yes
Petroica phoenicea	Flame Robin	BAMC, BioNet	849	1	No	Moderate	Yes
Phascolarctos cinereus	Koala (Foraging)	BAMC, BioNet	849	1	No	High	Yes
Polytelis swainsonii	Superb Parrot (Foraging)	BioNet	849	1	Yes	Moderate	Yes
Pteropus poliocephalus	Grey-headed Flying-fox (Foraging)	BAMC, BioNet	849	1	Yes	High	Yes
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	BAMC, BioNet	849	1	Yes	High	Yes
Scoteanax rueppellii	Greater Broad-nosed Bat	BioNet	849	1	Yes	High	Yes

Scientific Name	Common Name	Source	Relevant PCT	Relevant Vegetation Zones	Suitable Habitat within Planted Native Vegetation?	Sensitivity to Gain Class	Retained in Assessment?
Stagonopleura guttata	Diamond Firetail	BAMC	849	1	No	Moderate	Yes
Tyto novaehollandiae	Masked Owl (Foraging)	BAMC, BioNet	849	1	No	High	Yes

5.2.2. Justification for Removal

5.2.2.1. Glossy Black-Cockatoo

The Glossy Black-Cockatoo (*Calyptorhynchus lathami*) has been removed from the assessment as the habitat constraints for the species are absent from the subject land. The TBDC lists the following habitat constraints for the species: *Presence of Allocasuarina and casuarina species.* The subject land does not contain Allocasuarina or Casuarina species.

5.2.2.2. Black Bittern

The Black Bittern (*Ixobrychus flavicollis*) has been removed from the assessment as the habitat constraints for the species are absent from the subject land. The TBDC lists the following habitat constraints for the species: *Land within 40 m of freshwater and estuarine wetlands, in areas of permanent water and dense vegetation.* The subject land does not occur within 40m of freshwater or estuarine wetlands or in areas of permanent water and dense vegetation.

5.2.2.3. Yellow-bellied Glider

The Yellow-bellied Glider (*Petaurus australis*) has been removed from the assessment as the habitat constraints for the species are absent from the subject land. The TBDC lists the following habitat constraints for the species: *Hollows > 25cm diameter.* The subject land does not contain hollows >25cm.

5.3. Species Credit Species

5.3.1. Overview

A total of nine species credit species are predicted by the BAMC and BioNet Atlas, including four dual credit species which are considered as species credit species for their breeding or important habitat. As the project is being assessed under the Streamlined Assessment Module – small area development, candidate species credit species that are not at risk of an SAII and are not incidentally recorded on the subject land do not require further assessment. As such, species credit species identified from the BioNet Atlas search including, but not limited to, the Cumberland Plain Land Snail (*Meridolum corneovirens*), Southern Myotis (*Myotis macropus*), Dural Land Snail (*Pommerhelix duralensis*) and Red-crowned Toadlet (Pseudophryne australis) do not require further assessment and are therefore not included within the list of predicted species credit species.

Table 10 lists the predicted species credit species for the vegetation zones within the subject land, and whether they have been retained within the assessment following consideration of habitat constraints, geographic limitations, vagrancy and quality of microhabitats. Justification is provided below this table for species that have been removed from the assessment in accordance with Steps 1-3 of Section 5.2 of the BAM. All species not removed from consideration (i.e. retained in the assessment) are by default candidate species credit species that require further assessment.

Of the assessed predicted species, two species credit species have been retained for further assessment.

Table 10 Predicted species credit species

Scientific Name	Common Name	Source	Relevant PCT	Relevant Vegetation Zones	Suitable Habitat within Planted Native Vegetation?	Sensitivity to Gain Class	Retained in Assessment?
Flora							
Caladenia tessellata	Thick Lip Spider Orchid	BAMC, BioNet	849	1	No	Moderate	No
Eucalyptus sp. Cattai	-	BioNet	849	1	No	High	Yes
Persoonia hirsuta	Hairy Geebung	BioNet	849	1	No	High	Yes
Fauna							
Anthochaera phrygia	Regent Honeyeater (Breeding)		849	1	No	High	No
Chalinolobus dwyeri	Large-eared Pied Bat		849	1	No	Very High	No
Lathamus discolor	Swift Parrot (Breeding)		849	1	No	Moderate	No
Miniopterus australis	Little Bent-winged Bat (Breeding)		849	1	No	Very High	No
Miniopterus orianae oceanensis	Large Bent-winged Bat (Breeding)		849	1	No	Very High	No
Vespadelus troughtoni	Eastern Cave Bat		849	1	No	Very High	No

5.3.2. Justification for Removal

5.3.2.1. Caladenia tessellata

Caladenia tessellata (Thick-lipped Spider-orchid) has been removed from the assessment due to the absence of microhabitats required by the species within the subject land. The species is known to favour low, dry sclerophyll woodland (for example open *Kunzea* woodland) with a heathy or sometimes grassy understorey on clay loams or sandy soils, occurring less commonly in heathland on sandy loam soils (Duncan 2010). Such habitats are not present within the subject land.

Furthermore, whilst acknowledged that this is not an accepted reason for removal of a species, it is noted that subject land is located outside of the limited known range of the species. Within NSW, *Caladenia tessellata* (Thick-lipped Spider-orchid) is known from two disjunct areas; one population near Braidwood on the Southern Tablelands and three populations in the Wyong area on the Central Coast (OEH 2018).

5.3.2.2. Regent Honeyeater

The Regent Honeyeater (*Anthochaera phrygia*) has been removed from the assessment as the subject land is not located within and area on the important habitat map for the species.

5.3.2.3. Large-eared Pied Bat

The Large-eared Pied Bat (*Chalinolobus dwyeri*) has been removed from the assessment as the habitat constraints for the species are absent from the subject land. The TBDC lists the following habitat constraints for the species: *Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels.* The subject land does not occur within 2 km of rocky areas containing caves, overhands, escarpments, outcrops or crevices, or old mines or tunnels.

5.3.2.4. Swift Parrot

The Swift Parrot (*Lathamus discolor*) has been removed from the assessment as the subject land is not located within and area on the important habitat map for the species.

5.3.2.5. Little Bent-winged Bat

The Little Bent-winged Bat (*Miniopterus australis*) has been removed from the assessment as the habitat constraints for the species are absent from the subject land. The TBDC lists the following habitat constraint for the species: *Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records in BioNet with microhabitat code 'IC – in cave'; observation type code 'E nest-roost'; with numbers of individuals >500; or from the scientific literature*. None of these habitat features, or records held within BioNet, are present within the subject land.

5.3.2.6. Large Bent-winged Bat

The Large Bent-winged Bat (*Miniopterus orianae oceanensis*) has been removed from the assessment as the habitat constraints for the species are absent from the subject land. The TBDC lists the following habitat constraint for the species: *Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records with microhabitat code "IC - in cave;" observation type code "E nest-roost;"*

with numbers of individuals >500. None of these habitat features, or records held within BioNet, are present within the subject land.

5.3.2.7. Eastern Cave Bat

The Eastern Cave Bat (*Vespadelus troughtoni*) has been removed from the assessment as the habitat constraints for the species are absent from the subject land. The TBDC lists the following habitat constraint for the species: *Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, crevices or boulder piles, or within two kilometres of old mines, tunnels, old buildings or sheds*. The subject land does not occur within 2 km of these habitat features.

5.3.3. Presence of Candidate Species Credit Species

No candidate species credit species were recorded within the subject land. However, four planted threatened flora species were recorded within the subject land during field surveys, namely four *Eucalyptus scoparia (*Wallangarra White gum) individuals. This species was recorded in the southern portion of the subject land, as scattered individuals surrounded by mown exotic lawn.

Eucalyptus scoparia is listed as Endangered under the BC Act and Vulnerable under the EPBC Act. This species is documented to occur typically occur at high altitudes in open eucalypt forest, woodland and heaths on well-drained grained granite/rhyolite hilltops, slopes and rocky outcrops. At lower elevations, it is generally found in less rocky soils in damp environments. In NSW, the species is only known to naturally occur at three locations near Tenterfield (DPE. 2022).

As this species is not endemic to the subject land, and the individuals have been planted as part of the landscaping within a park, they are not considered to be natural components of the landscape. Therefore, these species have not been considered further within this BDAR. The exclusion of this species follows previous advice provided by the then OEH for planted threatened species as they have not been planted for restoration or propagation purposes. Furthermore, the species have not been planted within the subject land with the purpose of providing threatened species habitat in accordance with the options listed within the Decision-making Key of the Streamlined Assessment Module for planted native vegetation, as detailed in **Table 6** of ***Section 4.3.1*** in this BDAR.

6. Prescribed Impacts

Prescribed impacts are identified in Clause 6.1 of the *Biodiversity Conservation Regulation 2017* (BC Regulation). Prescribed impacts are those that are additional to the clearing of native vegetation and associated habitat. These include:

- Development on the habitat of threatened species or ecological communities associated with:
  - karst, caves, crevices, cliffs, rock outcrops and other geological features of significance;
  - human-made structures;
  - non-native vegetation;
- Development on areas connecting threatened species habitat, such as movement corridors;
- Development on water quality, water bodies and hydrological processes that sustain threatened species and TECs (including from subsidence or upsidence from underground mining);
- Wind turbine strikes on protected animals; and
- Vehicle strikes on threatened species or on animals that are part of a TEC.

An assessment of the relevance of these prescribed impacts to the project is provided in **Table 11.** The location of prescribed impacts is shown in **Figure 9**.

Table 11 Relevance of prescribed impacts

Prescribed Impact	Relevance to Project	Associated Threatened Entities
Karst, caves, crevices, cliffs, rock outcrops and other geological features of significance	Not relevant. Features are not present within the subject land.	-
Human-made structures	Not relevant. This feature is present in the form of the existing Parramatta Eels training facility in the south and a number of buildings associated with a temporary construction compound in the northern part of the subject land. Nevertheless, as the buildings are well-maintained, they are unlikely to provide suitable habitat for threatened species.	-
Non-native vegetation	Non-native vegetation occurring within the subject land comprises areas of managed lawns and limited scattered occurrences of trees and shrubs. This vegetation may provide some low-value	Ecosystem credit fauna species which may utilise the habitat as part of a larger foraging range.

Prescribed Impact	Relevance to Project	Associated Threatened Entities
	habitat for native fauna species, including threatened birds and bats, on occasion. Impacts to non-native vegetation would occur during the construction phase of the project and result in a long-term impact.	
Habitat connectivity	The subject land occurs in a highly urbanised environment and is not part of an established habitat corridor. Nonetheless, the treed areas of the subject land are likely to function as stepping-stone habitat for highly mobile fauna species between larger tracts of bushland. Minor direct impacts to habitat connectivity may occur as a result of the reduction of trees within the central portion of the subject land.	Ecosystem credit fauna species which may utilise the habitat as part of a larger foraging range and as stepping-stone habitat.
Waterbodies, water quality and hydrological processes	Not relevant. Features are not present within the subject land.	-
Wind turbine strikes	Not relevant. The project does not comprise a wind farm development.	-
Vehicle strikes	Not relevant. Although the project includes the construction of a new car park, vehicle movement is limited and no impacts to threatened species are predicted.	-

7. Avoid and Minimise Impacts

This section includes demonstration of efforts to avoid and minimise impacts on biodiversity values identified within the subject land, which includes assessment of direct, indirect and prescribed impacts. Any mentioning of the development footprint within this chapter is synonymous with the subject land.

7.1. Avoid and Minimise Direct and Indirect Impacts on Native Vegetation and Habitat

Under the BAM, measures taken to avoid and minimise impacts on biodiversity values from the development need to be documented. As described in previous chapters of this BDAR, the study area comprises an area of approximately 0.08 ha of Cumberland Plain Woodland CEEC comprised of a small patch in the centre of the site and a single canopy tree in the northern north-eastern extent, which is of high biodiversity value because of the highly cleared condition of this community. The remainder of the site comprises a mix of planted native and exotic vegetation that is generally considered to be of low biodiversity value.

When considering the requirements associated with the overall project, the scattered nature of the vegetation and the fact that the site has already been modified for the purposes of the existing land use as a park and sports field, opportunities to avoid all impacts on native vegetation in general and Cumberland Plain Woodland in particular are limited. As a result, the small patch of Cumberland Plain Woodland within the centre of the site will be removed as part of the project.

Several options for alternative designs were considered as part of the detailed design process of the project. These alternatives included locating the proposed Centre of Excellence further south along the southern end of the playing fields within the study area, with the community facility remaining along the eastern boundary of the playing fields. The new car park would also be located further south adjacent to the Centre of Excellence. However, this was not the preferred option for the following reasons:

- Alternatives would require rearrangement of already existing playing fields, which would result in a conflict with RMS road upgrades and future car parking;
- Disconnection between four playing fields due to alternative position of the Centre of Excellence;
- 'End of field' connection (visual and physical) between Centre of Excellence and primary training pitch;
- Lesser connection between new car park and Community Facility;
- Centre of Excellence would have less 'street presence' due to setback from Memorial Avenue;
- Significant cost of relocating existing playing fields;
- Adjacency of the Centre of Excellence and Community Facility to the recently constructed playing fields; and
- Consistency with the Kellyville Park Masterplan.

As a result, the proposed design presented in this BDAR is the preferred design for the project.

The 'do nothing' option for the project would maintain current vegetation cover on site but would not capitalise on the opportunity to upgrade the community facilities within The Hills Shire LGA through government funding. It would also not result in the project associated increase in canopy cover within the site. With an expected future population growth of the LGA, there will likely be extra demand placed on The Hills Shire Council ('Council') to provide more playing fields in the local area. The most cost-effective way of meeting this demand is to better utilise the facilitates that Council already manages rather than development a new alternative site. From a biodiversity perspective, most of the study area has already been subject to historical clearing, with the majority of the site now comprising planted native and exotic vegetation over exotic lawns. Hence, the impacts on biodiversity associated with a redevelopment of the subject land are considered to be relatively low considering the already modified nature of the site.

A partial development of the subject land to avoid and minimise the impacts on biodiversity is also not considered a feasible option for the project. The PNRL are responsible for the management and development of the Parramatta Junior Rugby League (PJRL) competition within the community, a unique position for a professional sporting organisation. The administration of the PJRL competition will occur out of the Centre of Excellence Building, hence its' required positioning adjacent to the Community Facility. The development of the Community Facility is key in providing the best facilities for Community Level Rugby League and other sports in Western Sydney.

Despite the information listed above, minimisation of impacts can still be achieved to a degree by the modification of the location and design of the project. Details of the minimisation measures adopted for the project are outlined in ***Section 7.1.1*** and ***Sections 7.2.1-7.2.2***. A summary of avoidance and minimising measures considered for this project is provided in **Table 12**.

7.1.1. Project Location and Design

In determining the location and design of the final development footprint, the project has sought to minimise impacts on native vegetation and habitat by:

- Locating the project predominantly within areas containing exotic-dominated vegetation which has previously been cleared;
- Locating the project in areas to retain the majority of canopy cover within the study area, including both Planted Native Vegetation and one mature tree associated with PCT 849;
- Incorporating a detailed landscape design as part of the project, to facilitate an overall increase in canopy cover within the study area;
- Designing the project's landscaping to incorporate replacement plantings of the TEC Cumberland Plain Woodland;
- Implementation of a suite of mitigation measures as part of the project (***Section 8.5***), to minimise the impacts on biodiversity, including:
    - Weed management;

- Pre-clearance surveys and clearance supervision;
- Tree protection measures;
- Sedimentation control measures; and
- Staging of clearing.

7.2. Avoid and Minimise Prescribed Impacts

7.2.1. Non-native Vegetation

Areas of non-native vegetation within the study area are predominantly in the form of managed lawns, with some smaller scattered areas of woody vegetation.

Although the non-native vegetation may provide some habitat value for native fauna in terms of shelter and foraging resources, these areas are unlikely to be favoured over the adjoining forest and woodland habitats outside of the study area.

Nevertheless, the location of the project and development design have been focused on avoiding and minimising impacts native trees and overall canopy cover. Hence, impacts to the areas of non-native vegetation are not able to be avoided as part of the project.

7.2.2. Habitat Connectivity

The subject land occurs in a highly urbanised environment and is not part of an established habitat corridor. Nonetheless, the treed areas of the subject land are likely to function as stepping-stone habitat for highly mobile fauna species between larger tracts of bushland. Minor direct impacts to habitat connectivity may occur as a result of the reduction of trees within the central portion of the subject land.

As explained in previous sections, when considering the requirements associated the project in combination with the scattered nature of the existing vegetation, there are limited opportunities to avoid all impacts on native vegetation and associated habitat connectivity. Nevertheless, the project has focused on retaining the majority of the canopy cover within the study area whilst still achieving a highly functional development. Therefore, although there will be some minor reduction in the overall habitat connectivity supported by the subject land, the overall study area will continue to function as stepping-stone habitat between larger patches of woodland in the wider landscape. Furthermore, the proposed future native plantings of Cumberland Plain Woodland as part of the landscaping of the project within the site will also contribute significantly to the habitat connectivity in the wider landscape in the long-term.

Table 12 Summary table of options considered for the project to avoid and minimise impacts on biodiversity

Action	Adopted (Yes/No/In part)	Justification	Timing (if adopted)	Responsibility (if adopted)	Outcome (if adopted)
Implementation of a suite of mitigation measures	Yes	To minimise the impacts on biodiversity, a suite of mitigation measures will be implemented such as weed management, tree protection measures, pre-clearance surveys, and landscaping and replacement plantings.	Pre and post construction and during operation phase	Proponent and consultant team	Minimise impacts on biodiversity
Locating the project predominantly within areas containing exotic-dominated vegetation which has previously been cleared	Yes	The project has been located in an area where the majority of vegetation to be impacted comprises exotic vegetation and grasslands, in the form of managed lawns.	Project planning	Proponent and consultant team	Impacts predominantly occur in areas of low biodiversity value, with the majority of native canopy cover retained.
Partial development of the study area to avoid/minimise impacts on biodiversity and achieve greater tree retention	No	The PNRL are responsible for the management and development of the PJRL competition within the community, a unique position for a professional sporting organisation. The administration of the PJRL competition will occur out of the Centre of Excellence Building, hence its' required positioning adjacent to the Community Facility. The development of the Community Facility is key in providing the best facilities for Community Level Rugby League and other sports in Western Sydney.	-	-	-

Action	Adopted (Yes/No/In part)	Justification	Timing (if adopted)	Responsibility (if adopted)	Outcome (if adopted)
'Do-nothing' option to avoid all impacts on biodiversity	No	The do-nothing option for the project would maintain current tree cover on site but would not enable redevelopment of the study area to meet the demand of the growing population in the LGA. Under a no-go option, trees would remain and continue to grow and age, potentially to form hollows. However, there would be no requirement to replant or maintain native plant species on the site. Furthermore, if a tree dies or is damaged in a storm there would be no requirement for the tree to be replaced. Therefore, over time, there is potential for the existing canopy area to be reduced and for the native vegetation to be degraded.	-	-	-
Consideration of alternative sites and layouts for the project within the study area	In part	Several layout options and alternative locations within the study area were considered as part of the detailed design phase. The final option selected has consideration to retention of majority of canopy cover as well as a functioning development that maximises the use of existing playing fields.	During design and approval	Proponent and consultant team	Retention of majority of canopy cover within the study area, whilst achieving an optimal project design.

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8. Assessment of Impacts

8.1. Direct Impacts

8.1.1. Native Vegetation

The direct impact resulting from the proposed development is the loss of vegetation and associated habitat within the subject land. **Table 13** identifies the extent of impacts to vegetation within the subject land.

Table 13 Extent of vegetation impacts within the subject land

Vegetation Zone	PCT #	PCT Name	BC Act Status	Subject Land (ha)
1	849	Cumberland Shale Plains Woodland	CEEC	0.08
-	-	Planted native vegetation	-	0.06
-	-	Exotic vegetation and grassland	-	0.62
Total				**0.76**

CEEC = Critically endangered ecological community

8.1.2. Threatened Species

No species credit species will be impacted by the proposed development.

8.2. Change in Vegetation Integrity Score

Table 14 details the change in vegetation integrity score for the one vegetation zone within the subject land.

For the purpose of this assessment, it has been assumed that all vegetation within the subject land will be cleared within the BAM-C, as described in ***Section 2.7.***

Table 14 Changes in vegetation integrity score

Zone	PCT Name	BC Act Status	BRW	Area (ha)	VI Score			
					Current	Future	Change	Total Change
1	849 – Cumberland Shale Plains Woodland	CEEC	2.5	0.08	26.1	0	-26.1	-26.1

BRW = Biodiversity Risk Weighting
VI Score = Vegetation Integrity Score

8.3. Indirect Impacts

Table 15 outlines the indirect impacts to native vegetation and habitat. No limitations to the assessment of indirect impacts have been identified.

Due to the existing highly modified nature of the vegetation both within and adjacent to the subject land, the indirect impacts of the project are not considered to be significant. No indirect impact zones have been identified for the purpose of this assessment.

Table 15 Indirect impacts of the project

Indirect Impact	Nature	Extent	Duration	Threatened Entities Likely Affected	Consequences
Inadvertent impacts on adjacent habitat or vegetation	Impact possible. Construction and operational activities may result in inadvertent impacts on vegetation surrounding the subject land and retained vegetation within the subject land, such as increased sedimentation.	Native vegetation surrounding the subject land, and retained within the subject land.	Short term (during construction) and potential long term	Cumberland Plain Woodland	Further reduced condition of the retained area of Cumberland Plain Woodland.
Reduced viability of adjacent habitat due to edge effects	Impact possible. Construction and operational activities may increase edge effects slightly along the eastern boundary of the subject land.	Native vegetation surrounding the subject land, and retained within the subject land.	Short term (during construction) and potential long term	Cumberland Plain Woodland	Further reduced condition of the retained area of Cumberland Plain Woodland.
Reduced viability of adjacent habitat due to noise, dust or light spill	Impact possible. The construction activities associated with the project are likely to increase the noise, dust and light above current levels within and immediately adjacent the subject land. Some impacts such as noise or light may persist during the operational phase.	Native vegetation surrounding the subject land	Short term (during construction) and potential long term	Ecosystem credit species	Short term disruption of fauna habitat usage during construction, with potential for ongoing occupation impacts.
Transport of weeds and pathogens from the site to adjacent vegetation	Impact possible. A number of high threat exotic weeds are known to occur within the subject land and may be inadvertently spread to surrounding vegetation.	Native vegetation surrounding the subject land, and retained within the subject land.	Potential long-term	Cumberland Plain Woodland	Further reduced condition of the retained areas of Cumberland Plain Woodland.
Increased risk of starvation, exposure	Impact unlikely. The project is predominantly in cleared land, and unlikely to cause displacement of fauna such that it	-	-	-	-

Indirect Impact	Nature	Extent	Duration	Threatened Entities Likely Affected	Consequences
and loss of shade or shelter	increases the risk of starvation, exposure and loss of shade or shelter.				
Loss of breeding habitats	Impact unlikely. Fauna breeding habitat occurs in adjacent vegetation, and includes hollow-bearing trees. The project is unlikely to result in the loss of breeding habitat within adjacent areas.	-	-	-	-
Trampling of threatened flora species	Impact unlikely. No threatened flora species known or likely to occur.	-	-	-	-
Inhibition of nitrogen fixation and increased soil salinity	Impact unlikely. The project is not considered to result in the inhibition of nitrogen fixation and increased soil salinity.	-	-	-	-
Fertiliser drift	Impact unlikely. The project does not involve fertiliser application, therefore the project is not considered to result in this indirect impact.	-	-	-	-
Rubbish dumping	Impact possible. Occupation of the subject land may result in rubbish dumping within adjoining areas of retained woody vegetation in the wider study area.	Native vegetation surrounding the subject land	Potential long term	Cumberland Plain Woodland	Further reduced condition of the retained Cumberland Plain Woodland.
Wood collection	Impact unlikely to occur, considering the nature of the subject land and the project, and residential status of surrounding areas.	-	-	-	-
Bush rock removal and disturbance	Impact unlikely. No bush rock has been identified within the subject land or	-	-	-	-

Indirect Impact	Nature	Extent	Duration	Threatened Entities Likely Affected	Consequences
	immediate vicinity, therefore the project is not considered to result in this indirect impact.				
Increase in predatory species populations	Impact unlikely. Considering the modified nature and the existing usage of the subject in combination with the nature of the project and the highly urbanised surrounding areas, the project is considered unlikely to result in an increase in predatory species populations.	-	-	-	-
Increase in pest animal populations	Impact unlikely. Considering the modified nature and the existing usage of the subject in combination with the nature of the project and the highly urbanised surrounding areas, the project is considered unlikely to result in an increase in pest animal populations.	-	-	-	-
Increased risk of fire	Impact unlikely. The project is unlikely to increase the risk of bushfire and does not occur on bushfire prone land.	-	-	-	-
Disturbance to specialist breeding and foraging habitat	Impact possible. Occupation of the development area may result in disturbance to adjoining foraging habitat	Native vegetation surrounding the subject land	Potential long term	Ecosystem credit species	Further reduced condition of potential foraging habitat.

8.4. Prescribed Impacts

The project has been assessed as resulting in two prescribed impacts (see ***Chapter 6***). An assessment of these prescribed impacts is provided below in accordance with Section 8.3 of the BAM.

8.4.1. Non-native Vegetation

8.4.1.1. Nature

Non-native vegetation to be impacted by the project occurs mainly as open areas of managed lawns within the existing Kellyville Park, and some smaller scattered areas of woody exotic vegetation.

8.4.1.2. Extent

The project will clear a total of approximately 0.62 ha of non-native vegetation. The majority of this comprises exotic dominated grasslands in the form of managed lawns in the southern portion of the subject land, which is considered to be of low habitat value.

8.4.1.3. Duration

Impacts to non-native vegetation would occur during the construction phase of the project. The removal of the non-native vegetation is a long-term impact.

8.4.1.4. Threatened Entities Affected

The habitat provided by non-native vegetation may provide some foraging habitat for ecosystem species, such as microchiropteran bats and birds, mainly within the small occurrences of woody exotic vegetation. The non-native vegetation is not considered suitable breeding/nest habitat due to lack of hollows.

8.4.1.5. Consequences

The project will result in a reduction in non-native vegetation by approximately 0.62 ha. The reduction of this small area of habitat is not considered to significantly impact upon the potentially affected threatened entities as other areas of suitable habitat, in the form of both native and non-native vegetation, will remain within the study area and wider assessment area. Furthermore, the majority of the non-native vegetation to be removed comprises exotic dominated lawns that are considered to be of low habitat value.

8.4.2. Habitat Connectivity

8.4.2.1. Nature

The native vegetation within the subject land has the potential to function as stepping-stone habitat that connects larger areas of woody vegetation within the assessment area (see **Figure 2**). The woody vegetation proposed to be removed from within the subject land occurs as scattered individual trees or as part of small patches within a mostly cleared site.

8.4.2.2. Extent

Habitat connectivity will be marginally reduced by the removal of 0.14 ha of woody native vegetation. Removal of the woody vegetation within the subject land will not result in further fragmentation of habitat in the locality, as it is only a very small decrease in total area. The majority of the subject land has previously been cleared of

treed vegetation, and approximately 0.21 ha of woody native vegetation will be retained within the study area and will continue to function as stepping-stone habitat in the landscape.

8.4.2.3. Duration

Direct impacts to habitat connectivity would occur during the construction and operational phase of the project. The reduction of habitat connectivity is considered to be a long-term impact.

8.4.2.4. Threatened Entities Affected

The habitat provided by woody vegetation may provide foraging habitat for ecosystem species, such as the Grey-headed Flying-fox, microchiropteran bats and birds.

8.4.2.5. Consequences

The project will result in the reduction in woody vegetation by 0.14 ha, represented by PCT 849 and Planted Native Vegetation, which would function as stepping-stone habitat between larger areas of habitat. The reduction of this small area of habitat is not considered to significantly impact the movement of mobile fauna species as extensive areas of similar vegetation and habitat, including better connected and larger areas of remnant vegetation, is located in the adjacent native vegetation in the immediate surrounding area. For example, the Grey-headed Flying-fox forages opportunistically, often at distances up to 30 km from camps, and occasionally up to 60-70 km per night, in response to patchy food resources (NSW Scientific Committee 2004). It is considered unlikely that native fauna would be solely reliant on the habitat within the subject land for movement between different areas of habitat.

8.5. Mitigation of Impacts to Native Vegetation and Habitat

A range of mitigation measures have been developed for the project to mitigate the impacts to native vegetation and habitat that are unable to be avoided. These include a range of measures to be undertaken before and during construction to limit the impact of the project. Each mitigation measure is discussed in detail below, and a summary is provided in **Table 16**.

8.5.1. Weed Management

In order to minimise the spread of weeds throughout the subject land and adjoining areas, appropriate weed control activities will be undertaken prior to vegetation clearing in accordance with the *Greater Sydney Regional Strategic Weed Management Plan 2017 – 2022* (LLS: Greater Sydney 2019) under the NSW *Biosecurity Act 2015*.

The *Biosecurity Act 2015* and regulations provide specific legal requirements for state level priority weeds and high risk activities, as provided in the Appendices of the *Greater Sydney Regional Strategic Weed Management Plan 2017 – 2022* (LLS: Greater Sydney 2019). In order to comply with the objectives of the plan, it is recommended the following measures be implemented as part of weed management for the subject land.

i. Prevention

Appropriate construction site hygiene measures will be implemented to prevent entry of new weeds to the area such as the cleaning of equipment prior to entering the subject land.

ii. Eradication

Initial weed management will be carried out within the subject land according to best-practice methods. The targeted species will be those listed under Appendices 1 and 2 of the *Greater Sydney Regional Strategic Weed Management Plan 2017 – 2022* (LLS: Greater Sydney 2019). Initial weed treatment will include eliminating woody species and targeting large dominant infestations of exotic herbs. This may be achieved via a combination of manual weed removal and herbicide use.

Weed management measures should avoid adverse impacts to retained vegetation within the subject land, including not over clearing (remove only targeted species), employment of minimal disturbance techniques to avoid soil and surrounding vegetation disturbance.

iii. Containment

Follow-up monitoring and maintenance should be undertaken in the subject land following vegetation clearing activities, to contain any re-emergence of weed species.

8.5.2. Delineation of Clearing Limits

The current limits of clearing will be marked either by high visibility tape on trees or metal/wooden pickets, fencing or an equivalent boundary marker that will be installed prior to clearing. To avoid unnecessary or inadvertent vegetation and habitat removal or impacts on fauna, disturbance must be restricted to the delineated area and no stockpiling of equipment, machinery, soil or vegetation will occur beyond this boundary.

8.5.3. Tree Protection Measures

As outlined in the Arboricultural Impact Assessment prepared by Earthscape Horticultural Services (2022) and associated Tree Protection Plan, several tree protection measures are recommended to be implemented to avoid inadvertent impacts to trees that are marked for retention. These measures include the implementation of tree protection fencing of retained trees and relevant signage, as well as specific measures for demolition and excavation works within Tree Protection Zones. Further details on tree protection measures are outlined in the Arboricultural Impact Assessment (Earthscape Horticultural Services. 2022).

8.5.4. Pre-clearance Surveys

In order to minimise impacts to fauna species during the construction of the project, pre-clearance surveys will be conducted in all areas of woody vegetation that are required to be cleared or modified. Pre-clearing surveys will be undertaken within one week of clearing activities by a qualified ecologist.

Although some were not recorded during the current assessment, the pre-clearance survey will seek to identify the following habitat features within the APZ:

- Hollow-bearing trees;
- Hollow-bearing logs; and
- Nests within tree canopy or shrubs.

Such features have the potential to contain native species. All habitat features will be identified, recorded and flagged with fluorescent marking tape and trees will have an "H" spray painted with marking paint on two sides of the tree.

8.5.5. Staging of Clearing

The clearing will be conducted using a two-stage clearing process as follows:

Stage 1: Clearing will commence following the identification of potential habitat features by a qualified ecologist. If found, hollow-bearing trees marked during pre-clearing will not be cleared during the first stage; however all vegetation around these trees will be cleared to enable isolation of the feature. Other habitat features, such as hollow-bearing logs, can be removed during Stage 1 done under supervision by a qualified ecologist. Identified hollow-bearing trees will be left at a minimum overnight after Stage 1 clearing to allow resident fauna to voluntarily move from the area.

Stage 2: After hollow-bearing trees have been left overnight, the trees will be cleared in a manner to minimise impacts to fauna. This includes shaking the hollow-bearing trees with machinery, slowly pushing over the tree and inspection of hollows by an ecologist for the presence of fauna following felling of the tree.

Provisions will be made to protect any native fauna during clearing activities by the following means:

- All staff working on the vegetation clearing will be briefed about the possible fauna present and should avoid injuring any present;
- Animals disturbed or dislodged during the clearance but not injured will be assisted to move to adjacent bushland or other specified locations; and
- If animals are injured during the vegetation clearance, appropriate steps will be taken to humanely treat the animal (either taken to the nearest veterinary clinic for treatment, or if the animal is unlikely to survive, it will be humanely euthanised).

8.5.6. Sedimentation Control Measures

The project may result in erosion and transport of sediments as a result of soil disturbance during construction. In order to prevent this impact, construction activities will be undertaken in accordance with "The Blue Book" (Landcom 2004). These include implementation of the following measures:

- Installation of sediment control fences;
- Covering soil stockpiles; and
- Avoiding soil disturbance prior to heavy rainfall.

8.5.7. Landscaping and Replacement Plantings

Landscaping works will be undertaken within the subject land in accordance with the Landscape Architecture Report prepared by iScape (2022). The landscaping for the subject land involves consideration of increased canopy coverage, and includes provisions for replacement plantings of a new large area dominated by species

associated with the TEC Cumberland Plain Woodland. The area identified for the replacement planting will, in combination with the retention of the majority of existing woody vegetation within the study area, ensure that the canopy coverage within the study area will increase as a result of the project.

The proposed compensatory plantings will cover an area of approximately 2000m^2. As a result, the future canopy cover of the site that is proposed as part of this project, once completed, will comprise approximately 4,935m^2.

Further details of the landscaping and replacement plantings are provided in the Landscape Architecture Report (iScape. 2022).

8.5.8. Habitat Salvage

Where native trees are to be felled, suitable sections of the tree are to be salvaged for reuse as logs in retained and revegetated areas of Cumberland Plain Woodland. This will include sections of the tree trunk that are >25-30cm DBH and approximately 2-3m in length. Consideration will also be given to the reuse of root balls where possible. In the event that hollow-bearing trees are identified during the pre-clearance assessment or clearance supervision, then hollows are to be removed and placed into retained trees. Suitable sections of the tree to be salvaged will be identified by the project ecologist during clearing supervision.

The sections of the tree to be salvaged will be removed using a chainsaw and either stockpiled for future reuse once landscaping has been completed, or placed directly into retained areas of Cumberland Plain Woodland following clearing. The reuse of native trees will provide additional habitat to native fauna species.

Table 16 Summary of mitigation measures

Mitigation Measure	Impact Addressed	Proposed Techniques	Timing	Frequency	Responsibility	Risk of Failure	Consequences of Residual Impacts
Weed management	Direct, indirect	Appropriate weed control activities will be undertaken in accordance with the *Greater Sydney Regional Strategic Weed Management Plan 2017 – 2022* (LLS: Greater Sydney 2019).	Construction	Prior to construction, following vegetation clearing	Contractor	Moderate	Further Spread of weeds throughout the surrounding land.
Delineation of clearing limits	Indirect, prescribed	Clearing limits marked either by high visibility tape on trees of metal/wooden pickets, fencing or an equivalent boundary marker. Disturbance, including stockpiling, restricted to clearing limits.	Construction	Once	Contractor	High	Unnecessary damage to retained trees in adjoining vegetation.
Tree Protection Measures	Indirect, prescribed	Implementation of tree protection measures in accordance with Arboricultural Impact Assessment.	Construction	Prior to construction and vegetation clearing	Contractor	High	Unnecessary damage to retained trees in the subject land and study area.
Pre-clearance survey	Direct, prescribed	Pre-clearance surveys will be conducted in all areas of vegetation that are required to be cleared. Pre-clearing surveys will be undertaken within one week of clearing. Habitat features will be marked during the pre-clearing survey.	Construction	Once	Contractor	Moderate	Increased and unnecessary mortality of native fauna.

Mitigation Measure	Impact Addressed	Proposed Techniques	Timing	Frequency	Responsibility	Risk of Failure	Consequences of Residual Impacts
Staging of clearing	Direct, prescribed	Vegetation clearing will be conducted using a two-stage clearing process. Animals disturbed or dislodged during the clearance but not injured will be assisted to move to adjacent bushland or other specified locations If animals are injured during the vegetation clearance, appropriate steps will be taken to humanely treat the animal (either taken to the nearest veterinary clinic for treatment, or if the animal is unlikely to survive, it will be humanely euthanized)	Construction	Once	Contractor	High	Increased and unnecessary mortality of native fauna.
Sedimentation control	Indirect, prescribed	Construction activities will be undertaken in accordance with "The Blue Book" (Landcom 2004). These include implementation of the following measures: Installation of sediment control fences; Covering soil stockpiles; and Avoiding soil disturbance prior to heavy rainfall	Construction	Throughout construction period	Contractor	Moderate	Sedimentation into adjoining vegetation.

Mitigation Measure	Impact Addressed	Proposed Techniques	Timing	Frequency	Responsibility	Risk of Failure	Consequences of Residual Impacts
Landscaping and Replacement Plantings	Direct, prescribed	Landscaping and replacement plantings will be undertaken within the subject land using species associated with the TEC Cumberland Plain Woodland.	Operation	Post construction	Contractor	Moderate	Loss of canopy cover and connectivity
Habitat Salvage	Direct, prescribed	Suitable sections of felled native trees will be removed using a chainsaw and placed into areas of Cumberland Plain Woodland	Construction	Once	Contractor	Low	Reduction in available habitat for fauna species

8.6. Mitigation of Prescribed Impacts

The following mitigation measures, described in ***Section 8.5***, are relevant to the prescribed impacts relevant to the project:

- Delineation of clearing limits;
- Tree protection measures;
- Pre-clearance survey;
- Staging of clearing;
- Landscaping and replacement plantings; and
- Habitat salvage.

No additional mitigation measures are proposed for prescribed impacts.

8.7. Adaptive Management for Uncertain Impacts

The project is considered unlikely to result in any uncertain impacts that require adaptive management.

8.8. Use of Biodiversity Credits to Mitigate or Offset Indirect or Prescribed Impacts

Due to the small scale of indirect and prescribed impacts, the project does not propose to use biodiversity credits to mitigate or offset these type of impacts.

9. Thresholds of Assessment

9.1. Introduction

The assessment thresholds that must be considered include the following:

- Impacts on an entity that is at risk of a serious and irreversible impact;
- Impacts for which the assessor is required to determine an offset requirement;
- Impacts for which the assessor is not required to determine an offset requirement; and
- Impacts that do not require further assessment by the assessor.

The following sections outline these assessment thresholds and their relevance to the project.

9.2. Impacts on Serious and Irreversible Impact Entities

One candidate SAII entity have been considered as relevant to the project, being Cumberland Plain Woodland. Further consideration of this entity is provided below.

9.2.1. Cumberland Plain Woodland

Cumberland Plain Woodland is confirmed as occurring within the subject land and will be impacted by the project. The location of the Cumberland Plain Woodland within the subject land is shown in **Figure 11**.

Approximately 0.08 ha of Cumberland Plain Woodland has been assessed as proposed to be removed within the subject land for the purpose of this assessment. However, as mentioned within **Chapter 7**, it should be noted that approximately 0.01 ha of the noted 0.08 ha will actually be retained within the landscaping of the project, which is represented by one canopy tree along the north-eastern boundary of the subject land. The area that has been assessed for removal comprises native canopy trees with an exotic-dominated understorey.

Section 9.1.1 of the BAM requires the provision of additional information regarding SAII entities that are TECs. The additional information is required to assist the consent authority to evaluate the nature of an impact on a potential entity at risk of a serious and irreversible impact. The additional information requirements are provided in **Table 17**.

Table 17 Additional impact assessment provisions for Cumberland Plain Woodland

Criteria	Additional Impact Assessment Provisions	Response
1	The assessor is required to provide further information in the BDAR or BCAR regarding the impacts on each TEC at risk of an SAII. This must include the action and measures taken to avoid the direct and indirect impact on the TEC at risk of an SAII. Where these have been addressed elsewhere the assessor can refer to the relevant sections of the BDAR and BCAR.	Avoidance of impacts to Cumberland Plain Woodland is addressed in **Chapter 7**.
2	The assessor must consult the TBDC and/or other sources to report on the current status of the TEC including:	-
(a)	Evidence of reduction in geographic distribution (Principle 1, clause 6.7(2)(a) BC Regulation) as the current total geographic extent of the TEC in NSW and the estimated reduction in geographic extent of the TEC since 1970 (not including impacts of the proposal)	The current total geographic extent of Cumberland Plain Woodland varies depending on the source interrogated. The current extent of Cumberland Plain Woodland in the TBDC is described as only less than 9% of the original extent remaining and does not include a conclusive total area for the community. BioNet Vegetation Classification Database estimates the current area of occupancy of the community based on the two PCTs (849 and 850) conforming to Cumberland Plain Woodland with available data as approximately 11,200 ha of the original 'Pre-European Extent' published on the database of 71,200 ha. It is noted however, that BioNet Vegetation Classification Database documents two further PCTs as potentially conforming to the BC Act listing of Cumberland Plain Woodland. These PCTs however, do not contain published total areas for the communities. Therefore, the BioNet total current and Pre-European Extent areas of the community cannot be accurately estimated.

Criteria	Additional Impact Assessment Provisions	Response
		Cumberland Plain Woodland is also associated with a targeted recovery plan for the Cumberland Plain that was prepared by the Department of Environment, Climate Change and Water in 2011 (DECCW 2011). This document is the currently accepted standard for the retention and recovery of TECs in the Cumberland Plain. Table 2 of the recovery plan displays an estimated current total of Cumberland Plain Woodland of 24,530 ha, however, it is reported that a small portion of this total does not meet the listing criteria for the TEC. The same table also estimates the 'Pre-1750 (ha)' total of the community at 125,449 ha being a reduction in area to current levels of approximately 20%. Of the current total area, the recovery plan reports approximately 967 ha identified as occurring within reserves. The Final Determination for Cumberland Plain Woodland (NSW Scientific Committee 2009) identifies that the TEC is restricted in geographic distribution to the Sydney Basin Bioregion and was estimated to have an extant area of approximately 11,054 ha (±1,564 ha) according to mapping by Tozer (2003), which covered the Cumberland Plain. This is reported by the final determination as being a reduction from the 'Pre-European distribution' by 8.8% (±1.2%) suggesting the Pre-European distribution of the community to cover approximately 125,613 ha. According to the Map of Critically Endangered Ecological Communities NSW Version 6 dated 25/02/2020 (DPIE 2020) the current extent of Cumberland Plain Woodland in NSW is approximately 23,020 ha. The mapping layer Threatened Ecological Communities Greater Sydney (DPIE 2021) provides a similar estimate for the current extent of Cumberland Plain Woodland as 21,951 ha. These mapping projects are the most recent and comprehensive published mapping available and could be considered to be most accurate of the sources reviewed.

Criteria	Additional Impact Assessment Provisions	Response
		Following a review of the above information for the extent of Cumberland Plain Woodland, both current and prior to European settlement, it is clear there is some variation in area calculations. It is noted however, that it is unanimously accepted by all sources that the community has suffered extensive clearing to a level that the community requires significant external intervention to maintain and recover the community within the Sydney Basin Bioregion. The estimated reduction in the geographic extent of Cumberland Plain Woodland since 1970 is not available in the TBDC, BioNet Vegetation Classification Database, the final determination or the recovery plan, and was not identified from a search of available literature. Nonetheless, the pre-European extent of Cumberland Plain Woodland is listed as approximately 125,449 ha within the Cumberland Plain Recovery Plan (DECCW 2011). No published data was found in the literature on the 1970 extent of Cumberland Plain Woodland and an accurate estimate of the reduction in distribution between the current extent and the 1970 geographic extent cannot be provided.
(b)	The extent of reduction in ecological function for the TEC using evidence that describes the degree of environmental degradation or disruption to biotic processes (Principle 2, clause 6.7(2)(b) BC Regulation) indicated by: • Change in community structure • Change in species composition • Disruption of ecological processes	According to the final determination for Cumberland Plain Woodland, there has been a very large reduction in the ecological function of the community through processes such as: • Extensive removal of large old trees; • Tree-felling for crops and pastures; • Fragmentation of habitat; • Grazing by livestock and rabbits;

Criteria	Additional Impact Assessment Provisions	Response
	• Invasion and establishment of exotic species • Degradation of habitat; and • Fragmentation of habitat	• Modification of understory, to be dominated by woody exotic species; • Soil chemical and structural modification associated with agricultural uses; • Changes in frequency of fire regimes; • Prevention of recruitment of species, through continued under-scrubbing and mowing; and • Reduction of understorey complexity, through the reduction of native shrub cover, resulting in degradation of habitat.
(c)	Evidence of restricted geographic distribution (Principle 3, clause 6.7(2)(c) BC Regulation), based on the TEC's geographic range in NSW according to the: • extent of occurrence • area of occupancy, and • number of threat defined locations	Paragraph 11 of the Final Determination for Cumberland Plain Woodland (NSW Scientific Committee 2009) identifies that the community is restricted in geographic distribution to the Sydney Basin Bioregion, however it is noted that this is based on an estimated extant area of 2,810 km^2, which was established from outdated mapping undertaken by Tozer (2003). Based on current available information it is estimated that the current area of occupancy is between approximately 11,000 ha and 25,000 ha according to resources reviewed for Criteria 2(a). No threat defined location are specifically identified in the TBDC, however the ecological community is critically endangered across its range. According to the Final Determination (NSW Scientific Committee 2009), small, protected areas of the community exist in reserves such as Kemps Creek, Mulgoa and Windsor Downs, Scheyville National Park, and Leacock, Rouse Hill and Western Sydney Regional Parks.
(d)	Evidence that the TEC is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation)	This principle is not identified as applicable to BDARs. It is noted that the TEC does respond to management, with several successful management measures outlined in the Best Practice Guidelines for Cumberland Plain Woodland (DEC (NSW) 2005).

Criteria	Additional Impact Assessment Provisions	Response
3	Where the TBDC indicates that data is 'unknown' or 'data deficient' for a TEC for a criterion listed in Section 9.1.1(2), the assessor must record this in the BDAR.	Not applicable.
4 (a)	The impact on the geographic extent of the TEC (Principles 1 and 3) by estimating the total area of the TEC to be impacted by the proposal: • in hectares; and • as a percentage of the current geographic extent of the TEC in NSW	The proposal will remove or modify approximately 0.08 ha of Cumberland Plain Woodland in the subject land. The extent of the TEC in NSW differs depending on the information source. Based on a review of vegetation mapping layers, the estimated geographic extent in NSW is between approximately 11,000 ha and 25,000 ha according to resources reviewed for Criteria 2(a). However, based on the existing literature, the lowest number quoted for the estimated geographic extent of Cumberland Plain Woodland is 11,054 ha (OEH 2011). Based on the lower of the numbers outlined above, the extent of Cumberland Plain Woodland to be impacted by the project is less than 0.001% of the current geographic extent of the TEC in NSW.
(b)	The extent that the proposed impacts are likely to contribute to further environmental degradation or the disruption of biotic processes (Principle 2) of the TEC by:	-
	• Estimating the size of any remaining, but now isolated, areas of the TEC; including areas of the TEC within 500m of the development footprint or equivalent area for other types of proposals	The project is not likely to result in the isolation of an area of Cumberland Plain Woodland from other areas of the community, as the subject land already occurs as an isolated patch within a mostly cleared site. One small patch (0.27 ha) of Cumberland Plain Woodland is mapped as occurring within 500m of the subject land, on the southern side of Fairway Drive.

Criteria	Additional Impact Assessment Provisions	Response
	• Describing the impacts on connectivity and fragmentation of the remaining areas of the TEC measures by:	-
	○ Distance between isolated areas of the TEC, presented as the average distance if the remnant is retained AND the average distance if the remnant is removed as proposed, and	The distance between isolated areas of the TEC will not be increased by the removal of the occurrence in the subject land, as the small patch of the TEC in the subject land occurs as an isolated patch surrounded by developed land. Other small scattered patches occur to the north-west and south of the subject land, however, the removal of the occurrence within the subject land will not increase the average distance between these patches as it occurs on the edge of the eastern extent of these scattered patches. The distance between the small southern patch of the TEC, which occurs within 500m of the subject land, and the next nearest patch of the TEC is currently ~320m. The distance between the occurrence of the TEC in the subject land to this patch is currently ~531m. With the removal of the occurrence of the TEC in the subject land, the distance between the Cumberland Plain Woodland south of Fairway Drive and the next nearest patch is still ~320m.
	○ Estimated maximum dispersal distance for native flora species characteristic of the TEC, and	The main dispersal mechanisms for flora species associated with Cumberland Plain Woodland include one or a combination of the following: • animals, • wind, • water runoff, and • gravity. Eucalypts within the community are likely to rely on animal assisted dispersal by highly mobile vertebrate pollinators (birds and bats) which disperse pollen over large areas when foraging (Southerton S.G. 2003). The maximum dispersal distance for native flora

Criteria	Additional Impact Assessment Provisions	Response
		species characteristic of the community is estimated to be at least 100 m and potentially much further.
	○ Other information relevant to describing the impact on connectivity and fragmentation, such as the area to perimeter ratio for remaining areas of the TEC as a result of the development	The occurrence of Cumberland Plain Woodland within the study area already occurs as a relatively isolated occurrence of the TEC, with other patches of the TEC occurring in surrounding areas as scattered patches. The project will therefore not increase the fragmentation of this TEC however it will reduce the extent of the TEC within the study area by ~0.08 ha in the short to medium term. In the long-term, with the compensatory planting of Cumberland Plain Woodland as part of the proposed landscaping, the occurrence of the TEC in the subject land will increase and add significantly to the connectivity through the site and wider landscape.
	• Describing the condition of the TEC according to the vegetation integrity score for the relevant vegetation zone (s) (Section 4.3). The assessor must also include the relevant composition, structure and function condition scores for each vegetation zone.	The Cumberland Plain Woodland in the subject land corresponds to PCT 849/ Zone 1. The vegetation integrity score for the TEC is as follows: • Vegetation Integrity Score: 26.1 ○ Composition: 13.1 ○ Structure: 34.5 ○ Function: 39.3
5	The assessor may also provide new information that demonstrates that the principle identifying that the TEC is at risk of an SAII is not accurate.	Not applicable.

9.3. Impacts that Require an Offset

9.3.1. Native Vegetation

In accordance with the BAM, the project requires offsets for the clearing of native vegetation as the following criteria are met:

- A vegetation zone that has a vegetation integrity score ≥15 where the PCT is representative of an Endangered Ecological Community or CEEC.

The PCT and vegetation zone requiring offsets are documented in **Table 18**. These areas are mapped in **Figure 11**.

Table 18 Summary of impact to native vegetation requiring an offset

Vegetation Zone	PCT	Condition Name	Area (ha)	Patch Size Class	Vegetation Integrity Score
1	849 - Cumberland Shale Plains Woodland	Modified	0.08	>100 ha	26.1

9.3.2. Threatened Species

No species credit species have been identified as requiring an offset.

9.4. Impacts that do not Require an Offset

In accordance with Appendix D of the BAM, impacts on planted native vegetation do not require an offset. The areas of planted native vegetation in the subject land comprise approximately 0.05 ha, as shown in **Figure 11**.

9.5. Impacts that do not Require Further Assessment

All areas identified as 'Cleared' or 'Exotic Vegetation and Grassland' that occur within the subject land do not require further assessment. These areas comprise approximately 0.60 ha, as shown on **Figure 11**.

9.6. Application of the No Net Loss Standard

The BAM sets a standard that will result in no net loss of biodiversity values where the impacts on biodiversity values are avoided, minimised and mitigation, and all residual impacts are offset by retirement of the required number of biodiversity credits.

The ecosystem credit requirement for the project is summarised in **Table 19**, whilst the 'like for like' offsetting options for the ecosystem credits are provided in **Table 20**. A credit summary report from the BAMC has been included in **Appendix B**.

The credit offset liability is proposed to be satisfied through payment into the Biodiversity Conservation Fund.

Table 19. Summary of ecosystem credit liability

PCT #	PCT Name	TEC	Area (ha)	Credits Required
849	Cumberland Shale Plains Woodland	Cumberland Plain Woodland in the Sydney Basin Bioregion	0.08	1

Table 20. Like for like offsetting options for PCT 849

Any PCT with the below TEC	Containing Hollow-bearing Trees?	In the below IBRA Subregions
Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 849, 850	No	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

10. Conclusion

This BDAR has been prepared to assess the impacts of the proposed development on biodiversity values, in accordance with the BAM Streamlined Assessment Module - small area and the streamlined assessment module - planted native vegetation. The project involves the construction of a Centre of Excellence and Community Facilities, including associated carpark, ancillary infrastructure, and landscaping, at Kellyville Park, Kellyville.

Native vegetation occurring within the subject land includes a small occurrence of Cumberland Plain Woodland CEEC (approximately 0.08 ha), which occurs as canopy trees over exotic dominated lawns. The remainder of the subject land comprises scattered small patches of planted native vegetation as part of the existing landscaping in the park, as well as exotic woody vegetation and grasslands.

As the project includes the removal of a small area of native vegetation, a small number of offsets are required in the form of ecosystem credits. This assessment indicates that the removal of the native vegetation within the subject land required a total of one (1) ecosystem credit of PCT 849.

No threatened flora or fauna species that are considered as species credit species were recorded within the subject land and none are considered likely to occur. Therefore, no species credits species are required to be offset.

The BAM sets a standard that will result in no net loss of biodiversity values where the impacts on biodiversity values are avoided, minimised and mitigated, and all residual impacts are offset by retirement of the required number of biodiversity credits. The project has sought to avoid impacts to biodiversity values, and a suite of mitigation measures will be implemented for the project including weed management, delineation of clearing limits, pre-clearance surveys, staging of clearing, sedimentation control measures, landscaping and compensatory plantings of Cumberland Plain Woodland and habitat salvage. The total credit liability for the project comprises one PCT 849 ecosystem credit. The project proposes to satisfy the credit obligation through the payment into the Biodiversity Conservation Fund.

11. References

Bannerman, S. M., and P. A. Hazelton. 1990. Soil Landscapes of the Penrith 1:100,000 Sheet. Soil Conservation Service of New South Wales, Sydney, NSW.

DAWE. 2022a. Directory of Important Wetlands in Australia. Department of Agriculture, Water and the Environment, Canberra.

DAWE. 2022b. EPBC Protected Matters Search Tool. Department of Agriculture, Water and the Environment, Canberra.

DAWE. 2022c. Species Profile and Threats Database. Depatment of Agriculture, Water and the Environment.

DEC (NSW). 2005. Recovering bushland on the Cumberland Plain: Best Practice Guidelines for the Management and Restoration of Bushland. Department of Environment and Conservation (NSW), Sydney.

DECCW. 2011. Approved Cumberland Plain Recovery Plan. DECCW, Hurstville.

DPE. 2022. Wallangarra White Gum - profile.

DPIE. 2020. NSW Critically Endangered Ecological Community Map. Version 6.0. February 2020. State of NSW and Department of Planning, Industry and Environment.

DPIE. 2021. Threatened Ecological Communities Greater Sydney. Department of Planning, Industry and Environment.

Duncan, M. 2010. National Recovery Plan for the Thick-lipped Spider-orchid *Caladenia tessellata*. Department of Sustainability and Environment, Melbourne.

Earthscape Horticultural Services. 2022. Arboricultural Impact Assessment Report: Proposed Centre of Excellence and Community Facilities - Kellyville Park, 6-8 Memorial Avenue, Kellyville.

EES. 2022a. BioNet Atlas. Environment, Energy and Science.

EES. 2022b. BioNet Vegetation Classification. Environment, Energy and Science.

EES. 2022c. Threatened Biodiversity Database Collection.*in* E. a. S. G. Environment, editor. Department of Planning, Industry and Environment.

iScape. 2022. Landscape Architecture Report: Kellyville Park PNRL Eels - Centre of Excellence and Community Facilities.

Landcom. 2004. Managing Urban Stormwater: Soils and Construction ("Blue Book"), Fourth Edition, NSW Government, Parramatta.

LLS: Greater Sydney. 2019. Greater Sydney Regional Strategic Weed Management Plan 2017 - 2022 - Revised September 2019. Local Land Services NSW.

NSW Scientific Committee. 2004. Grey-headed Flying-fox - vulnerable species listing. Department of Environment and Conservation (NSW), Hurstville.

NSW Scientific Committee. 2009. Cumberland Plain Woodland in the Sydney Basin Bioregion - critically endangered ecological community listing. Department of Environment, Climate Change and Water (NSW), Hurstville.

OEH. 2011. Cumberland Plain Woodland in the Sydney Basin Bioregion - critically endangered ecological community listing.

OEH. 2013. Remnant Vegetation of the western Cumberland subregion, 2013 Update. VIS_ID 4207 Office of Environment and Heritage, Hustville.

OEH. 2018. Thick Lip Spider Orchid - profile. Office of Environment and Heritage, Hurstville.

Southerton S.G., B. P., Porter J. and Ford H.A.,. 2003. Review of gene movement by bats and birds and its potential significance for eucalypt plantation forestry. Australia Forestry 2004 **67**:44-53.

Spatial Services NSW Goverment. 2021. Historical Imagery Viewer.

Threatened Species Scientific Committee. 2009. Commonwealth Listing Advice on Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest. Department of the Environment, Water, Heritage and the Arts, Canberra.

Tozer, M. 2003. The Native Vegetation of the Cumberland Plain, western Sydney: Systematic classification and field identification of communities. Cunninghamia **8**:1-75.

APPENDIX A :
BAM Plot Data

Table 21 BAM plot data used in the BAM-C

plot	pct	area	patchsize	conditionclass	Easting	Northing	Bearing	compTree	compShrub	compGrass	compForbs	compFerns	compOther	strucTree	strucShrub	strucGrass	strucForbs	strucFerns	strucOther	funLargeTrees	funHollowtrees	funLitterCover	funLenFallenLogs	funTreeStem5to10	funTreeStem10to20	funTreeStem20to30	funTreeStem30to50	funTreeStem50to80	funTreeRegen	funHighThreatExotic
1	849	0.08	101	Modified	3108827	6267220	180	3	0	2	3	0	1	43.0	0.0	5.1	0.4	0.0	0.2	5	0	8.6	0	0	0	0	1	1	0	65.4

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APPENDIX B :
BAMC Credit Reports

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00028815/BAAS19052/21/00028830	21246 - Small Area_SSD	16/06/2022
Assessor Name	Report Created	BAM Data version *
Matthew Freeman	29/07/2022	54
Assessor Number	BAM Case Status	Date Finalised
BAAS19019	Finalised	29/07/2022
Assessment Revision	Assessment Type	BOS entry trigger
1	Part 4 Developments (Small Area)	Test of significance

* 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.

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

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits

Cumberland shale plains woodland												
1	849_Modified	Cumberland Plain Woodland in the Sydney Basin Bioregion	26.1	26.1	0.08	PCT Cleared - 93%	High Sensitivity to Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	TRUE	1
											Subtotal	**1**
											Total	**1**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00028815/BAAS19052/21/00028830

Proposal Name
21246 - Small Area_SSD

BAM data last updated *
16/06/2022

Assessor Name
Matthew Freeman

Assessor Number
BAAS19019

BAM Data version *
54

Proponent Names

Report Created
29/07/2022

BAM Case Status
Finalised

Assessment Revision
1

Assessment Type
Part 4 Developments (Small Area)

Date Finalised
29/07/2022

BOS entry trigger
Test of significance

* 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.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Cumberland Plain Woodland in the Sydney Basin Bioregion	Critically Endangered Ecological Community	849-Cumberland shale plains woodland

Species
Nil

Additional Information for Approval

BAM Biodiversity Credit Report (Like for like)

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Calyptorhynchus lathami / Glossy Black-Cockatoo
Ixobrychus flavicollis / Black Bittern
Petaurus australis / Yellow-bellied Glider

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
849-Cumberland shale plains woodland	Cumberland Plain Woodland in the Sydney Basin Bioregion	0.1	0	1	1

BAM Biodiversity Credit Report (Like for like)

849-Cumberland shale plains woodland	Like-for-like credit retirement options					
	Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
	Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 849, 850	-	849_Modified	No	1	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

No Species Credit Data

Credit Retirement Options

Like-for-like credit retirement options

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id
00028815/BAAS19052/21/00028830

Proposal Name
21246 - Small Area_SSD

BAM data last updated *
16/06/2022

Assessor Name
Matthew Freeman

Assessor Number
BAAS19019

BAM Data version *
54

Proponent Name(s)

Report Created
29/07/2022

BAM Case Status
Finalised

Assessment Revision
1

Assessment Type
Part 4 Developments (Small Area)

Date Finalised
29/07/2022

BOS entry trigger
Test of significance

* 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.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Cumberland Plain Woodland in the Sydney Basin Bioregion	Critically Endangered Ecological Community	849-Cumberland shale plains woodland

Species
Nil

Additional Information for Approval

PCT Outside Ibra Added

None added

BAM Biodiversity Credit Report (Variations)

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Calyptorhynchus lathami / Glossy Black-Cockatoo
Ixobrychus flavicollis / Black Bittern
Petaurus australis / Yellow-bellied Glider

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
849-Cumberland shale plains woodland	Cumberland Plain Woodland in the Sydney Basin Bioregion	0.1	0	1	1.00

849-Cumberland shale plains woodland

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 849, 850	-	849_Modified	No	1	Cumberland,Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

No Species Credit Data

BAM Biodiversity Credit Report (Variations)

Credit Retirement Options

Like-for-like options

APPENDIX C :
Field Datasheets

Date: 28/09/2021	Project #: 21246	Location	Waypoint	Easting	Northing	cumberland ecology
Personnel: BF, CE,	Plot ID: P 001	Start:	151	310827	626	
Photos: 78 – 81	Orientation (°): 180	End:	152	626722 ~~7~~	310823	
Dimensions: □20x20, □10x40	PCT: CPW					Sheet: 1 of 1

	Species	Cover	Abundance	N, E, HTE	GF Group	Stratum	Voucher
1	Euc. tect.	20	2				
2	Corymbia mac.	3	0				
3	Eucalyptus malucc.	20	2				
4	Conchrus cland.	65	6000				
5	Dichondra repens	0.2	200				
6	Taraxacum officinale	0.2	30				
7	Bidens pilosa	0.25	40				
8	Cyperus gracilis	0.1	20				
9	Plantago lanceolata	0.3	200				
10	Lolium perenne	1	100				
11	Cirsium vulgare	0.1	3				
12	Conyza sumatr.	0.1	3				
13	Modiola caroll.	0.25	100				
14	Sporobolus afric.	0.1	10				
15	Sonchus oleraceus	0.1	5				
16	Hypochaeris radic.	0.2	50				
17	Cinnamomum camphor.	0.1	1				
18	Bromus cathart.	5	500				
19	Malva parvifl.	0.25	20				
20	Sida rhombifolia	0.1	10				
21	Glycine microph.	0.2	50				
22	Oxalis perennans	0.1	20				
23	Soliva sessilis	0.2	300				
24	Lepidium bonariense	0.1	3				
25	Paronychia brasil.	0.1	20				
26	Poa annua	0.2	300				
27	Vulpes brom.	5	2000				
28	Cynodon dactylon	5	500				
29	Briza minor	0.1	30				
30	Wahlen. gracilis	0.1	2				
31	Trifolium repens	3	300				
32	Lolium perenne	1	100				
33							
34							
35							
36							
37							
38							
39							
40							

Cover (%): **0.1, 0.2, 0.3**...etc. up to **1, 2, 3**...etc. up to **10, 15, 20, 25**...etc. up to **100**
Abundance (Count): **1, 2, 3**... up to **10, 20, 30**...up to **100, 200**... up to **1,000**...etc.

GF Group: TG=Tree, **SG**=Shrub, **GG**=Grass, **FG**=Forb, **EG**=Fern, **OG**=Other
Stratum: C = Canopy, **SC** = Sub-canopy, **S** = Shrub, **G** = Ground

Cover Note: 0.1% = approx 63 cm² or circle with 71cm diameter, 0.5% = approx 1.4m², 1% = approx 2m², 5% = approx 4.5m², 25% = approx 10m²

Date: 28 / 09 / 2021	Project #: 21246	Location	Waypoint	Easting	Northing	cumberland ecology
Personnel: BF, CE,	Plot ID: P 002	Start:	155	310830	6267208	
Photos: 84 - 87	Orientation (°): 162	End:	156	310847	6267161	
Dimensions: □20x20, □10x40	PCT: E tot. grass					Sheet: 1 of 1

	Species	Cover	Abundance	N, E, HTE	GF Group	Stratum	Voucher
1	Eucalyptus Scoparia	10	1				
2	Conchris cland	75	9000				
3	Lolium perenne	5	500				
4	Conyza sumatrensis	0.1	10				
5	Silba sessilis	1	2000				
6	Plantago lanc.	0.25	50				
7	Cynodon dactylon	~~20~~ 15	1500				
8	Hypochaeris radicata	0.2	100				
9	Sporobolus creber	0.1	10				
10	Eragrost. curvula	0.1	10				
11	Paronychia brasil.	0.1	20				
12	Senecio madagase	0.1	5				
13	Gamochaeta amer. c.	0.1	5				
14	Bromus cathartics	5	500				
15	Cirsium vulgare	0.1	3				
16	Capsella bursa-pastoris	0.1	20				
17	Arctotheca calendula	0.1	10				
18	Paspalum dilatatum	0.1	5				
19	Veronica arvensis	0.1	10				
20	Medicago minima	0.25	500				
21	Poa annua	1	300				
22	Sonchus oleraceus	0.1	20				
23	Oxalis perennans	0.1	10				
24							
25							
26							
27							
28							
29							
30							
31							
32							
33							
34							
35							
36							
37							
38							
39							
40							

Cover (%): **0.1, 0.2, 0.3**...etc. up to **1, 2, 3**...etc. up to **10, 15, 20, 25**...etc. up to **100**
Abundance (Count): **1, 2, 3**... up to **10, 20, 30**...up to **100, 200**... up to **1,000**...etc.

GF Group: TG=Tree, **SG**=Shrub, **GG**=Grass, **FG**=Forb, **EG**=Fern, **OG**=Other
Stratum: C = Canopy, **SC** = Sub-canopy, **S** = Shrub, **G** = Ground

Cover Note: 0.1% = approx 63 cm² or circle with 71cm diameter, 0.5% = approx 1.4m², 1% = approx 2m², 5% = approx 4.5m², 25% = approx 10m²

Date: 28/09/2021	Project #: 21246	cumberland ecology
Personnel: CE, BF, __	Plot ID: P 101	

Large Trees / Stem Classes / Hollows

DBH[1]	Stem Class Present[2]	Stem Class Count[2, 3]	Hollow-bearing Tree Count[4]
80+ cm	☑ Yes ☐ No	1	
50-79 cm	☑ Yes ☐ No	1111	
30-49 cm	☑ Yes ☐ No		
20-29 cm	☐ Yes ☑ No		
10-19 cm	☐ Yes ☑ No		
5-9 cm	☐ Yes ☑ No		
<5 cm	☐ Yes ☑ No		
Are there hollow-bearing trees within the zone?[5]			☐ Yes ☑ No

1. DBH measured at 1.3m above ground.
2. Only living, native, tree species are to be recorded.
3. Exact stem counts must be provided for stems in the following classes: 50-79cm and 80+ cm (or additional classes for a PCT which has a smaller large tree threshold – e.g. heathlands). Include estimates of stem counts of other classes where there is extensive regeneration.
4. Hollow-bearing trees include living and dead native species allocated to the tree and shrub growth form groups. Hollow-bearing trees rooted within the plot with hollows that are visible from the ground must be included.
5. Where there are no hollow-bearing trees within a plot, but they are present within the vegetation zone, a value of 1 is to be entered in the BAMC.

Logs

Length of logs[6, 7]	(≥10cm diameter, >50cm in length)
Tally	
Total (m)	0

6. Dead native and exotic species recorded.
7. Logs must be entirely or partially on the ground within the plot, and only the length within the plot is recorded.

Subplots (1x1m)

Subplot	Litter Cover (%)[9, 10]	Bare Ground Cover (%)	Cryptogram Cover (%)	Rock Cover (%)
1 x 1m Score[8]	15 10 2 15 1	0 5 0 80 0	0 0 0 0 0	0 0 0 5 0
Average Score				

8. Scores must be provided for litter cover. Include scores for other variables where supplementary information is required.
9. Litter includes leaves, seeds, twigs, branchlets and branches (<10cm diameter) from native and exotic species.
10. Must include all plant material detached from a plant and forms part of the litter layer on the ground surface. Material that is not detached is assessed as growth form foliage cover.

Composition and Structure Summary

Attribute		Value
Count of Native Richness (Composition)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Sum of Native Cover (Structure)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
High Threat Weed Cover		

Additional Notes

Date: 23/09/2021	Project #: 2246	cumberland ecology
Personnel: CB, BE, __	Plot ID: P002	

Large Trees / Stem Classes / Hollows

DBH[1]	Stem Class Present[2]	Stem Class Count[2, 3]	Hollow-bearing Tree Count[4]
80+ cm	☑ Yes ☐ No	1	1
50-79 cm	☐ Yes ☑ No		
30-49 cm	☐ Yes ☑ No		
20-29 cm	☐ Yes ☑ No		
10-19 cm	☐ Yes ☑ No		
5-9 cm	☐ Yes ☑ No		
<5 cm	☐ Yes ☑ No		
Are there hollow-bearing trees within the zone?[5]			☐ Yes ☐ No

1. DBH measured at 1.3m above ground.
2. Only living, native, tree species are to be recorded.
3. Exact stem counts must be provided for stems in the following classes: 50-79cm and 80+ cm (or additional classes for a PCT which has a smaller large tree threshold – e.g. heathlands). Include estimates of stem counts of other classes where there is extensive regeneration.
4. Hollow-bearing trees include living and dead native species allocated to the tree and shrub growth form groups. Hollow-bearing trees rooted within the plot with hollows that are visible from the ground must be included.
5. Where there are no hollow-bearing trees within a plot, but they are present within the vegetation zone, a value of 1 is to be entered in the BAMC.

Logs

Length of logs[6, 7]	(≥10cm diameter, >50cm in length)
Tally	
Total (m)	0

6. Dead native and exotic species recorded.
7. Logs must be entirely or partially on the ground within the plot, and only the length within the plot is recorded.

Subplots (1x1m)

Subplot	Litter Cover (%)[9, 10]	Bare Ground Cover (%)	Cryptogram Cover (%)	Rock Cover (%)
1 x 1m Score[8]	15 2 1 15 5	0 0 0 5 0	0 0 0 0 0	0 0 0 0 0
Average Score				

8. Scores must be provided for litter cover. Include scores for other variables where supplementary information is required.
9. Litter includes leaves, seeds, twigs, branchlets and branches (<10cm diameter) from native and exotic species.
10. Must include all plant material detached from a plant and forms part of the litter layer on the ground surface. Material that is not detached is assessed as growth form foliage cover.

Composition and Structure Summary

Attribute		Value
Count of Native Richness (Composition)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Sum of Native Cover (Structure)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
High Threat Weed Cover		

Additional Notes

FIGURES

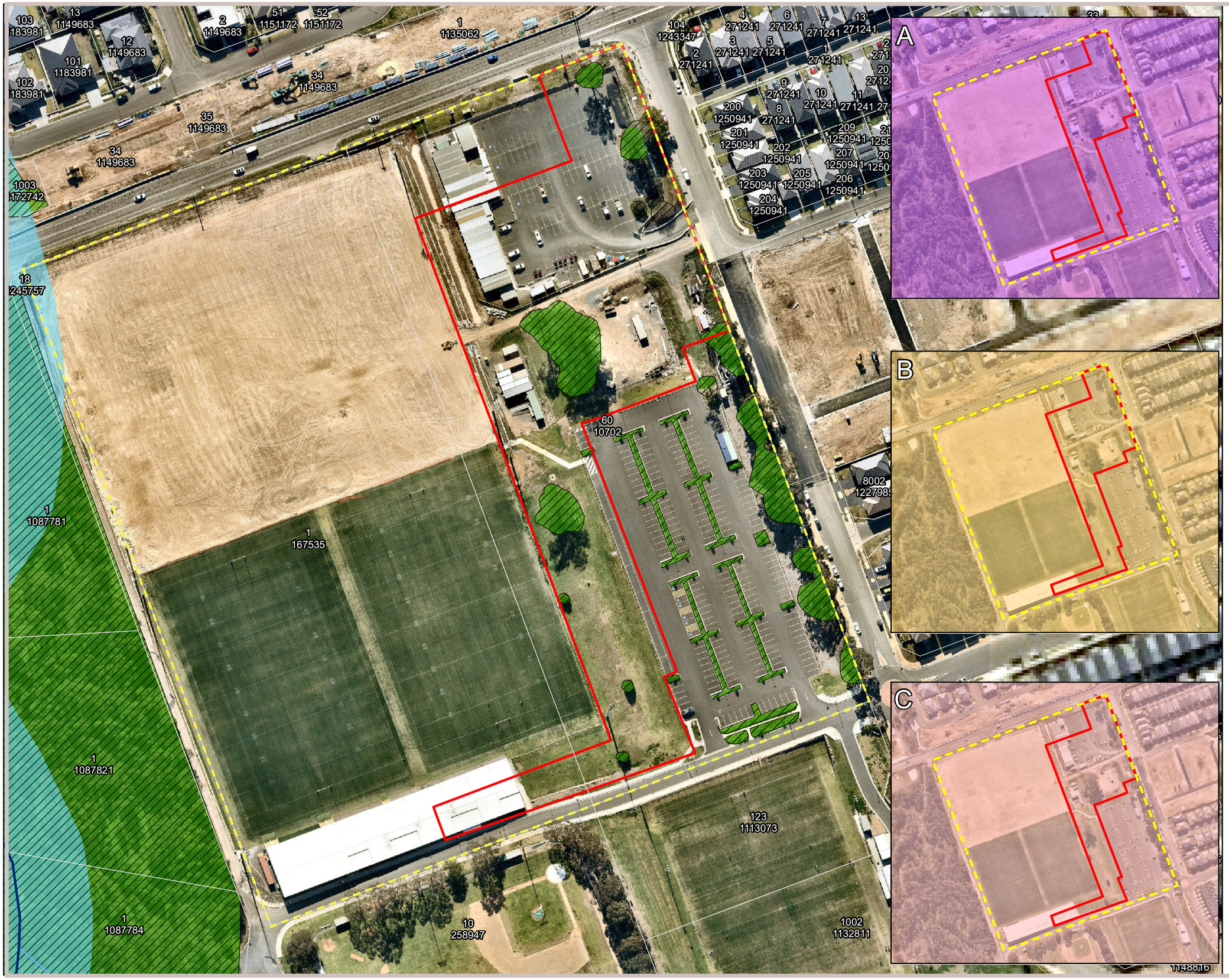

Figure 1. Site map

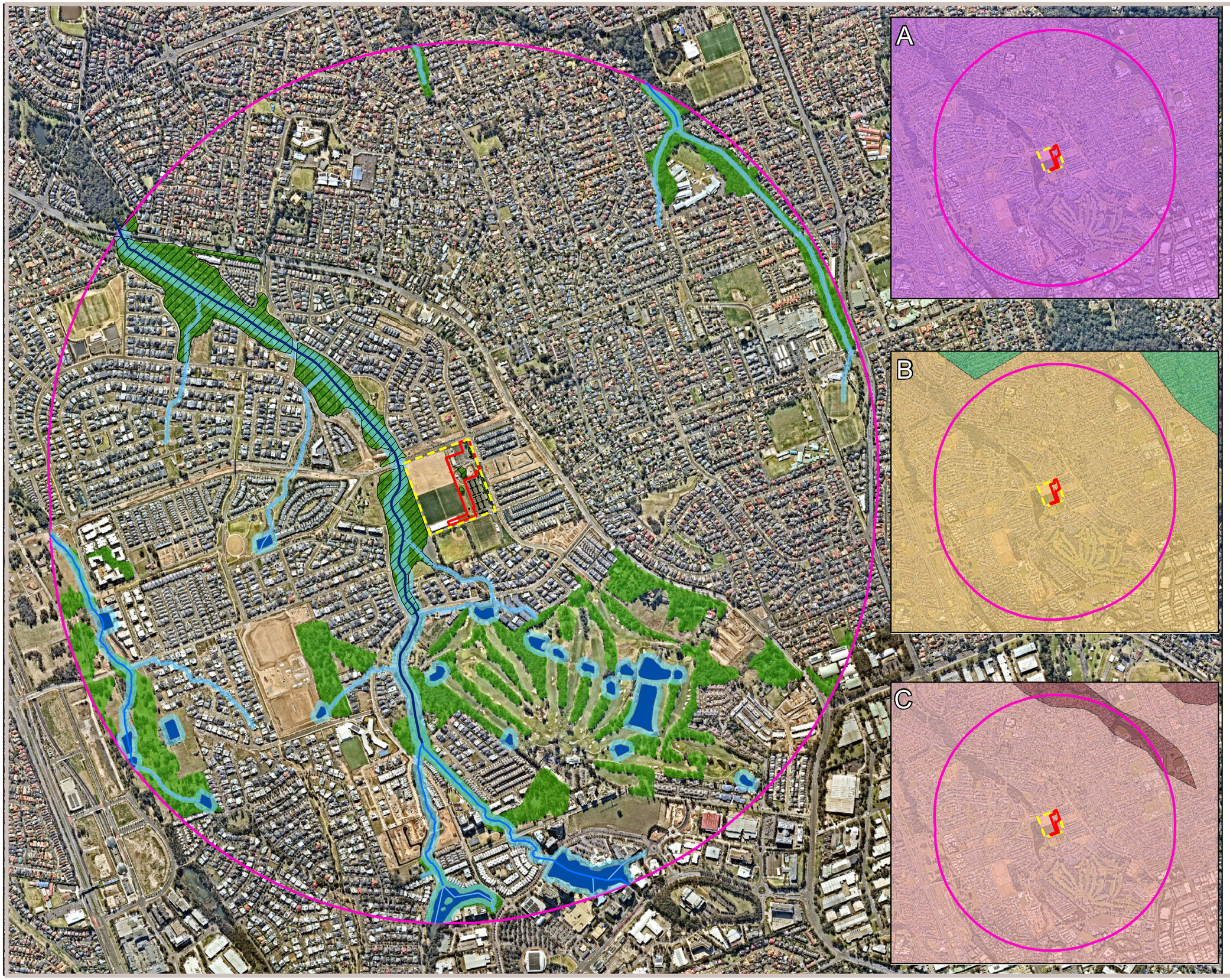

Figure 2. Location map

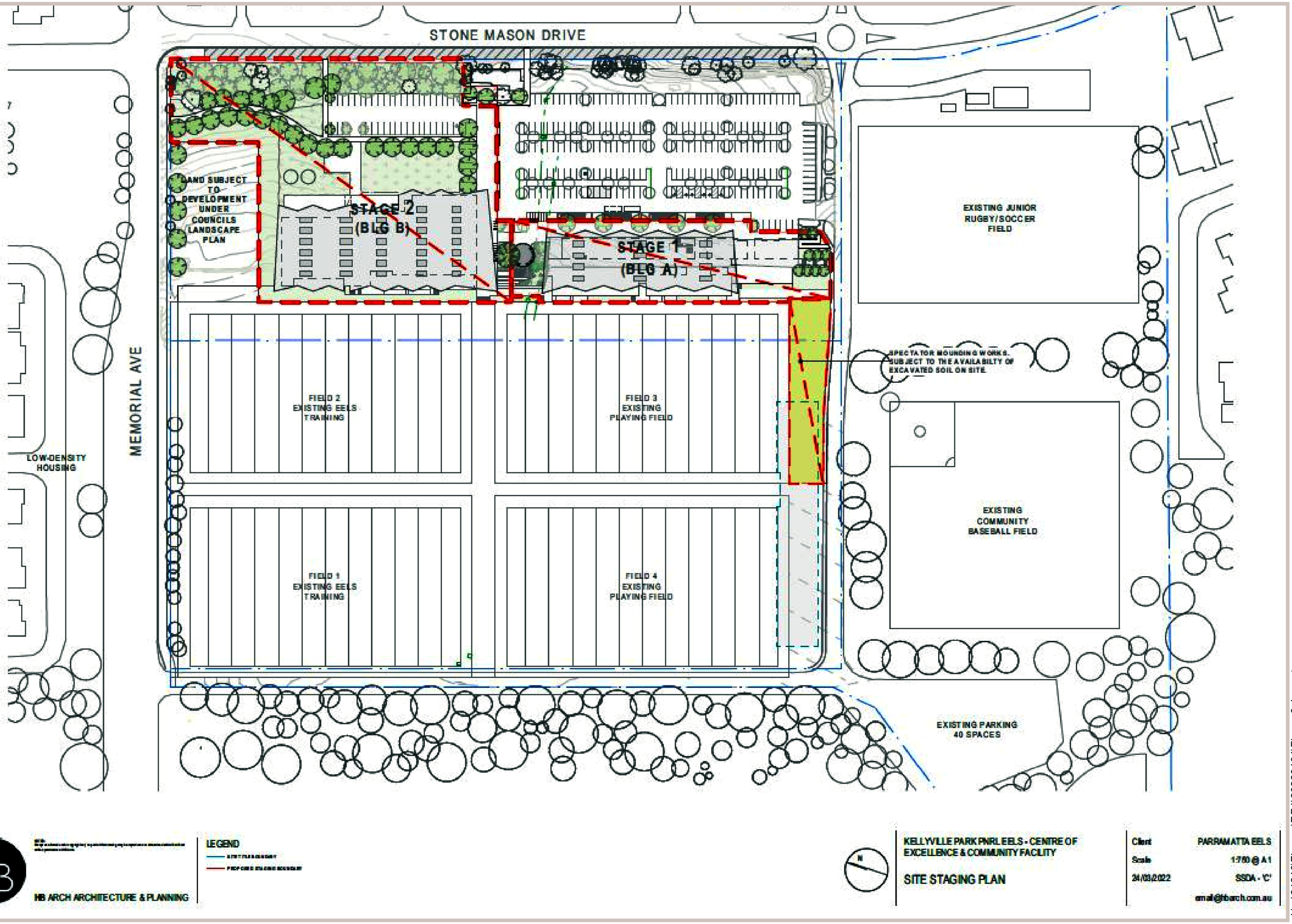

Figure 3. Layout of project

Image Source: HB Architecture & Planning 2022

Legend

- Subject Land
- Study Area
- BAM Plot Locations
- Random Meander Survey

Plant Community Type

- PCT849 (Zone 1)
- Planted Native Vegetation
- Exotic Vegetation and Grassland
- Cleared Land

Image Source:
Image © NearMap 2020
Dated: 7/8/2021

Data Source:
NSW Government Spatial Services
SIX Maps 'Clip and Ship'
The Hills LGA

Coordinate System: MGA Zone 56 (GDA 94)

cumberland ecology

0 50 m

I:\...\21246\Figures\RP1\20220404\Figure 4. Field survey locations

Figure 4. Field survey locations

Figure 5. Native vegetation extent

Figure 6. Plant community types

Legend

Subject Land

Study Area

Threatened Ecological Community

Cumberland Plain Woodland

Image Source:
Image © NearMap 2020
Dated: 7/8/2021

Data Source:
NSW Government Spatial Services
SIX Maps 'Clip and Ship'
The Hills LGA

Coordinate System: MGA Zone 56 (GDA 94)

cumberland ecology

0 50 m

I:\...\21246\Figures\RP1\20220404\Figure 7. TECs

Figure 7. Threatened ecological communities

Figure 8. Vegetation zones

Legend

- Subject Land
- Study Area

Prescribed Impact

- Non-native Vegetation
- Habitat Connectivity

Image Source:
Image © NearMap 2020
Dated: 7/8/2021

Data Source:
NSW Government Spatial Services
SIX Maps 'Clip and Ship'
The Hills LGA

Coordinate System: MGA Zone 56 (GDA 94)

cumberland ecology

0 50 100 150 200 m

I:\...\21246\Figures\RP1\20220404\Figure 9. Extent of prescribed impacts

Figure 9. Extent of prescribed impacts

Legend

- Subject Land
- Study Area
- Cumberland Plain Woodland in the Sydney Basin Bioregion
- 500m Buffer

Image Source:
Image © NearMap 2020
Dated: 7/8/2021

Data Source:
NSW Government Spatial Services
SIX Maps 'Clip and Ship'
The Hills LGA

Map of Critically Endangered Ecological Communities NSW Version 6

Coordinate System: MGA Zone 56 (GDA 94)

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0 50 100 150 200 m

I:\...\21246\Figures\RP1\20220404\Figure 10. SAII

Figure 10. Extent of Cumberland Plain Woodland surrounding the subject land

Legend

- Subject Land
- Study Area

Serious and Irreversible Impact Entity

- Cumberland Plain Woodland

Impacts that require an offset

- Zone 1: 849_Modified

Impacts that do not require an offset

- Planted Native Vegetation

Impacts that do not require further assessment

- Exotic vegetation and grassland
- Cleared Land

Image Source:
Image © NearMap 2020
Dated: 7/8/2021

Data Source:
NSW Government Spatial Services
SIX Maps 'Clip and Ship'
The Hills LGA

Coordinate System: MGA Zone 56 (GDA 94)

cumberland ecology

0 50 m

I:\...\21246\Figures\RP1\20220404\Figure 11. Thresholds of assessment

Figure 11. Thresholds of assessment