263 Mount Vernon Road, Mount Vernon

Biodiversity Development Assessment Report

Fowler Homes

29 September 2021

Final

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Report No. 1

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.

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Approved by:	Dr David Robertson
Position:	Director
Signed:	[redacted]
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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
AoBV	Area of Outstanding Biodiversity Value
APZ	Asset Protection Zone
asl	Above sea level
BAM	Biodiversity Assessment Method
BAMC	Biodiversity Assessment Method Calculator
BC Act	NSW *Biodiversity Conservation Act 2016*
BC Regulation	NSW *Biodiversity Conservation Regulation 2017*
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offset Scheme
DA	Development Application
DAWE	Commonwealth Department of Agriculture, Water and the Environment
DBH	Diameter at Breast Height
DPIE	Department of Planning, Industry and Environment
EES	Environment, Energy and Science Group
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EP&A Act	NSW Environmental Planning and Assessment Act 1979
GIS	Geographic Information System
GPS	Global Positioning System
IBRA	Interim Biogeographic Regionalisation for Australia
LGA	Local Government Area
NSW	New South Wales
OEH	Former Office of Environment and Heritage
PCT	Plant Community Type
the project	The proposed development at 263 Mt Vernon Rd, Mt Vernon
SAII	Serious and Irreversible Impact
Study Area	Lot 72 DP 32140
Subject land	The development impact area as shown in **Figure 1**
TBDC	Threatened Biodiversity Data
TEC	Threatened Ecological Community

1. Introduction

Cumberland Ecology was engaged by Fowler Homes to prepare a Biodiversity Development Assessment Report (BDAR) for a proposed development on a property located at 263 Mount Vernon Road, Mount Vernon (the 'study area'). This BDAR forms part of the documentation to support the application for development consent under Part 4 of the New South Wales (NSW) *Environmental Planning and Assessment Act 1979* (EP&A Act).

The client previously submitted a Development Application (DA) (DA21/0282) to Penrith City Council (Council) for the demolition of existing structures and construction of two new dual occupancy residential dwellings with Torrens title subdivisions (the 'project').

Council have since provided the following comments:

Biodiversity Values

- *Parts of the site are included in the Biodiversity Values Map (BV Map);*
- *There is development proposed in BV mapped areas of the site that will impact on biodiversity (such as dwellings, driveways, effluent disposal areas);*
- *Given the points above, a Biodiversity Development Assessment Report (BDAR) needs to be submitted with the application;*
- *The SEE states on page 10 that no trees are required to be removed as part of the proposal. This is incorrect as approximately 21 trees are shown to be removed on the demolition plan.*
- *Development is proposed in close proximity to a number of trees, especially trees on the neighbouring lot along the proposed driveway. Whilst these trees may not need to be removed to facilitate the proposed development, the driveway significantly intrudes into the structural root zone of a number of trees. As such an arborists report will needs to be provided to assess this impact.*

This BDAR has been prepared in accordance with the 2020 version of the Biodiversity Assessment Method (BAM) (DPIE 2020). The request by Council for an arborists report is not addressed by this BDAR.

1.1. Requirement for BDAR

Under the NSW *Biodiversity Conservation Act 2016* (BC Act), all development requiring development consent under Part 4 of the EP&A Act that is likely to significantly affect threatened species as set out in Clause 7.2 of the BC Act and Section 7.1 of the NSW *Biodiversity Conservation Regulation 2017* (BC Regulation), must be assessed using the Biodiversity Assessment Method (BAM) with the results presented in a BDAR. Any development that clears native vegetation above a threshold specified based on minimum lot size would automatically enter the Biodiversity Offsets Scheme (BOS) and require preparation of a BDAR. The threshold levels of clearing for each minimum lot size are shown in **Table 1**.

Table 1 Area of clearing thresholds

Minimum Lot Size of Land	Area of Clearing
Less than 1 hectare	0.25 hectares or more

Minimum Lot Size of Land	Area of Clearing
Less than 40 hectares but not less than 1 hectare	0.5 hectares or more
Less than 1,000 hectares but not less than 40 hectares	1 hectare or more
1,000 hectares or more	2 hectares or more

The minimum lot size for the study area is listed as 1 ha under the Penrith Local Environment Plan 2010 (LEP). As the proposed development would require the removal of approximately 0.39 ha of native vegetation, it has been determined not to exceed the clearing of native vegetation threshold.

As noted by Council, the development will occur on areas mapped on the Biodiversity Values Map and therefore the BOS is triggered, and this BDAR has been prepared.

This BDAR has been prepared in accordance with BAM 2020. Under BAM 2020 for projects involving clearing of less than two hectares of native vegetation on a lot with a minimum lot size of 1 ha to <40 ha, the Streamlined assessment module -Small area may be used, and this BDAR has been prepared according to the requirements for the streamlined assessment module.

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 2020.

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;
- 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);
- Identify potential prescribed biodiversity impacts on threatened species and communities;
- 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.

A compliance table showing how this report meets the requirements of BAM 2020 is provided in **Appendix A**.

1.3. Project Description

1.3.1. Location

The project is located at 263 Mount Vernon Road, Mount Vernon (Lot 72 DP 32140) (the 'study area'). The study area currently comprises an existing residential dwelling, a large shed, two dams and treed and grassland vegetation. The study area is zoned E4 – Environmental Living under the Penrith LEP and covers approximately 2.02 ha.

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. Proposed Development

Designs prepared by Fowler Homes show the development consists of the subdivision of the study area into two new lots that will each contain a new residential dwelling, driveway, and landscaped areas. Additional development works will include:

- Construction of a retaining wall around the dam to the west of the study area that is shared with the adjacent neighbour;
- Filling in of the dam to the east of the study area prior to construction;
- Demolition of the existing residential dwelling and large metal shed;
- Demolition of a small brick dog kennel;
- Construction of a pool and associated area for the proposed residential dwelling at the rear of the property.

1.3.3. Identification of the Development Site Footprint

The layout of the project is shown in **Figure 3**. The development site footprint comprises approximately 1.13 ha that is made up of 1.04 ha of land plus an additional 0.09 ha of dam area directly impacted by the project, and including the two proposed residential dwellings, landscaping areas, driveways, a pool, and areas for the subsurface irrigation system and water tanks. These areas comprising the development footprint are collectively referred to within this BDAR as the subject land. 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 Development Site

The subject land is currently mostly cleared land that now comprises grassland, with scattered trees around the boundary and a residential dwelling towards the front portion of the property near Mt Vernon Road. There is a large shed in the middle of the property, with two dams situated to the east and west of the property

between the residential dwelling and the shed. The land slopes gently down from the front access at Mt Vernon Road towards the rear of the property, with the eastern portion higher than the western.

Review of historical aerial imagery dating back to 1947 (NSW Government Spatial Services 2020) indicates that the subject land was cleared prior to this date, with only a few scattered paddock trees retained. By 2006 there had been regrowth of numerous canopy trees around the edges and within the centre of the property, however between 2006 and 2021 these have mostly been removed with the exception of a stand of native trees in the rear northern corner.

1.3.5. Asset Protection Zone

Asset Protection Zones (APZs) apply to the two residential dwelling as identified in the Bushfire Risk Assessment Report (2021) prepared by Local Group for the project, however these are contained within the areas already subject to landscaping or within areas of grassland that require no further modification to function as an APZ and have therefore not been incorporated into the subject land. The Bushfire Risk Assessment Report (2021) stipulates that the canopy of all trees must be a minimum of 2 – 5 metres from the edge of any residential dwelling, and this requirement is met for both the proposed residential dwellings.

1.3.6. Databases

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

- Environment, Energy and Science (EES) BioNet Atlas (EES 2021);
- EES Threatened Biodiversity Data Collection (EES 2021);
- EES BioNet Vegetation Classification database (EES 2021);
- Commonwealth Department of Agriculture, Water and the Environment (DAWE) Species Profile and Threat Database (DAWE 2021); and
- DAWE Directory of Important Wetlands in Australia (DAWE 2021).

1.3.7. Literature and Spatial Data

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
- Mining, Exploration and Geoscience (1983) Sydney 1:100 000 Geological Map (Department of Mineral Resources 1983)

The aerial imagery used in this BDAR is sourced from NearMap and is dated 26 January 2021. Additional aerial images available on Google Earth Pro and SixMaps were also consulted.

1.4. Authorship and Personnel

This document has been prepared under the direction of Dr David Robertson (BAM Accredited Assessor No: BAAS17027). This document and associated field surveys and geographic information systems (GIS) mapping

were prepared with the assistance of additional personnel as outlined in **Table 1**. Notwithstanding the assistance of the additional personnel, the assessment presented within this document is Dr Robertson's.

Table 2 Personnel involved in preparation of this BDAR

Name	Tasks	Relevant Qualifications / Training	BAM Accredited Assessor No.
Dr David Robertson	Document review, project direction	Doctor of Philosophy. Ecology, University of Melbourne, 1986 Bachelor of Science (Honours) in Ecology, University of Melbourne, 1980 BAM Accredited Assessor Training. Muddy Boots, 2017. BAM Renewal Training. August 2021	BAAS17027
Dr Trevor Meers	Document review	Doctor of Philosophy, Forest and Ecosystem Science. University of Melbourne 2007 Bachelor of Applied Science (Honours) Natural Resource Management. Deakin University 2002 BAM Accredited Assessor Training. Muddy Boots, 2017. BAM Renewal Training. August 2021	BAAS18119
Michael Davis	GIS Mapping	Bachelor of Biodiversity and Conservation. Macquarie University, 2016 BAM Accredited Assessor Training. Muddy Boots, 2017	-
Jesse Luscombe	GIS Mapping	Bachelor of Marine Science. Macquarie University, 2013 Certificate III in Conservation and Land Management. TAFE NSW, 2016	-
Bryan Furchert	Field surveys, PCT analysis	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
Heather Gosper	Document preparation, field survey	Bachelor of Environmental Science and Management. The University of Newcastle, 2013 BAM Accredited Assessor Training. Muddy Boots, 2017	BAAS19028

2. Methodology

2.1. Review of Existing Data

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

- Species data that is held in the BioNet Atlas;
- The following existing reports which form part of the DA:
    - Bushfire Risk Assessment Report (Local Group 2021);
    - Flood Study Assessment Report (Engineering Studio, 2020); and
    - Wastewater Management: Site & Soil Evaluation & Disposal System Design (SEEC, 2021).

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

2.2. Landscape Features

Landscape features requiring consideration were initially determined via desktop assessment. Field surveys undertaken on 08 June 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.

2.3. Native Vegetation Survey

2.3.1. Vegetation Mapping

Broad scale vegetation mapping exists for the subject land and surrounds, including the mapping of the Remnant Vegetation of the western Cumberland subregion, 2013 update VIS_ID 4207 (OEH 2013). Cumberland Ecology conducted vegetation surveys on 08 June 2021 to verify and update (where required) the vegetation 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 Community Types (PCTs). Mapping of PCTs 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.

Records of plant community boundaries were made using a hand-held Global Positioning System (GPS) and mark-up of aerial imagery. 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. Vegetation Integrity Assessment

Vegetation integrity assessments within the subject land were undertaken in accordance with the BAM on 08 June 2021.

Surveys included establishment of three 20 x 50 m plots, with an internal 20 x 20 m floristic 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 the 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 the 20 m x 20 m floristic plot;
- Cover of 'High Threat Exotic' weed species within the 20 m x 20 m floristic plot;
- Assessment of function attributes within the 20 m 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 each 20 m x 50 m plot; and
    - Number of trees with hollows that are visible from the ground within each 20 m x 50 m plot.

Three (3) BAM plots were completed, and their location is shown in **Figure 4**. **Table 3** summarises the plot requirements based on the size and number of vegetation zones in the subject land and study area. The minimum number of plots has been completed for all vegetation zones.

Table 3 BAM plot survey requirements

Vegetation Zone	PCT	Condition	Area within Subject Land (ha)	Minimum Number of Plots Required	Number of Plots Completed
1	850	Low	0.11	1	1
2	850	Grassland Low	0.28	1	1
-	850	Moderate	0.00*	0	1
-	850	Overhanging Canopy	0.02**	0	0

**0.0016 ha of Moderate Condition PCT 850 occurs within the subject land, however this is based on an overhanging canopy that will not be impacted or removed under the proposed development and rounding to two decimal places would equate this amount to zero within the BAM Calculator, therefore it has been excluded.*

***0.02 ha of Overhanging Canopy condition PCT 850 occurs within the subject land, however this is based on an overhanging canopy that will not be impacted or removed under the proposed development; the trees stems are within adjacent properties owned by neighbours and only the low impact construction of driveways will occur beneath the overhanging canopy. Therefore, the 0.02 ha that occurs underneath the overhanging canopy has been incorporated into Vegetation Zone 2 for the purposes of calculating impacts on the ground layer.*

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

No flora species credit species in the BAMC were determined to be candidate species that require further assessment. Therefore, no threatened flora surveys were undertaken within the subject land during the surveys on 08 June 2021.

Only one flora species credit species was predicted to occur within the subject land by the BAMC, *Caladenia tessellata* (Thick-lipped Spider Orchid), and this was not considered a candidate species due to the degraded vegetation condition and because there are no records of the species within 20 km of the subject land. The subject land vegetation is highly modified, having a history of clearing and light agricultural use. It currently comprises a mostly exotic understorey that would not be likely habitat for threatened flora species. Further, there are only four records of the *Caladenia tessellata* occurring within the Cumberland IBRA Subregion, with the closest being a record from 1901 located at Mortdale over 25 km away from the subject land, followed by another record from 1901 near Penhurst, one from 1893 near Tempe and one from 1770 – 2008 (first and last dates) near Marrickville South. Based on the lack of recent, local records and the degraded state of the subject land; *Caladenia tessellata* has been excluded from consideration as a candidate species.

2.4.2.1. Random Meander

A random meander survey and plot survey was undertaken within the subject land on 08 June 2021. Due to the relatively small area of the subject land with native vegetation, a random meander was deemed appropriate to collect additional flora species to supplement the flora list for the subject land provided by the plot data.

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, stick nests and hollowing-bearing trees.

2.5.1.1. Targeted Species Survey

No species credit species from the BAMC were determined to be candidate species requiring further assessment. Accordingly, no targeted threatened fauna species surveys were required for the project, and none were undertaken.

The following species were output from the BAMC to be considered as candidate species:

- Regent Honeyeater (*Anthochaera phrygia*);
- Swift Parrot (*Lathamus discolor*);
- Large-eared Pied Bat (*Chalinolobus dwyeri*);
- Little Bent-winged Bat (*Miniopterus australis*); and
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*).

All of these species were assessed for habitat constraints and were excluded from further assessment for the reasons detailed below.

The Regent Honeyeater and Swift Parrot have been excluded from further assessment following subsequent checks of Mapped Important Areas confirmed that no important habitat occurs within the subject land for either species. Breeding habitat for both species is limited to specific areas that are not associated with, or in the vicinity of, the subject land, therefore since the species credit species component for both species is associated with breeding habitat only, both the Regent Honeyeater and Swift Parrot were excluded from further assessment and assessed as ecosystem credit species for foraging habitat only.

For the Large-eared Pied Bat, only the breeding habitat component is considered to be a candidate SAII. As no potential breeding habitat (i.e. within 2 km of rocky areas containing caves, overhands or crevices, cliffs, mines, tunnels, or culverts) exists within the study area, no further assessment for this species is required.

For the Little Bent-winged Bat and the Large Bent-winged Bat, only the breeding habitat is considered to be a candidate SAII. As no potential breeding habitat (i.e. caves, tunnels, mines or culverts) exists within the study area, no further assessment for this species is required.

2.6. Weather Conditions

Weather conditions during the field surveys were appropriate for detection of species. A summary of weather conditions in the wider locality of the subject land (BOM Weather Station 067119 – Horsley Park Equestrian Centre) during the field survey is provided in **Table 4**.

Table 4 Weather conditions during field survey

Date	Temperature Minimum (°C)	Temperature Maximum (°C)	Rainfall (mm)
08/06/2021	8.8	18.4	0

3. Landscape Features

3.1. Assessment Area

The subject land is approximately 1.13 ha in area 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 795.51 ha in area and is shown in **Figure 2**.

3.2. Landscape Features

The following site context features have been identified from an inspection of the site and GIS assessment of available relevant digital mapping layers and aerial imagery. These features are used to determine the biodiversity values that are important for identifying the site context and habitat suitability of the proposed development site for the purposes of impact assessment.

A site map is provided as **Figure 1** and a location map is provided as **Figure 2.**

3.2.1. General description of site topographic, hydrological, geological and soil characteristics

The subject land includes a gently sloping landform which drops down towards the western side, with an approximate maximum height of 87 m above sea level (asl) and a minimum height of approximately 22 m asl. There is dam on the eastern side of the subject land and further downslope on the western side is a large dam that is situated half within the study area and half within the neighbouring property. The dams are connected by a mapped first order stream that has a starting point in the western dam, however it is clear the dam to the west could not be the accurate starting point for this first order waterway as it is at a significantly lower elevation than the dam to east where the watercourse is supposedly flowing to. The watercourse must commence on the rise to the east of study area and it is not considered that a first order watercourse occurs within the subject land.

3.2.2. IBRA Bioregion and IBRA Subregion

The subject land is located within the Sydney Basin IBRA Bioregion and the Cumberland IBRA Subregion. The assessment area also includes the Cumberland IBRA Subregion.

3.2.3. Rivers and Streams

There is one 1st order watercourse mapped within the subject land that occurs between the two dams; however, as described above it would not be possible for this to commence at the lower elevation dam to the west of the subject land. The watercourse is not evident within the subject land and recent earthworks have covered the area where it would have been located. Watercourses in the 1500m buffer ('assessment area') are mapped in **Figure 2** and include the 1st to 4th order streams.

3.2.4. Wetlands

The two dams occurring within the study area are mapped as local wetlands, as shown in **Figure 2.** Only the eastern dam occurs within the subject land.

There are no wetlands included in the DAWE Nationally Important Wetlands database in the subject land or assessment area.

3.2.5. Habitat Connectivity

The subject land contains native vegetation that has connectivity with other retained native vegetation in the surrounding rural residential properties to the west, east and north. This retained vegetation exists generally as canopy trees with a modified understorey due to land use activities, including grazing by horses and sheep. Mount Vernon Road occurs directly to the south of the subject land, followed by further rural residential properties that are predominantly cleared, though a property to the southeast has retained treed vegetation that has some linkage through private properties to larger tracts of habitat on the southern side of Elizabeth Drive, including along Kemps Creek and around Brandown Quarry.

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

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

3.2.7. Areas of Outstanding Biodiversity Value

No Areas of Outstanding Biodiversity Value (AoBVs) have been mapped within the subject land or assessment area.

3.2.8. BioNet NSW Landscapes

The subject land is located entirely within the Cumberland Plain 'BioNet NSW Landscape.' The assessment area comprises predominantly Cumberland Plain BioNet NSW Landscape, with a small portion of Hawkesbury-Nepean Channels and Floodplains to the west.

3.2.9. Soil Hazard Features

No areas of geological significance or soil hazard features have been identified within the subject land. No areas of Acid Sulphate Soils are mapped within the subject land, based on the DPIE Acid Sulphate Soil Risk layer available in SEED mapping.

3.3. Native Vegetation Cover

The native vegetation cover was determined using 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 the vegetation mapping of the western Cumberland subregion (OEH 2013).

The native vegetation cover within the assessment area is shown in **Figure 2**. It occupies approximately 183.97 ha, which represents 23.13% 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 and exotic vegetation. No differences between the aerial photographs using 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 was subject to detailed surveys by Cumberland Ecology for the purpose of this BDAR. The native vegetation extent within the subject land was determined through aerial photograph interpretation, review and field surveys. The native vegetation extent within the subject land is shown in **Figure 5**. It occupies approximately 0.39 ha, which represents approximately 18.3 % of the subject land. The native vegetation extent within the subject land largely comprises low condition derived native grasslands and scattered remnant canopy trees over a modified understorey that represent components of an original PCT. This includes overhanging canopy vegetation area of 0.02 ha that is mapped as occurring within the subject land, however, will not be removed or directly impacted as part of the proposed project.

The remaining vegetation within the subject land comprises exotic vegetation totalling an area of approximately 0.61 ha. There is an additional 0.04 ha cleared area and 0.09 ha area constituting the eastern dam within the subject land. In accordance with Section 4.1.2 of the BAM, these areas do not require further assessment, unless they provide habitat for threatened species or are proposed for restoration as part of an offset. Therefore, these areas do not require further assessment. 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

Identification of the PCTs occurring within the subject land was guided by the results of the Cumberland Ecology surveys. 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. Consideration was given to the following:

- Existing vegetation mapping prepared by OEH (2013) for the subject land and immediate surrounds;
- Occurrence within the Cumberland IBRA subregion;
- Vegetation formation;
- Landscape position, soil and geology;
- The relative abundance of locally indigenous native species; and
- Upper, mid and ground strata species including key diagnostic species.

The analysis determined that the native vegetation within the subject land aligned with one PCT held within the BioNet Vegetation Classification database.

Table 5 provides a summary of the PCTs identified within the subject land and the approximate areas of each PCT. The distribution of these PCTs within the subject land is shown in **Figure 6**. Detailed descriptions of these PCTs and the justification for PCT selection is provided in the sections below.

Table 5 Plant community types within the subject land

PCT #	PCT	Subject Land (ha)
850	Cumberland shale hills woodland	~ 0.39

The ~0.39 ha above relates to the area of native vegetation to be removed as part of the proposed development. It is recognised that ~0.0016 ha of Moderate condition PCT 850 occurs within the subject land, however this is based on an overhanging canopy that will not be impacted or removed under the proposed development and rounding to two decimal places would equate this amount to zero within the BAM Calculator.

A further 0.02 ha of Overhanging Canopy condition PCT 850 occurs within the subject land, however this is based on an overhanging canopy of neighbouring trees with stems in adjacent properties that will not be impacted or removed under the proposed development. Only the exotic dominated ground layer underneath the canopy will be removed, therefore this 0.02 ha has been included within the grassland low condition class described below in ***Section 4.2.1.2***.

4.2.1. PCT 850 Cumberland Shale Hills Woodland

Vegetation Formation: Grassy Woodlands

Vegetation Class: Coastal Valley Grassy Woodlands

Percent Cleared Value: 88%

TEC Status of PCT: Critically Endangered Ecological Community

TEC Name: Cumberland Plain Woodland in the Sydney Basin Bioregion

4.2.1.1. Condition Class 1 - Low

This zone includes for the most part scattered remnant Cumberland Plain Woodland trees (**Photograph 1**), and a small patch of young regrowth trees along the east of the property boundary. The ground layer is mown and either dominated or co-dominated by exotic species. The zone includes several large old growth *Eucalyptus tereticornis* (Forest Red Gum) trees and a large, remnant *Eucalyptus moluccana* (Grey Box) tree that contain hollows. Due to mowing a shrub layer is absent from the zone, with the exception of some areas where fallen trees or structures provide shelter from mowing, and exotic shrub species such as *Lantana camara* (Lantana) and *Cestrum parqui* occur.

Exotic species in the ground layer include the grass species *Paspalum dilatatum* (Paspalum), *Ehrharta erecta*, *Echinochloa crus-galli* (Barnard grass), *Chloris gayana* (Rhodes Grass), and *Cenchrus clandestinus* (Kikuyu). Forbs include *Phytolacca octandra* (Inkweed), *Sonchus oleraceus* (Milk Thistle), and *Bidens pilosa*.

Native species in the ground layer include the grass species *Microlaena stipoides* var. *stipoides*, *Paspalidium distans*, and *Eriochloa pseudoacrotricha* (Early Spring Grass). Forbs include *Cotula australis* (Carrot Weed) and *Dichondra repens* (Kidney Weed).

Photograph 1 Low condition PCT 850 within the subject land

4.2.1.2. Condition Class 2 – Grassland Low

This zone includes areas of grassland that are co-dominated by exotic grass species and the native grass *Microlaena stipoides* var. *stipoides* (**Photograph 2**). Due to the significant presence of *Microlaena stipoides* var. *stipoides* these areas have been mapped as the derived native grassland form of Cumberland Plain Woodland. Other native grasses are uncommon in the community, occurring as scattered individuals. Species include *Bothriochloa macra* (Redleg Grass). Native forbs include *Brunoniella australis* and *Hypericum gramineum* (Small St John's Wort).

Exotic species include the grasses *Paspalum dilatatum* and *Cenchrus clandestinus* most commonly, with other species including *Lolium perenne* (Ryegrass), *Axonopus fissifolius* (Carpet Grass), and *Setaria parviflora*. Forbs present include *Taraxacum officinalis* (Dandelion), *Hypochaeris radicata* (Cat's Tongue), and *Plantago lanceolata* (Lamb's Tongue).

Photograph 2 Low condition grasslands of PCT 850 within the subject land

i. Justification for PCT Selection

The selection of this PCT involved:

- PCT Name;
- Vegetation Formation and Class;
- IBRA Subregion;
- Upper and lower stratum species;
- Diagnostic species;
- Review of existing vegetation mapping; and
- Landform elements.

Existing vegetation mapping for the western Cumberland subregion (OEH 2013) shows Cumberland Shale Hills Woodland within the subject land aligning approximately with the areas of current treed vegetation.

Within the subject land, the vegetation is degraded through the modification of the ground layer and absence of a shrub layer. Nevertheless, there are sufficient native species present within the scattered canopy trees and

ground layer species, to confidently assign PCT 850 to the vegetation. The location on hills and rises in the Cumberland Plain is also consistent with the description of this PCT (EES 2021).

The three BAM plots within the area mapped as PCT 850 in the subject land contained a total of eight (8) key species listed in the description of Cumberland Shale Hills Woodland in the BioNet Vegetation Classification

These include the canopy species *Eucalyptus tereticornis* and *Eucalyptus moluccana*, and the ground layer species *Asperula conferta* (Common Woodruff), *Carex inversa* (Knob Sedge), *Cyperus gracilis* (Slender Flat-sedge), *Dichondra repens*, *Microlaena stipoides var. stipoides* and *Oxalis perennans*.

The PCT selection process is shown in **Table 6**.

Table 6 PCT selection

PCT Filtering Criteria Used	PCTs Considered	Selected PCT	Selected PCT Name	Species Used for Identification
1. IBRA Subregion (NSW South Cumberland), vegetation formation (Grassy Woodlands) and the characteristic canopy species.	850, 849	-	-	Canopy stratum species: *Eucalyptus tereticornis, Eucalyptus moluccana*
2. Landform, ground layer species, existing vegetation mapping	850, 849	850	Cumberland Shale Hills Woodland	Ground layer species: *Dichondra repens*, *Microlaena stipoides var. stipoides, Asperula conferta, Carex inversa, Cyperus gracilis, Oxalis perennans*

ii. Alignment with Threatened Ecological Communities

Within the BioNet Vegetation Classification, this PCT is associated with the threatened ecological community (TEC) Cumberland Plain Woodland in the Sydney Basin Bioregion (Cumberland Plain Woodland), which is listed as a critically endangered ecological community (CEEC) under both the BC Act and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The BC Act listing criteria are met according to the final determination documenting the vegetation class and formation, the dominant canopy species, the geography and soil characteristics for the community for both condition classes. The extent of TECs listed under the BC Act is shown in **Figure 7**.

Condition Class 1 – Low also conforms to the EPBC Act listing of Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest ecological community (DEWHA 2010) based on native tree species minimum projected foliage cover of >10%, the patch of the community exceeding 0.5 ha, and of the perennial understorey vegetative cover present, >50% is made up of native species.

4.2.2. Exotic Vegetation

This community consists of exotic species, predominately weeds. For the most part the community comprises exotic dominated grasslands (**Photograph 3**), however some woody vegetation is present in areas sheltered from mowing, such as besides structures (**Photograph 4**), and consists mostly of the exotic shrub *Cestrum parqui*.

Exotic dominated grasslands are dominated mostly by *Cenchrus clandestinus,* with other species present including *Paspalum dilatatum* and *Axonopus fissifolius.* Exotic forbs such as *Taraxacum officinale* and *Hypochaeris radicata* are common. Native species are rare in these grassland areas however there are very scattered occurrences of grasses such as *Microlaena stipoides* var. *stipoides* and forbs such as *Dichondra repens*.

Photograph 3 Exotic dominated grasslands

Photograph 4 Exotic dominated grasslands and shrubs

4.3. Vegetation of the Study Area

Other vegetation conditions of PCT 850 occur within the study area and were surveyed as part of preparation of this BDAR; however, they do not occur within the subject land and will not be directly impacted by the proposed development. These are described below.

4.3.1. PCT 850 Moderate Condition

This vegetation comprises the highest quality patch of Cumberland Plain Woodland within the study area in the north eastern corner, this vegetation does not occur within the subject land (**Photograph 5**). It has a higher native species richness and coverage in the ground layer than other areas, likely as the ground layer appears not to be mown. It is still however degraded and impacted by past land uses. The canopy is dominated by *Eucalyptus tereticornis* (Forest Red Gum) and consists for the most part of trees younger than several adjacent old growth eucalypts which occur over a mown and degraded ground layer.

A native shrub layer is absent. The exotic shrub *Cestrum parqui* (Green Cestrum) is common in the shrub layer however, and *Ligustrum sinense* (Small-leaved Privet) also occurs, along with a single juvenile individual of the exotic tree species *Jacaranda mimosifolia* (Jacaranda).

The ground layer is dominated by the native grass *Microlaena stipoides* var. *stipoides* (Weeping Grass). Few other species are present or have high coverages. Other native grasses include *Chloris ventricosa* (Tall Chloris)

and *Bothriochloa decipiens* var. *decipiens* (Pitted Bluegrass). Native forbs are present and include *Brunoniella australis* (Blue Trumpet), *Rumex brownii* (Swamp Dock), and *Glycine microphylla* (Small-leaf Glycine).

Exotic species are common in the ground layer and the exotic grass *Ehrharta erecta* (Panic Veldtgrass) is sub-dominant. Other species present include the forbs *Solanum sisymbriifolium* (Sticky Nightshade), *Sida rhombifolia* (Paddys Lucerne), *Bidens pilosa* (Cobbler's Pegs), and the grass *Setaria parviflora* (Pigeon Grass).

Photograph 5 Moderate condition PCT 850 within the study area

4.3.2. PCT 850 Overhanging Canopy

This vegetation consists floristically of exotic dominated grassland, however the grassland occurs underneath overhanging canopy of Cumberland Plain Woodland trees which have stems located in adjoining properties (**Photograph 6**). While this canopy overhangs some areas of the subject land where driveways will be constructed, the stems of these trees occur in neighbouring properties and they will not be removed, or trimmed, as part of the proposed development. Due to no proposed direct impact to the overhanging canopy trees, and despite the occurrence of exotic grasslands underneath these overhanging canopy species, the 0.02 ha area of this vegetation that occurs within the subject land has been included within Vegetation Zone 2 for the purposes of calculating impacts as a precautionary measure; thus providing for the removal of ground layer vegetation but the retention of the trees and their canopy.

Photograph 6 Overhanging canopy of PCT 850 within the study area

4.4. Vegetation Integrity Assessment

The native vegetation identified within the subject land was assigned to a vegetation zone based on PCTs and their broad condition state. Patch sizes were subsequently assigned for each vegetation zone. The extent of vegetation zones within the subject land is shown in **Figure 8**.

Each vegetation zone was assessed using survey plots/transects (see ***Section 2.3.2***) to determine the vegetation integrity score. A summary of BAM plot data utilised within the BAM Calculator (BAMC) to determine the vegetation integrity score is provided in **Appendix B**.

Vegetation zones, patch sizes and vegetation integrity scores for the subject land are summarised in **Table 7**.

Table 7 Vegetation integrity of PCTs within the subject land

Vegetation Zone	PCT #	PCT Name	Condition Name	Subject land (ha)	Patch Size Class	Vegetation Integrity Score
1	850	Cumberland Shale Hills Woodland	Low	0.11	>101	35.2 (Composition: 25.0 Structure: 51.8 Function: 33.6)
2	850	Cumberland Shale Hills Woodland	Grassland Low	0.28	>101	7.2

Vegetation Zone	PCT #	PCT Name	Condition Name	Subject land (ha)	Patch Size Class	Vegetation Integrity Score
						(Composition: 16.8 Structure: 39.3 Function: 0.6)

5. Threatened Species

5.1. Identifying Threatened Species for Assessment

The BAM Calculator (BAMC) generates a list of threatened species requiring assessment utilising several variables. The following criteria have been utilised to predict the threatened species requiring further assessment in the BAMC:

- IBRA subregion: Cumberland;
- Associated PCTs: 850;
- Percent native vegetation cover in the assessment area: 18.3%;
- Patch size: >101 ha; and
- Credit type: Ecosystem and/or Species Credit species.

Based on the above variables, the BAMC generated a list of 30 ecosystem credit species and six species credit species. These totals include four dual credit species which are considered as ecosystem credit species for their foraging habitat and as species credit species for their breeding habitat. The BAMC generation of species credit species was limited to species listed as candidate entities for Serious and Irreversible Impacts (SAII) under the Streamlined assessment module - Small area.

5.2. Ecosystem Credit Species

Table 8 lists the predicted ecosystem credit species for the vegetation zones within the subject land and the associated PCT. No ecosystem credit species were removed from consideration. The highest sensitivity class of these species is "High Sensitivity to Potential Gain", which has subsequently been utilised by the BAMC for the calculation of ecosystem credits.

Table 8 Ecosystem credit species requiring further assessment

Scientific Name	Common Name	Habitat Constraint	Sensitivity to Gain Class	Predicted PCTs	Retained in Assessment?	Justification if Not Retained
Anthochaera phrygia	Regent Honeyeater (Foraging)	-	High	850 Low 850 Grassland Low	Yes	-
Artamus cyanopterus cyanopterus	Dusky Woodswallow	-	Moderate	850 Low 850 Grassland Low	Yes	-
Callocephalon fimbriatum	Gang-gang Cockatoo (foraging)	-	Moderate	850 Low 850 Grassland Low	Yes	-

Scientific Name	Common Name	Habitat Constraint	Sensitivity to Gain Class	Predicted PCTs	Retained in Assessment?	Justification if Not Retained
Chthonicola sagittata	Speckled Warbler	-	High	850 Low 850 Grassland Low	Yes	-
Circus assimilis	Spotted Harrier	-	Moderate	850 Low 850 Grassland Low	Yes	-
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	-	High	850 Low 850 Grassland Low	Yes	-
Daphoenositta chrysoptera	Varied Sittella	-	Moderate	850 Low 850 Grassland Low	Yes	-
Dasyurus maculatus	Spotted-tailed Quoll	-	High	850 Low 850 Grassland Low	Yes	-
Glossopsitta pusilla	Little Lorikeet	-	High	850 Low 850 Grassland Low	Yes	-
Grantiella picta	Painted Honeyeater	-	Moderate	850 Low 850 Grassland Low	Yes	-
Haliaeetus leuogaster	White-bellied Sea Eagle (Foraging)	Waterbody, within 1km of a river, lakes, large dams, wetlands and coastlines	High	850 Low 850 Grassland Low	Yes	-
Hieraaetus morphnoides	Little Eagle	-	Moderate	850 Low 850 Grassland Low	Yes	-

Scientific Name	Common Name	Habitat Constraint	Sensitivity to Gain Class	Predicted PCTs	Retained in Assessment?	Justification if Not Retained
Hirundapus caudacutus	White-throated Needletail	-	High	850 Low 850 Grassland Low	Yes	-
Lathamus discolor	Swift Parrot (Foraging)	-	Moderate	850 Low 850 Grassland Low	Yes	-
Lophoictinia isura	Square-tailed Kite (Foraging)		Moderate	850 Low 850 Grassland Low	Yes	-
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	-	Moderate	850 Low 850 Grassland Low	Yes	-
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	-	Moderate	850 Low 850 Grassland Low	Yes	-
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	-	High	850 Low 850 Grassland Low	Yes	-
Miniopterus australis	Little Bent-winged Bat (Foraging)	-	High	850 Low 850 Grassland Low	Yes	-
Miniopterus orianae oceanensis	Large Bent-winged Bat (Foraging)	-	High	850 Low 850 Grassland Low	Yes	-
Neophema pulchella	Turquoise Parrot	-	High	850 Low 850 Grassland Low	Yes	-
Ninox connivens	Barking Owl (Foraging)	-	High	850 Low 850 Grassland Low	Yes	-

Scientific Name	Common Name	Habitat Constraint	Sensitivity to Gain Class	Predicted PCTs	Retained in Assessment?	Justification if Not Retained
Ninox strenua	Powerful Owl (Foraging)	-	High	850 Low 850 Grassland Low	Yes	-
Petroica boodang	Scarlet Robin	-	Moderate	850 Low 850 Grassland Low	Yes	-
Petroica phoenicea	Flame Robin	-	Moderate	850 Low 850 Grassland Low	Yes	-
Phascolarctos cinereus	Koala (Foraging)	-	High	850 Low 850 Grassland Low	Yes	-
Pteropus poliocephalus	Grey-headed Flying-fox (Foraging)	-	High	850 Low 850 Grassland Low	Yes	-
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	-	High	850 Low 850 Grassland Low	Yes	-
Stagonopleura guttata	Diamond Firetail	-	Moderate	850 Low 850 Grassland Low	Yes	-
Tyto novaehollandiae	Masked Owl (Foraging)	-	High	850 Low 850 Grassland Low	Yes	-

5.3. Species Credit Species

5.3.1. Assessment of Habitat Constraints and Microhabitats

Table 9 lists the flora and fauna species credit species predicted 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.

All of the candidate species credit species generated by the BAMC comprise candidate entities for SAII. As per the requirements of the Streamlined assessment module - Small area of the BAM, 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.

Under Section 5.2.2 of the BAM 2020, species credit species can be excluded from further assessment, and thereby from targeted surveys, if it is determined that none of the species-specific habitat constraints are present within the subject land. Furthermore, under Section 5.2.3 of the BAM, a candidate species credit species can be considered unlikely to occur on the subject land (or specific vegetation zones) if after carrying out a field assessment, the assessor determines that the habitat is substantially degraded such that the species is unlikely to utilise the subject land (or specific vegetation zones).

Habitat assessments of the subject land were undertaken as described in ***Section 2.5.1***. The habitat assessments focussed on habitat features relevant to species credit species predicted to occur. This included determining the presence/absence of the habitat constraints identified for the predicted threatened species and the condition of these habitat constraints and other microhabitats.

Based on the results of the habitat assessment, all species credit species generated in the BAM-C were removed from consideration in accordance with Step 3 of Section 5.2.3 of the BAM, and as detailed in ***Section 2.4*** and ***Section 2.5***.

Table 9 Species credit species requiring further assessment

Scientific Name	Common Name	Sensitivity to Gain Class	Retained in Assessment?	Justification if Not Retained
Flora				
Caladenia tessellata	Thick Lip Spider Orchid	Moderate	No	The subject land is degraded such that the species is unlikely to occur and there are a lack of recent records within the locality to support its potential occurrence.
Fauna				
Anthochaera phrygia	Regent Honeyeater (breeding habitat)	High	No	The species is a SAII entity for breeding habitat only, as defined by mapped important areas., As the subject land is not located within a mapped important area, the species does not require further assessment.
Chalinolobus dwyeri	Large-eared Pied Bat	Very High	No	The species is a SAII entity for breeding habitat only, which is described as PCTs associated with the species within 2 km of rocky areas containing caves, overhangs or crevices, cliffs or escarpments, or old mines, tunnels,

Scientific Name	Common Name	Sensitivity to Gain Class	Retained in Assessment?	Justification if Not Retained
				culverts or derelict concrete buildings. Since there is no suitable breeding habitat within 2 km of the subject land, the species does not require further assessment.
Lathamus discolor	Swift Parrot (Breeding)	Moderate	No	The species is a SAII entity for breeding habitat only, as defined by mapped important areas. As the subject land is not located within a mapped important area, the species does not require further assessment.
Miniopterus australis	Little Bent-winged Bat (Breeding)	Very High	No	The species is a SAII entity for breeding habitat only, described as caves, tunnels, mines, culverts 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. As the subject land does not contain suitable breeding habitat, the species does not require further assessment.
Miniopterus orianae oceanensis	Large Bent-winged Bat (Breeding)	Very High	No	The species is a SAII entity for breeding habitat only, described as caves, tunnels, mines, culverts 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. As the subject land does not contain suitable breeding habitat, the species does not require further assessment.

5.3.2. Presence of Candidate Species Credit Species

5.3.2.1. Surveys

As no candidate species credit species require further assessment, no targeted threatened species surveys were conducted for this BDAR.

5.3.2.2. Expert Report

This assessment has not utilised any expert reports.

6. Prescribed Impacts

6.1. Prescribed Impacts

Prescribed impacts are identified in Clause 6.1 of the *Biodiversity Conservation Regulation 2017*. 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 threatened and 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 10**. The location of prescribed impacts is shown in **Figure 9**.

Table 10 Relevance of prescribed impacts

Prescribed Impact	Relevance to the Project
Karst, caves, crevices, cliffs, rock outcrops and other geological features of significance	No karsts, caves, crevices, cliffs or areas of geological significance have been identified within the subject land. Prescribed impact not relevant.
Human-made structures	The residential dwelling and large shed within the subject land will be demolished as part of the proposed development. These have the potential to be roosting habitat for some microchiropteran bats or bird species. Impacts to human-made structures would occur during the construction phase of the project and result in a long-term impact.
Non-native vegetation	Non-native vegetation occurring within the subject land comprises areas of exotic grassland. This vegetation may provide some low-value 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 contains native vegetation that connects to other retained native vegetation in the surrounding properties. The proposed development will not fragment or break the connectivity but will result in a slight reduction to the width of the native vegetation patch as a whole.

Waterbodies, water quality and hydrological processes	The eastern dam within the study area will be filled in as part of the proposed development. A retaining wall will be built around the portion of the retained western dam, preventing sediment from the study area flowing freely into the water. The removal of one of the dams has the potential to eliminate a water source that the ecosystem credit threatened fauna species may utilise from time to time, however the retained dam on site will remain to fill this role. It is not considered removal of one dam would impact on native vegetation occurrence in the surrounding area. Surface runoff from the proposed development will be minor, though will continue to flow downslope across the study area and the retained dam downslope will remain as a collection point. There will be no change in water processes upslope. The impacts to the water bodies will occur during the construction phase of the project and will be long-term.
Wind farm developments	Not relevant. The project does not comprise a wind farm development
Vehicle strikes	Vehicle strikes would be limited to potential threatened fauna impacts to ecosystem credit species. Access to the proposed development will be through driveways. Vehicle movement would be at low speed as vehicles enter the property from Mount Vernon Road. Most threatened species with potential to be impacted are arboreal and would largely be active in the canopy, such that interactions with vehicles on the driveways are unlikely. Most threatened microbat species are active at night, when there would be very limited vehicle traffic. Vehicle strike impacts could also take place during construction but would be very limited as construction would take place during daylight when fauna is unlikely to be active, and construction noise would likely keep fauna away. As such vehicle strike impacts to threatened fauna species are likely to be a very rare occurrence.

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. The subject land includes the area to be completely cleared for the proposed development (the development footprint).

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 subject land contains vegetation conforming to a TEC that was prioritised for retention in the proposed development.

7.1.1. Project Location

The development footprint has been situated within the study area to allow for the construction and operational requirements of the project while minimising impacts to areas containing biodiversity values. In determining the location of the development footprint, the project has sought to avoid and minimise direct impacts on native vegetation and habitat by:

- Locating the project within areas currently comprising exotic grassland and cleared land where possible;
- Locating the project to minimise direct impacts on the TEC Cumberland Plain Woodland occurring within the study area;
- Locating the project to avoid all direct impacts on the canopy area of moderate condition Cumberland Plain Woodland, thereby retaining the best condition vegetation of the TEC within the study area;
- Re-design of the project to move the subsurface irrigation away from the moderate condition Cumberland Plain Woodland.

An original project layout was proposed and submitted to Council for the development (**Figure 10**) that placed the subsurface irrigation in the area of moderate condition Cumberland Plain Woodland in the northeast corner of the study area and would have required complete removal of this patch. Following identification of the TEC in this area by Cumberland Ecology, the client re-designed the project to reduce the rear house size and move the subsurface irrigation away from this area as much as possible; including through splitting the irrigation system into three sites rather than two. The subsurface irrigation cannot be moved elsewhere due to specific requirements on buffers to waterbodies; indicating the current proposed development layout is the optimal design to facilitate the development while retaining as much Cumberland Plain Woodland as practicable. Further, the design was modified to allow for the retention of a significant large *Eucalyptus moluccana* that has multiple hollows and is situated between the two proposed house sites.

7.1.2. Project Design

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

- Avoidance of the TEC Cumberland Plain Woodland where possible, particularly the entirety of the moderate condition state, and excluding these high biodiversity value areas;

- Minimising impacts to native vegetation by placing the development footprint within exotic vegetation and cleared areas where possible;
- Redesigning the project layout to move the subsurface irrigation to retain additional Cumberland Plain Woodland;
- Limiting the construction footprint of earthworks to comprise only the operational footprint area surrounding the project to reduce removal of native vegetation; and
- Minimise impacts to biodiversity through the implementation of a suite of mitigation measures, including weed management, tree protection measures and clearing protocols.

A summary of the avoidance and minimising measures considered for this project is outlined in **Table 11**.

7.1.3. Mitigation Measures

- A suite of mitigation measures as part of the project will be implemented to minimise the impacts on biodiversity, and include:
    - Weed management;
    - Delineation of clearing limits;
    - Pre-clearance surveys and clearance supervision;
    - Sedimentation control measures;
    - Nest box installation; and
    - Dam dewatering supervision.

These are described in ***Section 8.6***.

Table 11. 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)
Incorporation of suitable technologies and design configurations to minimise overall development footprint	Yes	As part of the design process of the project, careful consideration has been given to reducing the footprint of the two house sites and situating the subsurface irrigation sites to minimise the on ground impact and ensure maximum efficiency in utilising the space.	During design and approval	Proponent and consultant team	Retention of approximately 0.49 ha of Cumberland Plain Woodland within the study area, including all the moderate condition vegetation and retention of a significant large hollow-bearing tree
Implementation of a suite of mitigation measures	Yes	To minimise the impacts on biodiversity, and the Cumberland Plain Woodland TEC in particular, a suite of mitigation measures will be implemented such as nest box installation, weed management, and tree protection measures.	Pre and post construction and during operation phase	Proponent and consultant team	Minimise impacts on biodiversity
Design amendments to various elements of the project design	Yes	Redesign of the project was undertaken following identification of Cumberland Plain Woodland	During design and approval	Proponent and consultant team	Avoid and minimise impacts of the TEC Cumberland Plain Woodland
Partial development of the study area to avoid/minimise	No	Partial development would not allow for the construction of the two dwellings that are the basis of the development	-	-	-

Action	Adopted (Yes/No/In part)	Justification	Timing (if adopted)	Responsibility (if adopted)	Outcome (if adopted)
impacts on biodiversity and achieve greater tree retention					
'Do-nothing' option to avoid all impacts on biodiversity	No	The do-nothing option for the project would maintain current tree and derived native grassland cover on site but would not enable redevelopment. Under a no-go option, trees would remain. However, the subject land occurs in a rural residential area and it would likely be utilised for grazing if it were not developed, which would result in the ongoing degradation of the vegetation on site.	-	-	-
Consideration of alternative sites and layouts within the study area	In part	Similar earlier options were considered and investigated for the project. The final option selected has consideration to both biodiversity values and the development.	During design and approval	Proponent and consultant team	Retention of approximately 0.49 ha of Cumberland Plain Woodland within the study area, including all the moderate condition vegetation and retention of a significant large hollow-bearing tree

7.2. Avoid and Minimise Prescribed Impacts

7.2.1. Human-made Structures

The existing house and large tin shed will be demolished as part of the proposed development. These have the potential to provide roosting habitat for some microchiropteran bat species and birds. The shed was inspected during the field survey and no fauna or roosting sites within the roof were observed, though the house was not able to be internally inspected.

The potential inhabitation of these structures would be limited to ecosystem credit species and non-threatened native species. All species credit species microchiropteran bats identified for the project in ***Section 5.3*** are cave-dwelling species and would not utilise these structures for roosting purposes. It is recommended a pre-clearance survey is undertaken by an experienced ecologist of the structures prior to demolition and any fauna found can be relocated; thus, minimising the impact of removing these structures.

7.2.2. Non-native Vegetation

Areas of non-native vegetation within the subject are in the form of low-biodiversity value exotic grasslands.

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 woodland habitats of the study area and surrounds. The proposed development will remove 0.61 ha of non-native vegetation and will retain 0.36 ha. The development has prioritised the retention of the TEC Cumberland Plain Woodland and has therefore predominantly situated the development in the areas of exotic grasslands and shrubs. As such, impacts to the areas of non-native vegetation are not able to be avoided as part of the project.

7.2.3. Habitat Connectivity

The areas of PCT 850 on the eastern and western boundaries to be removed have connectivity with the treed vegetation in the surrounding properties. No habitat corridor connectivity will be broken or fragmented due to the proposed vegetation removal, there will just be a minor reduction in the area of habitat available.

When considering the requirements associated with the extent of earthworks and the requirement for the subsurface irrigation systems, it would not be possible to avoid all impacts native vegetation.

Some connectivity will however be retained by retaining trees within north-eastern corner, and other scattered trees throughout the study area. These trees would provide 'steppingstones' for arboreal species to other native trees within the rural residential area.

7.2.4. Waterbodies, Water Quality and Hydrological Processes

The eastern dam will be filled in as part of the proposed development. The dams are surrounded by exotic vegetation that does not conform to any native vegetation community. A retaining wall will be built around the portion of the retained western dam, preventing sediment from the study area flowing freely into the water. The removal of one of the dams has the potential to eliminate a water source that the ecosystem credit fauna species may utilise from time to time, however the retained dam on site will remain to fill this role. It is not considered removal of the dam would impact on native vegetation in the surrounding area through any

changes to groundwater. Surface runoff will be minor, though will continue to flow downslope across the study area and the retained dam downslope will remain as a collection point. There will be no change in water processes upslope. A Flood Impact Assessment Report has been prepared for the project by Engineering Studio (2021) and it has been shown that the proposed development can be constructed on the site with no flooding impacts to surrounding properties and within the guidelines imposed by the regulatory authorities. A Wastewater Management: Site and Soil Evaluation & Disposal System Design Report was also prepared by SEEC (2021) for the project that notes that onsite drainage can and will be managed appropriately.

Any run-off from retained landscaping areas would be minor, and less than under current conditions due to the reduced area. As such, potential indirect impacts to water quality would primarily be because of sediment inputs during construction and cannot be completely avoided. Erosion and sediment control measures will be implemented during construction following Managing Urban Stormwater: Soils and Construction ("the Blue Book") (Landcom 2004).

7.2.5. Vehicle Strikes

Access to the proposed development will be via driveways into the two dwellings. As such this design would limit potential vehicle interaction with fauna to the points where the driveways pass near retained vegetation to the east of the subject land. Vehicles will be entering the two residential properties and will be travelling slowly along the short driveway, minimising the likelihood of vehicle strikes to fauna. There is limited opportunity to re-design the driveways to further avoid potential fauna strike impacts.

8. Impact Assessment

8.1. Direct Impacts

8.1.1. Native Vegetation Clearing

One PCT, PCT 850, present in two condition states will be impacted by the proposed development. A total of 0.39 ha of this will be completely cleared within the development footprint. A further 0.61 ha of exotic vegetation will also be removed. The native vegetation to be removed conforms to the TEC Cumberland Plain Woodland listed under the BC Act.

The direct impact resulting from the proposed development is the loss of vegetation and associated habitat within the subject land. **Table 12** identifies the extent of clearing impacts to vegetation within the subject land.

Table 12 Extent of clearing impacts

Vegetation Zone	PCT #	PCT Condition Class	Cleared (ha)	Retained in study area (ha)
1	850	Low	011	0.07
2	850	Grassland Low	0.28	0.29
-	850	Moderate	0.04	0.04
-	850	Overhanging Canopy	0.09	0.09
-	-	Exotics	0.61	0.36
-	-	Cleared	0.04	0.00
-	-	Dams	0.09	0.06
Total			**1.13**	**0.89**

8.1.1.1. Impact on EPBC Act Listed Vegetation

While there is the potential for the 0.11 ha of Low condition PCT 850 to conform to the Cumberland Plain Woodland listing under the EPBC Act (DEWHA, 2010), the area of impact is minimal, and it is not considered a significant impact would result from the proposed development or that a referral to the Commonwealth would be required.

8.1.1.2. Loss of Specific Habitat Features

The main habitat for native fauna in the subject land is in the areas of native vegetation. In addition to native vegetation, specific habitat features identified within the subject land include hollow-bearing trees, stags, dams and course woody debris.

The project will result in the loss of habitat features within the development footprint, comprising four hollow-bearing trees, one hollow-bearing stag, one other stage, one of the two dams, one hollow log and one log pile.

Within the study area habitat features will be retained, including one large hollow-bearing tree, one stick nest, and the larger of the two dams.

Overall, the removal of these specific habitat features is considered to have only minor implications for native fauna species due to the modified ecological context within which most of the development site occurs within, and the high mobility of the species likely to utilise these habitats.

8.2. Change in Vegetation Integrity Score

8.2.1. Native Vegetation Clearing

Due to the need to removal all vegetation from the development footprint the future vegetation integrity score for this management zone assumes complete removal of all vegetation.

Table 13 details the change in vegetation integrity score for the vegetation zones and management zones within the subject land.

Table 13 Changes in vegetation integrity score for management zones

Zone	Veg Zone Name	Management Zone	BRW	Area (ha)	VI Score		
					Current	Future	Total Change
1	850_Low	Cleared	2.5	0.11	35.2	0.0	-35.2
2	850_Grassland low	Cleared	2.5	0.28	7.2	0.0	-7.2

BRW = Biodiversity Risk Weighting

VI Score = Vegetation Integrity Score

8.3. Indirect Impacts

Table 14 outlines the indirect impacts to native vegetation and habitat. 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.

Table 14 Indirect impacts of the project

Indirect Impact	Nature	Extent	Duration	Threatened Entities Likely Affected	Consequences
Inadvertent impacts on adjacent habitat or vegetation	Construction activities may result in inadvertent impacts on vegetation surrounding the subject land, such as increase sedimentation.	Native vegetation surrounding the subject land	Short term (during construction) and potential long term	Ecosystem credit species, Cumberland Plain Woodland	Reduced condition of the adjoining vegetation
Reduced viability of adjacent habitat due to edge effects	Minor impact as subject land is within a rural residential area where the habitat is already highly modified and scattered due to land use. The proposed development would not significantly increase edge effects beyond current conditions.	Native vegetation to the north of the subject land	Long-term	Ecosystem credit species, Cumberland Plain Woodland	Reduced condition of the adjoining vegetation
Reduced viability of adjacent habitat due to noise, dust or light spill	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.	Native vegetation surrounding the subject land	Short term (during construction)	Ecosystem credit species	Short term disruption of fauna habitat usage during construction.
Transport of weeds and pathogens from the site to adjacent vegetation	Several 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	Potential long-term	Ecosystem credit species, Cumberland Plain Woodland	Reduced condition of adjoining vegetation.
Increased risk of starvation, exposure	Impact unlikely. The project is unlikely to cause displacement of fauna such that it increases the risk of starvation, exposure and loss of shade or shelter.	-	-	-	-

Indirect Impact	Nature	Extent	Duration	Threatened Entities Likely Affected	Consequences
and loss of shade or shelter					
Loss of breeding habitats	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 have been observed and none are likely to occur, considering the nature of the subject land.	-	-	-	-
Inhibition of nitrogen fixation and increased soil salinity	While the proposed development would remove nitrogen fixing species from the disturbance footprint, impacts beyond this on nitrogen fixing species or soil salinity are considered unlikely	-	-	-	-
Fertiliser drift	Impact unlikely, fertiliser use would be limited to landscaping areas during plant establishment and would not be expected to drift	-	-	-	-
Rubbish dumping	Construction activities and occupation of the subject land may result in rubbish dumping within adjoining areas of native vegetation.	Native vegetation surrounding the subject land	Potential long term	Ecosystem credit species, Cumberland Plain Woodland	Reduced condition of the adjoining native vegetation
Wood collection	Impact may occur, though there is limited fallen logs or timber to be collected.	Native vegetation surrounding the subject land	Potential long term	Ecosystem credit species, Cumberland Plain Woodland	Reduced condition of the adjoining native vegetation

Indirect Impact	Nature	Extent	Duration	Threatened Entities Likely Affected	Consequences
Bush rock removal and disturbance	No bush rock was recorded within the study area	-	-	-	-
Increase in predatory species populations	Impact unlikely. The proposed development is considered unlikely to result in an increase in predatory species populations.	-	-	-	-
Increase in pest animal populations	Impact unlikely. 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.	-	-		-
Disturbance to specialist breeding and foraging habitat	The subject land contains five hollow bearing trees that will require removal, but it not expected to impact on specialist breeding and foraging habitat in adjacent areas	Native vegetation surrounding the subject land	Short term (construction)	Ecosystem credit species	Short term disruption of fauna habitat usage during construction.

8.4. Prescribed Impacts

The project has been assessed as potentially resulting in five prescribed impacts (see ***Section 6.1***). An assessment of these prescribed impacts is provided below in accordance with Section 8.3 of the BAM.

8.4.1. Human-made Structures

8.4.1.1. Nature

An existing residential dwelling and large metal shed will be demolished as part of the proposed development.

8.4.1.2. Extent

The development footprint of these areas occupied by the two structures is 0.04 ha.

8.4.1.3. Duration

Impacts to the human-made structures would occur during the construction phase of the project. The removal is a long-term impact.

8.4.1.4. Threatened Entities Affected

Ecosystem credit microchiropteran bat and woodland bird species have the potential to be impacted by the removal of possible roosting habitat.

8.4.1.5. Consequences

The project will result in the removal of these structures that may provide roosting habitat for some threatened species. The impact is unlikely to be significant as preferable woodland habitat will be retained within the study area and in surrounding properties.

8.4.2. Non-native Vegetation

8.4.2.1. Nature

Non-native vegetation is proposed to be cleared for the project. Non-native vegetation includes areas of exotic grassland as shown in **Figure 8**.

8.4.2.2. Extent

The proposed development will clear a total of 0.61 ha of non-native vegetation in the form of exotic grassland.

8.4.2.3. 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.

8.4.2.4. Threatened Entities Affected

The habitat provided by non-native vegetation may provide some foraging habitat for ecosystem credit species, such as microchiropteran bats and birds. However, the non-native vegetation is not considered suitable breeding/nest habitat due to lack of hollows and structural features, other than some minor woody weeds such as scattered shrubs.

8.4.2.5. Consequences

The project will result in a reduction in non-native vegetation by 0.61 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 immediately adjacent the subject land and within the assessment area.

8.4.3. Habitat Connectivity

8.4.3.1. Nature

The native woody vegetation within the subject land connects to other native treed vegetation within surrounding properties. The width of this area of native vegetation will be reduced marginally. The construction of the two residential buildings would be an impediment to the movement of some fauna species.

8.4.3.2. Extent

Habitat connectivity will be reduced through the removal of 0.39 ha of native vegetation, comprising 0.11 ha of treed vegetation and 0.28 ha of grassland. Some connectivity will remain through the retention of vegetation within the study area.

8.4.3.3. Duration

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

8.4.3.4. Threatened Entities Affected

The habitat provided by native vegetation may provide foraging habitat for ecosystem credit species, such as the Grey-headed Flying-fox, microchiropteran bats and birds. Some species such as the Grey-headed Flying-fox and threatened owl and eagle species would be able to fly over the proposed buildings and would only be impacted through the direct loss of foraging habitat.

8.4.3.5. Consequences

The project will result in the direct reduction in native vegetation by 0.39 ha. Although the clearing of the subject land will result in a slight reduction of the width of the existing vegetation patch, the reduction of this small area of habitat is not considered to significantly impact the movement of mobile fauna species as better-quality habitat is located in the adjacent native vegetation. 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.

8.4.4. Waterbodies, Water Quality and Hydrological Processes

8.4.4.1. Nature

The eastern dam that has an area of 0.09 ha will be filled in as part of the proposed development.

8.4.4.2. Extent

The eastern dam will be completely filled in, however the larger western dam shared with the neighbouring property will be retained and protected through the construction of a retaining wall. These dams are an artificial waterbody that have been constructed in the study area as part of the historical use as a rural residential property. Similar dams exist in most surrounding rural residential properties. As such the extent of impacts of removing this one dam with an area of 0.09 ha would be minor.

8.4.4.3. Duration

Impacts to waterbodies would be most likely to take place during construction. These will be managed through erosion and sediment control measures to prevent sediment laden run-off from leaving the construction site. Changes to surface run-off will be permanent if the development is constructed.

8.4.4.4. Threatened Entities Affected

Any changes to waterbodies, water quality and hydrological processes are unlikely to affect threatened entities within the subject land beyond the removal of one dam within a mosaic of similar dams retained within the surrounding rural residential properties, that may provide a water source for foraging threatened and native species. The PCT that conforms to Cumberland Plain Woodland within the subject land is a community that occurs on a landscape of hills and higher elevations and would not be expected to be dependent on groundwater or the presence of a dam.

8.4.4.5. Consequences

The consequences of impacts to waterbodies, water quality and hydrological processes are likely to be minor and would primarily take place during construction. These impacts can be mitigated through implementation of erosion and sediment control measures.

8.4.5. Vehicle Strikes

8.4.5.1. Nature

Access to the proposed development will be through a shared driveway off Mount Vernon Road. Vehicle movement would be at low speed as vehicles enter and navigate through the short driveways in the property. Most threatened species with potential to be impacted are arboreal and would largely be active in the canopy, such that interactions with vehicles are unlikely. Most threatened bat species are active at night when there would be very limited vehicle traffic. Vehicle strike impacts could also take place during construction but would be very limited as construction would take place during daylight when fauna is unlikely to be active, and construction noise would likely keep fauna away.

8.4.5.2. Extent

There extent on vehicle strike impacts during construction would primarily be limited to the boundary between the construction site and retained vegetation within the study area and along the fence boundary. During operation, impacts would be limited to where vehicles enter the from Mount Vernon Road via the driveway. Vehicles would enter at low speed, such that strike impacts causing mortality would be unlikely.

8.4.5.3. Duration

Fauna strike impacts could take place both during construction, and during the operational phase of the project.

8.4.5.4. Threatened Entities Affected

The threatened entities with the potential to be impacted would primarily be ecosystem credit species. Most species are likely to forage in the canopy and as such would rarely be at the level where vehicles are entering the proposed development. The Grey-headed Flying-fox, threatened owl and microbat species only forage at night, when there will be no construction activities and vehicle access to the proposed development will be limited.

8.4.5.5. Consequences

Vehicle strike impacts to threatened fauna are likely to be a very rare occurrence. During construction retained vegetation will be fenced-off, and fauna are unlikely to be present due to construction noise. During operation, the likelihood of vehicle strikes would be rare due to the limited space where interactions with fauna could take place and the low speed of vehicles.

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, during and after construction to limit the impact of the project. Each mitigation measure is discussed in detail below, and a summary is provided in **Table 15**.

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 Management Region and is subject to the Greater Sydney Regional Strategic Weed Management Plan 2017 – 2022 (LLS: North Coast 2017) 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: North Coast 2017). To comply with the objectives of the Greater Sydney Regional Strategic Weed Management Plan, it is recommended the following measures be implemented as part of weed management for the subject land.

8.5.1.1. 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.

8.5.1.2. Eradication

Initial weed management will be carried out within the subject land according to best-practice methods under the direction of a suitably qualified bush regenerator. The targeted species will be those listed under Appendices 1 and 2 of the Greater Sydney Regional Strategic Weed Management Plan 2017 – 2022 (LLS: North

Coast 2017). 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 will focus on the removal of targeted species from within landscaping areas.

Best-practice bush regeneration should undertake measures to 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, and replacement of disturbed mulch/leaf-litter.

8.5.1.3. Containment

Follow-up monitoring and maintenance should be undertaken in retained vegetation areas following construction, 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, rock or vegetation will occur beyond this boundary.

8.5.3. Pre-clearance Surveys

To minimise impacts to fauna species during construction, pre-clearance surveys will be conducted in all areas of vegetation that are required to be cleared and within the two structures to be demolished. Pre-clearing surveys will be undertaken within one week of clearing activities by a qualified ecologist.

Habitat features to be identified include:

- 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.

8.5.4. Staging of Clearing

The clearing of vegetation 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. 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 only if 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 using the following protocols:

- Trees marked as containing hollows will be shaken by machinery prior to clearing to encourage any animals remaining to leave the hollows and move on;
- Use a bulldozer or excavator to start pushing the tree over. Move the bulldozer over the roots and continue gently pushing the tree over;
- Remove branches with hollows and sections of trunk and set aside for immediate transfer to a storage area for placement within retained vegetation; and
- All hollows will be investigated by an ecologist for the presence of fauna following felling of the tree.

The felled habitat tree will be left overnight to allow any remaining fauna time to leave the hollows and move on. The two-stage clearing process enables fauna a chance to self-relocate upon nightfall, when foraging typically occurs.

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).

Provision of a report following the completion of clearing works will be provided detailing the total number and species of individuals recorded and details of their release/health.

8.5.5. Structure Removal Supervision

Due to a Red-bellied Black Snake (*Pseudechis porphyriacus*) being observed retreating into a crack in the concrete beneath the house site, and the potential for microchiropteran bats and birds to roost within the shed, it is recommended a suitably qualified ecologist is present to oversee the demolition of these structures and removal of the concrete slabs. A brief letter report will be provided on completion of these works detailing the total number and species of individuals recorded and details of their release/health.

8.5.6. Sedimentation Control Measures

The project may result in erosion and transport of sediments because of soil disturbance during construction. In order to prevent this impact, construction activities will be undertaken in accordance with "The Blue Book" (Landcom 2004).

8.5.7. Nest Box Installation

To mitigate any potential impacts on native fauna associated with the removal of five trees containing hollows, a minimum of five nest boxes are proposed to be installed as part of the project. The nest boxes will be installed in trees to be retained within landscaping areas.

8.5.8. Dam Dewatering

A suitably qualified ecologist should be present throughout the dam dewatering process to catch and relocate any aquatic or terrestrial species present. All native species will be relocated to the large dam retained to the west of the study area and any exotic species will be humanely euthanised. The ecologist should also be present while an excavator strips the sediment out of the dam to a depth of approximately 0.5 m to relocate any sub-terranean species. Additional details will be provided in the Construction Environmental Management Plan to be prepared for the project.

A brief letter report will be provided on completion of these works detailing the total number and species of individuals recorded and details of their release/health.

Table 15 Summary of mitigation measures

Mitigation Measure	Proposed Techniques	Timing	Frequency	Responsibility	Risk of Failure	Risk and Consequences of Residual Impacts
Weed management	Appropriate weed control activities will be undertaken in accordance with the Greater Sydney Regional Strategic Weed Management Plan 2017 – 2022 (LLS: North Coast 2017).	Construction	Prior to construction, following vegetation clearing	Contractor	High	Spread of weeds throughout the subject land and surrounding area.
Delineation of clearing limits	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/ Arborist	High	Unnecessary damage to retained trees in the landscaping area or adjacent properties.
Pre-clearance survey	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	Project ecologist	Moderate	Increased and unnecessary mortality of native fauna.
Staging of clearing	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	Construction	Once	Contractor/ Project ecologist	High	Increased and unnecessary mortality of native fauna.

Mitigation Measure	Proposed Techniques	Timing	Frequency	Responsibility	Risk of Failure	Risk and Consequences of Residual Impacts
	animal (either taken to the nearest veterinary clinic for treatment, or if the animal is unlikely to survive, it will be humanely euthanized)					
Structure Removal Supervision	An ecologist will be present during the demolition of the human-made structures to catch and relocate any species utilising these buildings	Construction	Once	Contractor/ Project ecologist	High	Increased and unnecessary mortality of native fauna.
Sedimentation control	Construction activities will be undertaken in accordance with "The Blue Book" (Landcom 2004). These include implementation of measures detailed in Preliminary Erosion and Sediment Control Plan (Costin and Roe Consulting 2021)	Construction	Throughout construction period	Contractor	High	Sedimentation into adjoining vegetation.
Nest box installation	Installation of nest boxes in retained trees in the landscaping area	Prior to vegetation clearing	Once	Project ecologist	Low	Reduction in available fauna habitat
Dam Dewatering	An ecologist will be present throughout the dam dewatering and during sediment removal to catch and relocate any terrestrial and aquatic species present.	Construction	Once	Contractor/ Project ecologist	High	Increased and unnecessary mortality of native fauna.

8.6. Mitigation of Prescribed Impacts

The following mitigation measures, described in ***Section 8.6***, are relevant to the prescribed impacts relevant to the project:

- Delineation of clearing limits;
- Pre-clearance survey;
- Staging of clearing;
- Structure Removal Supervision;
- Sedimentation control measures;
- Nest box installation; and
- Dam Dewatering.

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

No additional biodiversity credits are required for prescribed 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; and
- 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 has been considered as relevant to the project, being Cumberland Plain Woodland. Further consideration of this entity is provided in the sections 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 7**.

Approximately 0.39 ha of Cumberland Plain Woodland will be removed within the subject land, including 0.11 ha of treed Cumberland Plain Woodland in low condition and 0.28 ha of Cumberland Plain Woodland grasslands in low condition. The area that has been assessed for removal comprises predominantly degraded grasslands with overhanging canopy trees.

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 16**.

Table 16 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**.

Criteria	Additional Impact Assessment Provisions	Response
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. 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.

Criteria	Additional Provisions	Impact	Assessment	Response
				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 23,020.75 ha. This mapping is the most recent and comprehensive published mapping available and could be considered to be most accurate of the sources reviewed. The extent of this mapping in relation to the subject land and adjoining areas is shown in **Figure 11**. 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

Criteria	Additional Impact Assessment Provisions	Response
		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 Invasion and establishment of exotic species Degradation of habitat; and Fragmentation of habitat	According to the final determination for Cumberland Plain Woodland (NSW Scientific Committee 2011), 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; 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.

Criteria	Additional Impact Assessment Provisions	Response
(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).
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 0.39 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 0.0034% 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 occurs on the edge of a larger patch of the TEC. As a result, the impact on Cumberland Plain Woodland in the subject land will result in a slight reduction in the larger patch. No isolated areas have been identified within 500 m of the subject land. Based on the Map of Critically Endangered Ecological Communities NSW Version 6 dated 25/02/2020 (DPIE

Criteria	Additional Provisions	Impact Assessment	Response
			2020), there is approximately 39.49 ha of Cumberland Plan Woodland within 500 m of the subject land. Therefore, the removal or modification of 0.39 ha represents approximately 0.99% of the occurrence of the TEC within 500 m of the subject land.
	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 removal of Cumberland Plain Woodland within the subject land will not fragment any patch of the community as the subject land occurs on the edge of a larger continuous corridor of native vegetation.
	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 species characteristic of the community is estimated to be at least 100 m and potentially much further. As no areas of native vegetation will be fragmented as part of the project and therefore dispersal distances will not increase as a result of the project.
	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 subject land is part of a remnant patch of Cumberland Plain Woodland (and other native vegetation communities). As previously described, the project is not considered to significantly affect the connectivity of the TEC, as the vegetation proposed for removal occurs on the edge of a larger patch of the TEC.
	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		The Cumberland Plain Woodland in the subject land corresponds to PCT 850 and the 'Low' and "Grassland

Criteria	Additional Provisions	Impact Assessment	Response
	include the relevant composition, structure and function condition scores for each vegetation zone.		Low' condition state. The vegetation integrity score for the TEC is as follows: Vegetation Zone 1: Condition Class - Low Vegetation Integrity Score: 35.2 Composition: 25.0 Structure: 51.8 Function: 33.6 Vegetation Zone 2: Condition Class – Grassland Low Vegetation Integrity Score: 7.2 Composition: 16.8 Structure: 39.3 Function: 0.6
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 in Vegetation Zone 1 as the following criteria is met:

- A vegetation zone that has a vegetation integrity score ≥17 where the PCT is associated with threatened species habitat (as represented by ecosystem credits).

The PCT and vegetation zones requiring offsets is documented in **Table 17**. This area is mapped in **Figure 12**.

9.3.1.1. Cleared Management Zone

For the area covered by the development footprint, all native vegetation will require removal, as such offsetting requirements are calculated on the assumption that the future vegetation integrity score will be zero.

Table 17 Native vegetation impacts requiring an offset

Zone	Veg Zone Name	Management Zone	Total Vegetation Integrity Loss	Biodiversity Risk Weighting	Area (ha)	Credits
1	850_Low	Cleared	-35.2	2.5	0.11	2

9.3.2. Threatened Species

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

9.4. Impacts that do not Require Offsets

In accordance with the BAM, the project does not require offsets for the clearing of native vegetation in Vegetation Zone 2 as the following criteria is met:

- A vegetation zone that has a vegetation integrity score <15 where the PCT is representative of an EEC or CEEC; or
- A vegetation zone that has a vegetation integrity score of <17 where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or is representative of a vulnerable ecological community.

The PCTs and vegetation zones not requiring offsets is documented in **Table 18**. This area is mapped on **Figure 12**.

Table 18 Native vegetation impacts that do not require an offset

Zone	Veg Zone Name	Management Zone	Total Vegetation Integrity Loss	Biodiversity Risk Weighting	Area (ha)	Credits
2	850_Grassland Low	Cleared	-7.2	2.5	0.28	0

9.5. Impacts that do not Require Further Assessment

Impacts to areas identified as Overhanging Canopy, Exotic Vegetation, Cleared and Dams that occur within the subject land do not require further assessment. These areas comprise approximately 0.76 ha cumulatively and include all areas not mapped as a Vegetation Zone.

Note that the 0.02 ha area of Overhanging canopy within the subject land has been included in Vegetation Zone 2 for the purposes of impact assessment as only the ground layer will be removed. While it was identified that the ground layer under the Overhanging Canopy comprises exotic vegetation, it was included within Vegetation Zone 2 on a precautionary basis.

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 mitigated, 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.**

Note that a total of two ecosystem credits are required to offset the impacts of the project on native vegetation.

A credit summary report from the BAMC has been included in **Appendix C**.

Table 19 Summary of ecosystem credit liability

Zone	Vegetation Zone Name	Sensitivity to Gain	Area (ha)	Credits Required
1	850_Low	High sensitivity to potential gain	0.11	2

Table 20 Like for like offsetting options for PCT 850

Class	Containing Hollow-bearing Trees?	In the below IBRA Subregions	Credits
Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 849, 850	Yes	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.	2

10. Conclusion

The project has been determined to enter the BOS due to including land mapped on the Biodiversity Values Map and therefore this BDAR was undertaken to assess the impacts of the project on the biodiversity values of the subject land. This BDAR has been prepared in accordance with the 2020 version of the BAM following the Streamlined assessment module – Small area development.

The project involves the construction of two residential dwellings and associated infrastructure. The development will involve the removal of two existing structures and infilling of one dam. The development will take place on land that has been modified because of historical land use, and as a result largely contains cleared areas, degraded grasslands and scattered canopy trees.

To facilitate the project, a total of 1.13 ha of land will be directly impacted of which 0.39 ha comprises native vegetation. The remaining area of the subject land covering 0.89 ha will be retained as grassland and native canopy trees.

Of the native vegetation to be cleared, approximately 0.39 ha conforms to the BC Act listed TEC Cumberland Plain Woodland. 0.11 ha of this vegetation that includes treed vegetation also may conform to the TEC Cumberland Plain Shale Woodland listed under the EPBC Act.

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, nest box installation, sedimentation control measures, and dam dewatering.

Due to the area requiring clearing, and the vegetation integrity scores of the native vegetation within the subject land, the biodiversity credit liability of the project has been calculated at two ecosystem credits. With the implementation of the proposed mitigation measures and the offsetting described, it is considered that the impacts of this project on biodiversity will be limited and can be appropriately managed.

11. References

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APPENDIX A :
BAM Compliance Table

BDAR Section	BAM Requirements	Operational Manual Requirements	Assessment of Compliance and Recommendations
Introduction	Information		
	Introduction to the biodiversity assessment including:		
	identification of development/biodiversity stewardship site footprint, including: operational footprint construction footprint indicating clearing associated with temporary construction facilities and infrastructure		Section 1.3.3
	general description of development/biodiversity stewardship site		Section 1.3.4
	sources of information used in the assessment, including reports and spatial data.		Section 1.3.6, Section 1.3.7
	Maps and Data		
	Site Map (as described in Section 4.2)		Figure 1
	Location Map (as described in Section 4.2)		Figure 2
	Digital shape files for all maps and spatial data		To be provided in BOAMs or email
Landscape Features	Information		
	Identification of landscape features at the development/biodiversity stewardship site, including:		
	IBRA bioregions and subregions, NSW landscape region and area (ha)	Subject land area (ha) IBRA bioregions and subregions	Figure 1

BDAR Section	BAM Requirements	Operational Manual Requirements	Assessment of Compliance and Recommendations
		BioNet NSW Landscapes	
	native vegetation extent in the buffer area		Figure 1
	cleared areas	Cleared areas	Figure 2
	evidence to support differences between mapped vegetation extent and aerial imagery		Figure 2
	rivers and streams classified according to stream order	Rivers, streams and estuaries	Figure 2
	wetlands within, adjacent to and downstream of the site	Wetlands within, adjacent to and downstream of the site	Figure 2
	connectivity features	Connectivity of areas of habitat including areas identified as priority investment areas, flyways for migratory species	Section 3.2.5
	areas of geological significance and soil hazard features	Areas of geological significance and soil hazard features	Figure 1
		Areas of Outstanding Biodiversity Value	Section 3.2.7
	site context components, including: identification of method applied (i.e. linear or site-based) percent native vegetation cover in the landscape (development site and biodiversity stewardship site).	Percent native vegetation cover including: buffer area justification to support differences between aerial imagery used for the assessment and final mapped native vegetation cover.	Section 3.3
	Maps and Data		
	IBRA bioregions and subregions (as described in Paragraphs 4.2.1.3–4.2.1.4)	IBRA bioregions and subregions	Figures 1 and 2

BDAR Section	BAM Requirements	Operational Manual Requirements	Assessment of Compliance and Recommendations
	NSW landscape regions (as described in Paragraph 4.2.1.5)	BioNet NSW landscapes	Figures 1 and 2
	Rivers and streams (as described in Paragraph 4.2.1.6)	Rivers, streams (using Strahler stream ordering) and estuaries	Figures 1 and 2
	Wetlands (as described in Paragraph 4.2.1.7)	Wetlands	Figures 1 and 2
	Connectivity of different areas of habitat (as described in Paragraphs 4.2.1.8–4.2.1.11)	Connectivity	Figure 2
	Areas of geological significance and soil hazard features (as described in Paragraphs 4.2.1.12–4.2.1.15)	Areas of geological significance and soil hazards	Figures 1 and 2
	Native vegetation extent (as described in Subsection 4.3.2)	Native vegetation cover	Figure 5
		Boundary of the subject land.	Figure 1
		Areas of Outstanding Biodiversity Value	Section 3.2.6
Native Vegetation	Information		
	Identify native vegetation extent within the development/biodiversity stewardship site, including cleared areas and evidence to support differences between mapped vegetation extent and aerial imagery.	Native vegetation cover on subject land and justification to support differences between mapped native vegetation cover and aerial imagery.	Section 4.1 and Figure 5
	Describe PCTs within the development/biodiversity stewardship site, including:	PCTs within the subject land, including:	

BDAR Section	BAM Requirements	Operational Manual Requirements	Assessment of Compliance and Recommendations
	vegetation class	vegetation class	Section 4.2
	vegetation type	vegetation type (i.e. PCT names and ID numbers)	Section 4.2
	area (ha) for each vegetation type	area (ha)	Table 5
	species relied upon for identification of vegetation type and relative abundance	species relied upon for identification of vegetation type and relative abundance	Table 6
	justification of evidence used to identify a PCT (as outlined in Paragraph 5.2.1.12)	evidence and justification of decision pathway used in identification of PCT (e.g. vegetation structure and landscape position/geomorphology).	Table 6
	TEC status (as outlined in Paragraphs 5.2.1.14–5.2.1.15)	TEC status	Section 4.2
	estimate of percent cleared value of PCT(as outlined in Paragraph 5.2.1.16)	estimate of percent cleared value of the PCT (available in the BioNet Vegetation Classification)	Section 4.2
	Perform a vegetation integrity assessment of the development/biodiversity stewardship site, including:	Vegetation integrity assessment of the subject land, including:	Section 4.4
	mapping vegetation zones (Subsection 5.3.1)	description of vegetation zones within the subject land with justification for assigning vegetation zones to PCTs area (ha) of each vegetation zone	Section 4.2 and Figure 8
	patch size (development site and biodiversity stewardship site)	patch size for each vegetation zone	Section 4.5

BDAR Section	BAM Requirements	Operational Manual Requirements	Assessment of Compliance and Recommendations
	assessing vegetation integrity using benchmark data (Subsection 5.3.3)		
	survey effort as described in Subsection 5.3.4 (number of plots)	survey effort	Table 2
	determining the vegetation integrity score (Appendix 6): composition condition score structure condition score function condition score vegetation integrity score.	composition, structure, function and vegetation integrity condition scores.	Section 4.4
		Where use of local data is proposed, identify: source of information for local benchmark data justification of use of local data in preference to database values.	
	Maps and Data		
	Map of native vegetation extent within the development/biodiversity stewardship site (as described in Section 5.1)	Native vegetation extent within the subject land.	Figure 5
	Map of PCTs within the development/biodiversity stewardship site (as described in Section 5.2)	Distribution of PCTs within the subject land.	Figure 6
	Map of plot locations relative to PCTs	Plot locations relative to PCTs including GPS coordinates (GDS zone, eastings, northings and bearings)	Figure 4

BDAR Section	BAM Requirements	Operational Manual Requirements	Assessment of Compliance and Recommendations
	Map of TECs	TECs on the subject land	Figure 7
	Plot field data (MS Excel format)		
	Plot field data sheets	Plot field data and sheets	Appendix B
		Vegetation zones	
	Patch size of intact native vegetation (as described in Subsection 5.3.2)	Patch size of intact native vegetation	Figure 5
	Table of current vegetation integrity scores for each vegetation zone within the development/biodiversity stewardship site.	Table of vegetation integrity scores for each vegetation zone within the subject land	Table 7
Threatened Species	Information		
	Identify ecosystem credit species associated with PCTs on both the development site and biodiversity stewardship site as outlined in Section 6.2, including:		
	list of species derived	List of predicted ecosystem credit species associated with PCTs on the subject land	Table 8
	justification for exclusion of any ecosystem credit species predicted above.	Justification for exclusion of any ecosystem credit species predicted above	Table 8
	Identify species credit species on both the development site and the biodiversity stewardship site as outlined in Sections 6.3 to 6.5, including:	Identify species credit species on the subject land, including:	
	list of candidate species	list of candidate species assessed	Section 5.3

BDAR Section	BAM Requirements	Operational Manual Requirements	Assessment of Compliance and Recommendations
	justification for inclusions and exclusions based on habitat features	justification for inclusions and exclusions of any species credit species predicted above based on habitat features, or vagrancy	Section 5.3
	indication of presence based on targeted survey or expert report	indication of presence based on targeted survey or expert report (see below)	N/A
	details of targeted survey technique, effort, timing and weather	details of targeted survey including technique, effort, timing and weather	N/A
	species polygons	species polygons	N/A
	biodiversity risk weighting for the species	biodiversity risk weighting for the species	N/A
		area of suitable habitat or number of individuals counted	N/A
	threatened species survey		N/A
	additional requirements for wind farm developments.		N/A
	Where use of local data is proposed:	Where use of local data is proposed:	N/A
	identify relevant species	identify relevant species or population	N/A
	identify aspect of species data		N/A
	identify source of information for local data	identify source of information for local data	N/A
	justify use of local data in preference to database values.	justify use of local data in preference to database values.	N/A
	Where expert reports are used in place of targeted survey:	Where expert reports are used in place of targeted survey:	
	identify the relevant species	identify the relevant species or population	N/A

BDAR Section	BAM Requirements	Operational Manual Requirements	Assessment of Compliance and Recommendations
	justify the use of an expert report	justify the use of an expert report	N/A
	indicate and justify the likelihood of presence of the species and information considered in making this assessment	flag the likely presence of the species or population and the evidence to support this assessment including all information considered	N/A
	estimate the number of individuals or area of habitat (whichever unit of measurement applies to the species/individual) for the development site or biodiversity stewardship site, including a description of how the estimate was made	estimate the number of individuals or area of suitable habitat, including a description of how the estimates were made (e.g. reference populations, past reports)	N/A
	identify the expert and provide evidence of their expert credentials.	identify the expert and provide evidence of their expert credentials.	N/A
		Identify potential prescribed biodiversity impacts on threatened species.	N/A
	Maps and Data		
	Table of habitats or habitat components and their sensitivity classes	Table of habitats or habitat components and their sensitivity classes.	N/A
	Table detailing the list of species credit species and presence status on site as determined by targeted survey, indicating also where presence was assumed and/or where presence was determined by expert report	Table detailing the list of species credit species; presence on subject land as determined by targeted survey, indicating where presence is assumed or by expert report.	N/A
		Mapped targeted survey locations including GPS coordinates of survey sites.	N/A

BDAR Section	BAM Requirements	Operational Manual Requirements	Assessment of Compliance and Recommendations
	Species credit species polygons (as described in Paragraph 6.4.1.33)	Species credit species polygons including GPS locations of any individuals counted.	N/A
	Table detailing species and habitat feature/component associated with species and its abundance on site (as described in Paragraph 6.4.1.34)	Table detailing species habitat features associated with the species and its location (GPS coordinates) and abundance on the subject land.	N/A
	Table detailing biodiversity risk weighting for species on site (as described in Section 6.6)	Table detailing biodiversity risk weighting for species credit species on the subject land.	N/A
		Map location of prescribed biodiversity impacts on the subject land	Figure 9
	For wind farm developments: maps of habitual flight paths for nomadic and migratory species likely to fly over the site and maps of likely habitat for threatened aerial species resident on the site	For wind farm developments, maps of habitual flight paths for nomadic and migratory species likely to fly over the site and maps of likely habitat for threatened aerial species and raptor species resident on site.	N/A
Avoid and Minimise Impacts	Information		
	Demonstration of efforts to avoid and minimise impact on biodiversity values in accordance with Chapter 8.	Demonstration of efforts to avoid or minimise impacts on native vegetation, threatened species habitat and prescribed impacts during project planning including: 1. locating the project –	Section 7.1

BDAR Section	BAM Requirements	Operational Manual Requirements	Assessment of Compliance and Recommendations
		options considered (including maps and why they were not feasible/suitable) analyses associated with alternative options (e.g. routes, locations, sites within the property, constraints) justification for selecting proposed location 2. designing the project – temporary and permanent ancillary construction and maintenance facilities required for the proposal options for avoiding these features (e.g. alternative locations, engineering solutions, modes of technology, constraints) justification for selecting proposed location measures taken to minimise impacts long-term management of areas avoided.	
	Assessment of direct and indirect impacts unable to be avoided at the development site in accordance with Sections 9.1 and 9.2. The assessment would include but not be limited to: type, frequency, intensity, duration and consequence of impact.	Determination of the impacts on native vegetation and threatened species habitat including: describing impacts of clearing describing the nature, extent, frequency, duration and timing of indirect and prescribed impacts including during construction and operation phases, on adjacent vegetation	Section 8.1

BDAR Section	BAM Requirements	Operational Manual Requirements	Assessment of Compliance and Recommendations
		calculating the change in VI score and habitat suitability	Section 8.2
		describing impacts that are uncertain and their management/mitigation	Section 8.7
		evaluating consequences of indirect and prescribed impacts	Section 8.3 and Section 8.4
		documenting limitations to data, assumptions and predictions.	N/A
	For major projects: details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain (Section 9.4).		N/A
	Maps and Data		
	Table of measures to be implemented before, during and after construction to avoid and minimise the impacts of the project, including action, outcome, timing and responsibility	Table of biodiversity mitigation measures to be implemented before, during and after construction to avoid and minimise the impacts of the project, including action, outcome, timing and responsibility. Unique identifiers (e.g. BIO01) should be included for tracking through management plans and compliance auditing.	Table 15
		Map of alternative locations or sites within the development site that were considered when	Figure 10

BDAR Section	BAM Requirements	Operational Manual Requirements	Assessment of Compliance and Recommendations
		locating and designing the project including constraints to the final selection.	
	Map of final project footprint, including construction and operation	Map of the final development footprint, including demarcation of any prescribed impacts and measures to minimise impacts.	Figure 3
		Showing the areas of biodiversity value on the site map of where impact has been avoided will assist in demonstrating the reasonable measures that the proponent has taken to avoid and minimise impacts.	N/A
	Maps demonstrating indirect impact zones where applicable	Map of sites within the subject land likely to be impacted by direct, indirect and prescribed impacts where applicable.	Figure 12
Impact Summary	Information		
		Identification of impacts:	
	Identification and an assessment of the impacts which are potential serious and irreversible impacts, in accordance with Subsections 10.2.2 for impacts on CEECs and 10.2.3 for threatened species.	on entities at risk of a serious and irreversible impact (SAII), including addressing the assessment criteria in Subsection 10.2.2 (TECs) and 10.2.3 (species) of the BAM All relevant information required by the consent authority to determine whether the proposed impact is serious and irreversible including:	Section 9.2

BDAR Section	BAM Requirements	Operational Manual Requirements	Assessment of Compliance and Recommendations
		clear documentation of the sources of information where confidence in the information provided is low or of questionable reliability how proposed additional measures will contribute to the recovery of the entity where information is not available, for example where impact thresholds for the entity have not been provided.	
	Identification of impacts requiring offset in accordance with Section 10.3.	requiring offsets	Section 9.3
	Identification of impacts not requiring offset in accordance with Paragraph 10.3.2.2.	not requiring offsets	Section 9.4
	Identification of areas not requiring assessment in accordance with Section 10.4.	not requiring further assessment.	Section 9.5
	Maps and Data		
		Mapped locations:	
	Map showing the location of serious and irreversible impacts	that support an entity at risk of a serious and irreversible impact (SAII)	Figure 11
	Map of impacts requiring offset	where offsets are required	Figure 12
	Map of impacts not requiring offset	where offsets are not required, and	Figure 12
	Map of areas not requiring assessment	where no further assessment is required.	Figure 12

BDAR Section	BAM Requirements	Operational Manual Requirements	Assessment of Compliance and Recommendations
		Maps illustrating the extent of a TEC or species distribution and any other data used to address the assessment criteria for an entity at risk of an SAII.	Figure 11
Impact Summary	Information		
		The assessor is required to report on:	
	Ecosystem credits and species credits that measure the impact of the development on biodiversity values, including:		
	future vegetation integrity score for each vegetation zone at the development site (Equations 17 and 18 in Appendix 6)		Section 9.3
	change in vegetation integrity score (Subsection 9.1.3)		Section 9.3
		the biodiversity risk weighting (BRW) for each ecosystem and species credit requirement generated	Table 17
	number of required ecosystem credits for the impact of development on each vegetation zone at a development site (Subsection 11.2.3)	the number of ecosystem credits for each PCT/TEC	Table 17
	number of required species credits for each threatened species that is impacted on by development (Subsection 11.2.4).	the number of species credits for each species credit species impacted by the proposal	N/A

BDAR Section	BAM Requirements	Operational Manual Requirements	Assessment of Compliance and Recommendations
	Maps and Data		
	Table of PCTs requiring offset and the number of ecosystem credits required		Table 17
	Table of threatened species requiring offset and the number of species credits required		Table 17
	Submitted proposal in the Credit Calculator	All digital data must be submitted using the Upload Files function in BOAMS: digital shape files for all maps and spatial data completion of all required data fields in BOAMS and the BAM-C. Finalised case in the BAM-C (can be returned to assessor for editing).	To be submitted in BOAMs
Biodiversity Credit Report	Information		
	Credit classes for ecosystem credits and species credits at the development site.	biodiversity credit report from the BAM-C, which defines the number and class of ecosystem and species credits from the proposed impact.	Appendix C
	Maps and Data		
	Table of credit class and matching credit profile		Table 20

APPENDIX B :

BAM Plot Data

plot	pct	area	patchsize	conditionclass	compTree	compShrub	compGrass	compForbs	compFerns	compOther	strucTree	strucShrub	strucGrass	strucForbs	strucFerns	strucOther	fun LargeTrees	fun Hollowtrees	fun LitterCover	fun LenFallenLogs	fun TreeStem 5 to 9	fun TreeStem 10to19	fun TreeStem 20 to 29	fun TreeStem 30 to 49	fun TreeStem 50 to 79	funTreeRegen	fun High Threat Exotic
1	850	0	101	moderate	1	0	5	7	0	2	35.0	0.0	61.4	1.3	0.0	0.2	1	2	44.0	7.5	0	1	1	1	0	0	30.7
2	850	0.28	101	grassland low	0	0	4	5	0	1	0.0	0.0	48.6	0.5	0.0	0.1	0	0	5.0	0.0	0	0	0	0	0	0	41.4
3	850	0.11	101	low	2	0	5	5	0	1	20.0	0.0	47.0	0.5	0.0	0.1	1	1	25.0	8.0	0	0	1	1	0	0	32.7

APPENDIX C :
BAM Credit Report

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00028189/BAAS17027/21/00028190

Proposal Name
263 Mount Vernon Road

BAM data last updated *
10/06/2021

Assessor Name
David Robertson

Assessor Number
BAAS17027

BAM Data version *
45

Proponent Names

Report Created
29/09/2021

BAM Case Status
Open

Assessment Revision
0

Assessment Type
Part 4 Developments (Small Area)

Date Finalised
To be finalised

BOS entry trigger
BOS Threshold: Biodiversity Values Map

* 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	850-Cumberland shale hills woodland

Species
Nil

Additional Information for Approval

BAM Biodiversity Credit Report (Like for like)

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

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
850-Cumberland shale hills woodland	Cumberland Plain Woodland in the Sydney Basin Bioregion	0.4	2	0	2

BAM Biodiversity Credit Report (Like for like)

850-Cumberland shale hills 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	-	850_low	Yes	2	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.
	Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 849, 850	-	850_grassland_low	No	0	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.

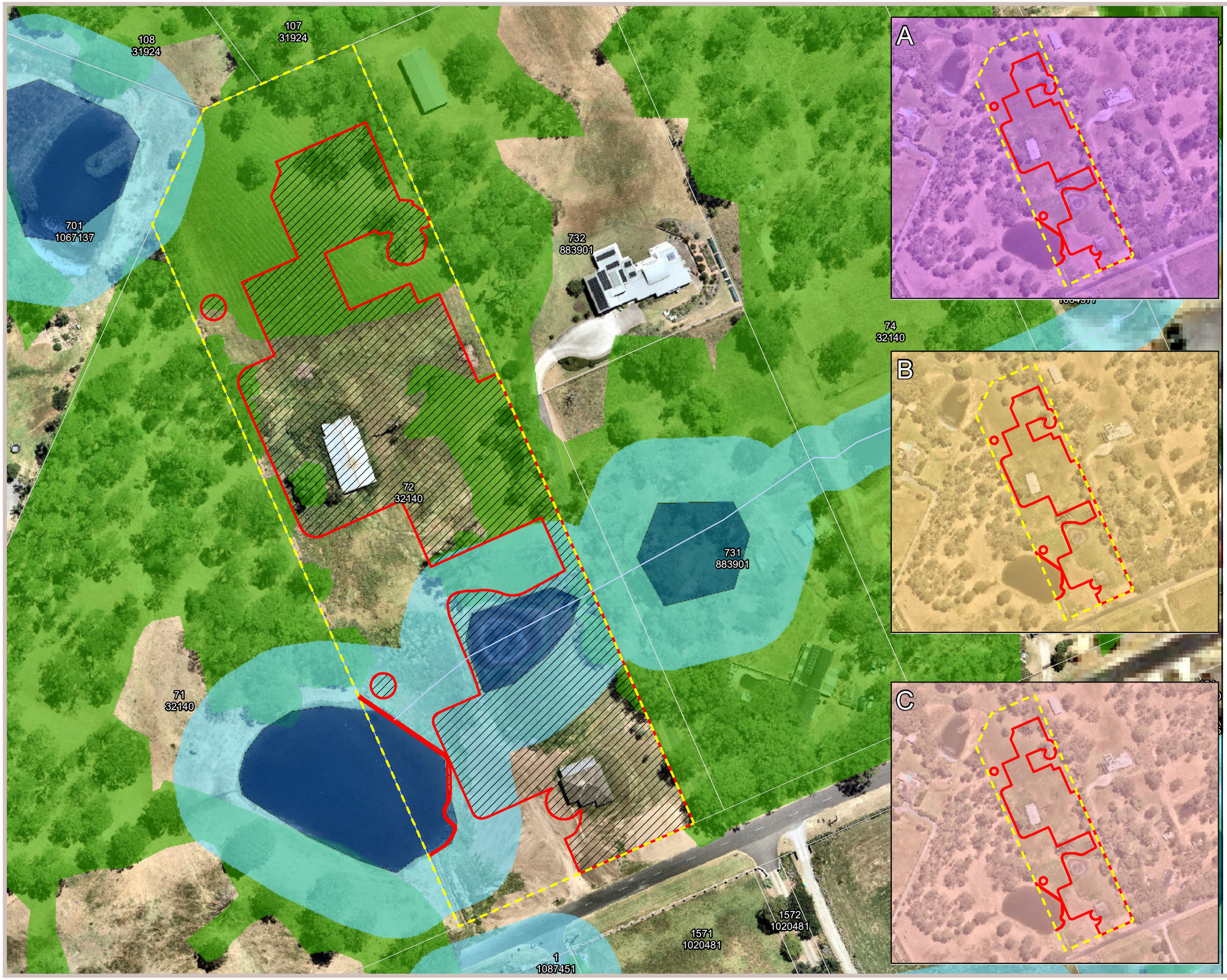
Species Credit Summary

No Species Credit Data

Credit Retirement Options

Like-for-like credit retirement options

FIGURES



Legend

- Subject Land
- Study Area
- Assessment Area
- Cadastre
- Native Vegetation Cover
- Local Wetlands
- Riparian Corridor

Watercourse

- 1st Order Stream

IBRA Region (Inset A)

- Sydney Basin

IBRA Subregion (Inset B)

- Cumberland

NSW (Mitchell) Landscape (Inset C)

- Cumberland Plain

Image Source:
Image © NearMap 2020
Dated: 26/1/2021

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

DECCW (2008). Landscapes (Mitchell) of NSW - Version 3.

DSEWPaC (2012). Interim Biogeographic Regionalisation for Australia (IBRA) - Version 7.

Coordinate System: MGA Zone 56 (GDA 94)

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0 50 100 150 m

I:\...\21144\Figures\RP1\20210923\Figure 1. Site map

Figure 1. Site map

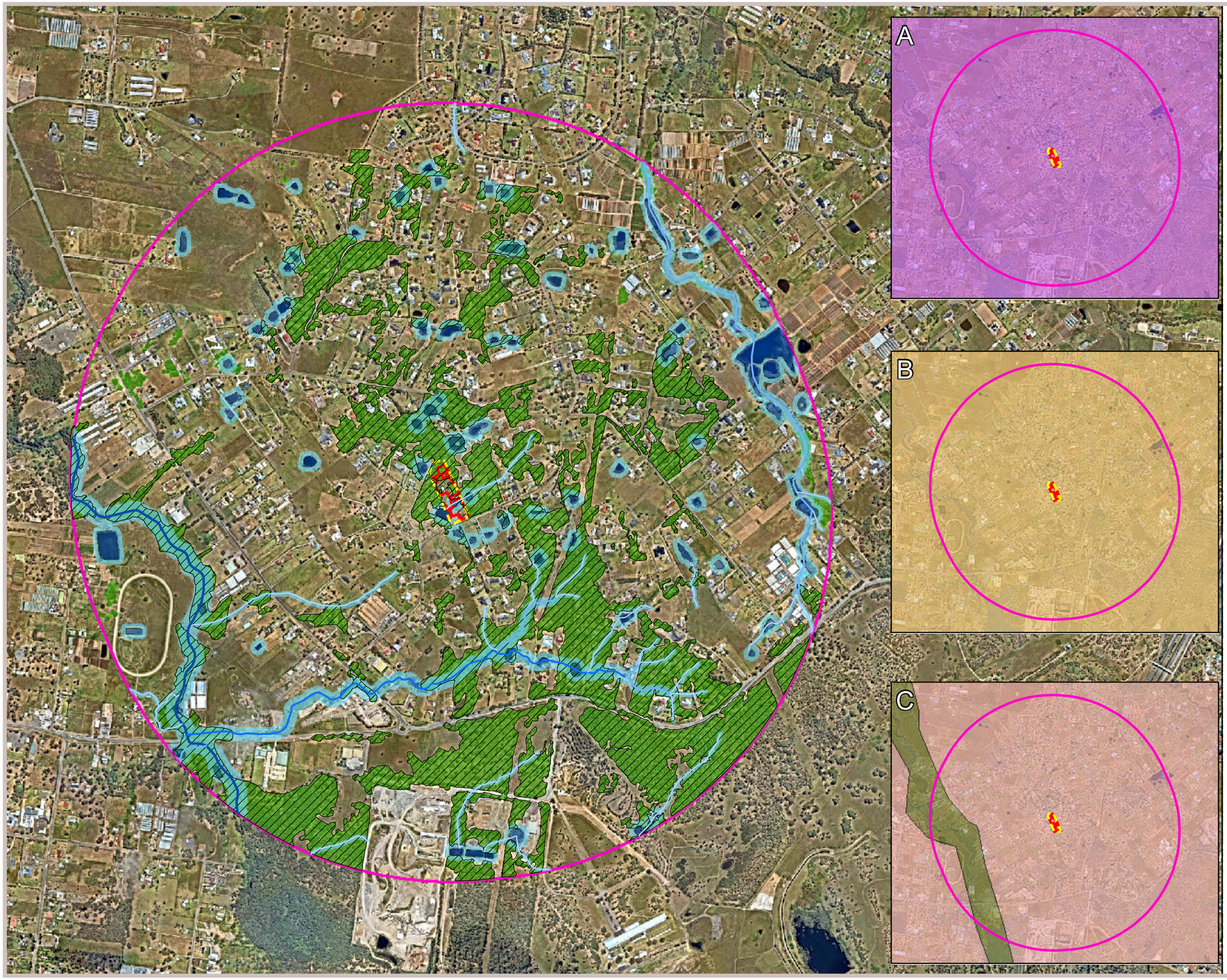

Figure 2. Location map

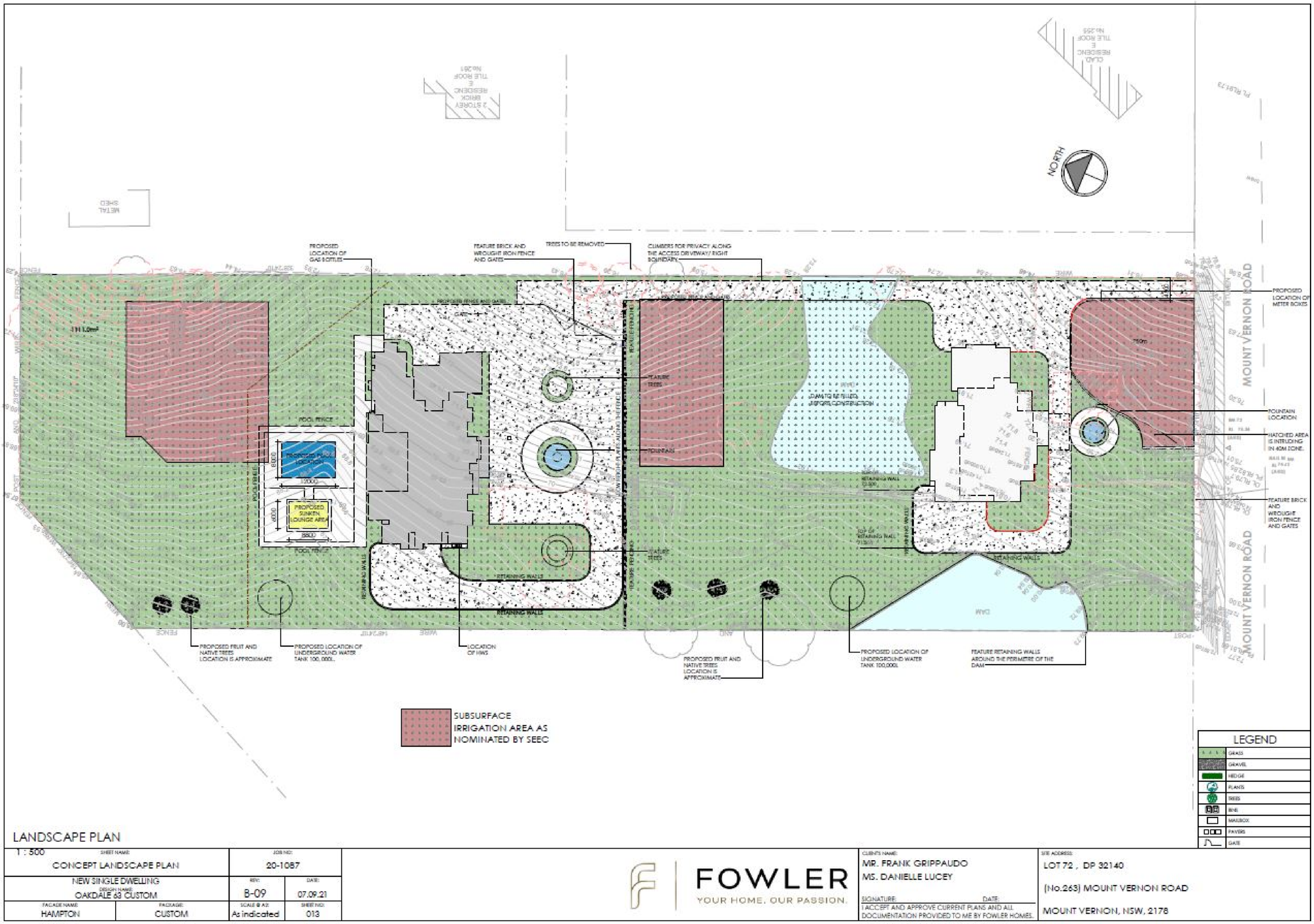

Figure 3. Layout of the project

Image Source: Fowler 2021

I:\...\21144\Figures\RP1\20210923\Figure 3. Layout of the project

Figure 4. Field survey locations

Figure 5. Native vegetation extent within the subject land

Legend

Subject Land

Study Area

Plant Community Type

PCT 850: Cumberland shale hills woodland

PCT 850: Cumberland shale hills woodland - Overhanging Canopy

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
Image © NearMap 2020
Dated: 26/1/2021

Data Source:
NSW Government Spatial Services
SIX Maps 'Clip and Ship'
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I:\...\21144\Figures\RP1\20210923\Figure 6. PCTs

Figure 6. Plant Community Types within the subject land

0 40 m

Legend

Subject Land

Study Area

Threatened Ecological Community

Cumberland Plain Woodland

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
Image © NearMap 2020
Dated: 26/1/2021

Data Source:
NSW Government Spatial Services
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I:\...\21144\Figures\RP1\20210923\Figure 7. TECs

Figure 7. Threatened Ecological Communities

0 40 m

Legend

Subject Land

Study Area

Vegetation Zone

Zone 1: 850_Low

Zone 2: 850_Grassland Low

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
Image © NearMap 2020
Dated: 26/1/2021

Data Source:
NSW Government Spatial Services
SIX Maps 'Clip and Ship'
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I:\...\21144\Figures\RP1\20210923\Figure 8. Vegetation zones

Figure 8. Vegetation zones within the subject land

0 40 m

Legend

Subject Land

Study Area

Prescribed Impact

Human-made Structures

Non-native Vegetation

Waterbodies

Vehicle Strike

Habitat Connectivity

Watercourse

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
Image © NearMap 2020
Dated: 26/1/2021

Data Source:
NSW Government Spatial Services
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I:\...\21144\Figures\RP1\20210923\Figure 9. Prescribed Impacts

Figure 9. Extent of Prescribed Impacts

0 40 m

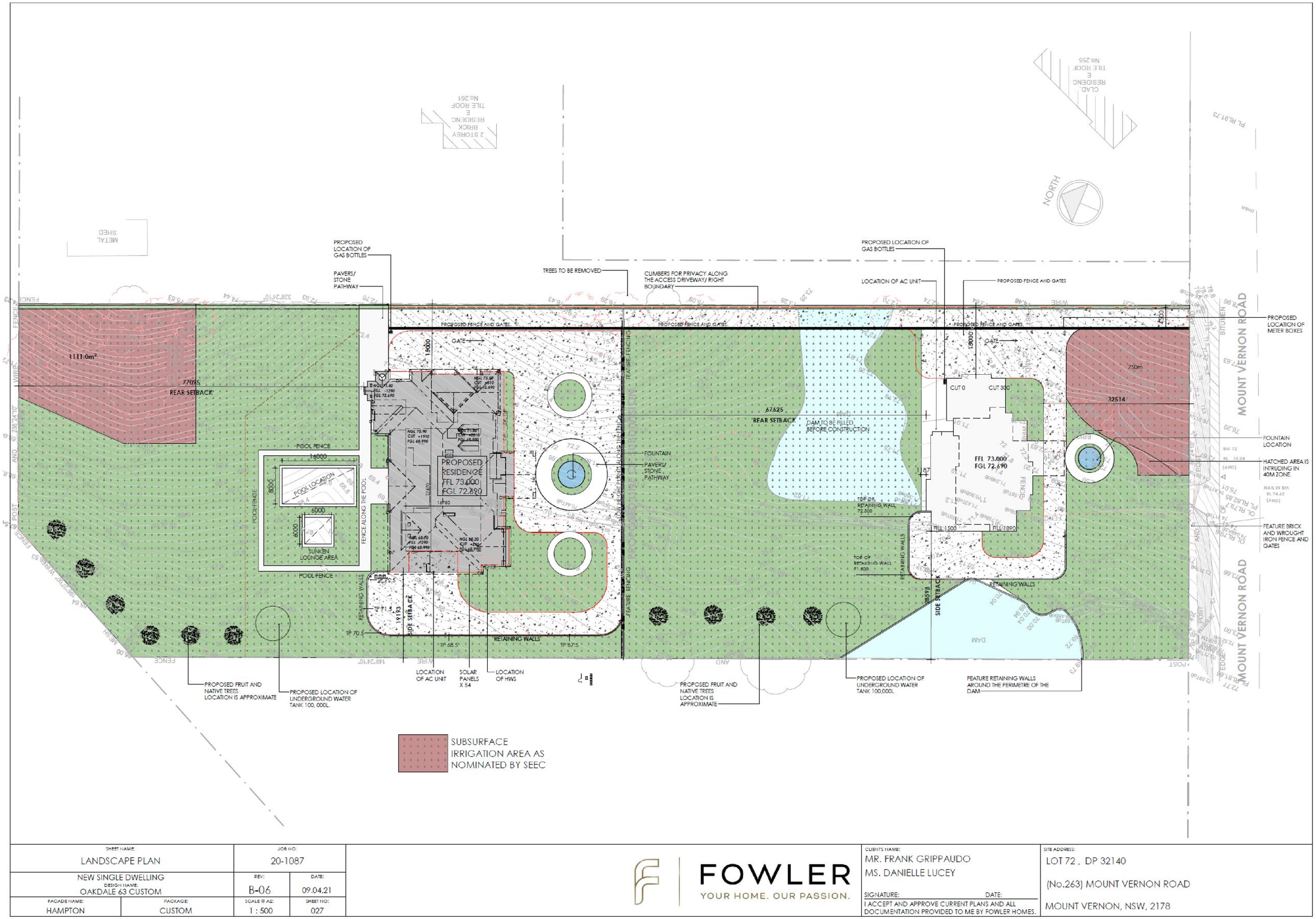

Figure 10. Prior development layout

Image Source: Fowler 2021

Legend

- Subject Land
- Study Area
- Cumberland Plain Woodland

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
Image © NearMap 2020
Dated: 26/1/2021

Data Source:
NSW Government Spatial Services
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0 100 200 300 400 m

I:\...\21144\Figures\RP1\20210923\Figure 11. Extent of CPW

Figure 11. 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: 850_Low

Impacts that do not require an offset

Zone 2: 850_Grassland Low

Impacts that do not require further assessment

Exotic Grassland

Cleared Land

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
Image © NearMap 2020
Dated: 26/1/2021

Data Source:
NSW Government Spatial Services
SIX Maps 'Clip and Ship'
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I:\...\21144\Figures\RP1\20210923\Figure 12. Thresholds of assessment

Figure 12. Thresholds of assessment

0 40 m