Cobbitty Rezoning

Ecological Constraints Analysis

The Planning Hub

1 September 2020

Final

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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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Glossary

Abbreviation	Definition
BAM	Biodiversity Assessment Method
BC Act	NSW *Biodiversity Conservation Act 2016*
BC Regulation	NSW *Biodiversity Conservation Regulation 2017*
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offset Scheme
CEEC	Critically Endangered Environmental Community
CPW	Cumberland Plain Woodland
DA	Development Application
DBH	Diameter at Breast Height
DPIE	Department of Planning, Industry and Environment
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
GPS	Global Positioning System
ha	Hectares
Locality	Area within a 5 km radius of the subject site
MNES	Matters of National Environmental Significance
NSW	New South Wales
OSO	Outer Sydney Orbital
PCT	Plant Community Type
RFEF	River-flat Eucalypt Forest
SAII	Serious and Irreversible Impact
The project	Rezoning of the subject site and the sub-division into larger-size lots
TEC	Threatened Ecological Community
The subject site	Land located at Tidapa, Chittick Lane, Cobbitty (Lots 2, 3, 4 and 5 DP 239612)
VRZ	Vegetation Riparian Zone
WM Act	*Water Management Act 2000*

1. Introduction

Cumberland Ecology has been requested by The Planning Hub on behalf of The O'Grady's to prepare an ecological constraints assessment for land located in Tidapa, Chittick Lane, Cobbitty (the 'subject site'). The subject site is proposed to be rezoned and sub-divided into lots of various sizes (the 'project'). This report has been prepared to support a planning proposal to facilitate future development of the subject site.

1.1. Purpose

The purpose of this report is to document and describe the current biodiversity values of the subject site and to identify any impacts that may constrain future development as a result of the planning proposal. In particular, biodiversity values include threatened species, populations and communities that are listed under the New South Wales (NSW) *Biodiversity Conservation Act 2016* (BC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The specific objectives of this report are to:

- Describe the biodiversity values of the subject site, including an updated plant community type (PCT) map and description of fauna habitat characteristics;
- Identify any threatened species, populations or ecological communities (as listed under the BC Act and/or EPBC Act) existing within the subject site;
- Summarise the ecological constraints associated with the subject site;
- Identify potential impacts associated with the project;
- Identify additional potential avoidance and mitigation measures to ameliorate the potential impacts of the proposed development;

1.2. Background

1.2.1. Site Description

The subject site is located in Tidapa, Chittick Lane, Cobbitty and comprises Lots 2, 3, 4 and 5 DP 239612, and by road is approximately 2.5 km north of Cobbitty Road, 8.4 km west of Oran Park Town Centre and 67 km from Sydney Central Business District (**Figure 1**).

The subject site is approximately 149 ha in size, and located entirely within the Camden Local Government Area and is currently zoned as RU1 – Primary Production under the *Camden Local Environmental Plan 2010*. The subject site and surrounding area have been extensively cleared for agricultural purposes, but still contain areas of scattered woodland and several agricultural dams.

1.2.2. Project Description

The Planning Hub has prepared a rezoning plan for the subject site (**Figure 2**) and the subdivision into lots ranging in size from 600 to 2000 m^2 ('the project') that will provide a transition from land to be developed under the South-Western Region Growth Centre and the soon to be gazetted Outer Sydney Orbital (OSO) also known as the M9 (**Figure 3**).

1.3. Relevant Legislation

1.3.1. Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) is the overarching planning legislation in NSW. This Act provides for the creation of planning instruments that guide land use. The EP&A Act also provides for the protection of the environment, including the protection and conservation of native animals and plants. This includes threatened species, communities, habitat and processes as listed under the BC Act and *Fisheries Management Act 1994*.

1.3.2. Environmental Protection and Biodiversity Conservation Act 1999

The EPBC Act is the Commonwealth Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places – defined in the EPBC Act as Matters of National Environmental Significance (MNES). Under the EPBC Act, any action (which includes a development, project or activity) that is considered likely to have a significant impact on MNES (including nationally listed threatened ecological communities and species, and listed migratory species) must be referred to the Australian Government Minister for the Environment (the Minister). The purpose of the referral is to allow a decision to be made about whether an action requires approval on a Commonwealth level. If an action is declared a "controlled action", then Commonwealth approval is required.

1.3.3. NSW Biodiversity Conservation Act 2016

The BC Act is the key piece of legislation in NSW relating to the protection and management of biodiversity and threatened species. The purpose of the BC Act is to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development. The BC Act is supported by a number of regulations, including the *Biodiversity Conservation Regulation 2017* (BC Regulation).

The BC Act requires consideration of whether a development or an activity is likely to significantly affect threatened species. For Part 4 local developments under the EP&A Act, projects that significantly affect threatened species or communities trigger the Biodiversity Offsets Scheme (BOS).

The BOS is intended to simplify biodiversity assessment and improve biodiversity outcomes by creating consistent assessment requirements to measure the likely biodiversity loss of development proposals and gains in biodiversity value achieved at offset sites through active management. The BOS requires an assessment following the Biodiversity Assessment Methodology (BAM) by an accredited BAM assessor and the preparation of a Biodiversity Development Assessment Report (BDAR).

For a proposed development to trigger the BOS, it would need to be considered as likely to significantly affect threatened species, which could occur as follows:

- It is likely to significantly affect threatened species or ecological communities, or their habitats, according to the test of significance in Section 7.3 of the BC Act; or
- It exceeds the biodiversity offsets scheme threshold; or

- It is carried out in a declared area of outstanding biodiversity value (AOBV).

These three criteria are further detailed in **Chapter 4**.

1.3.4. Water Management Act 2000

The objectives of the *Water Management Act 2000* (WM Act) are to provide for the sustainable and integrated management of the water systems of NSW and to protect, enhance and restore water sources, associated ecosystems and ecological processes.

Under the WM Act, approval is required for carrying out a 'controlled activity' that takes place on 'waterfront land' to ensure that the activity to ensure negative impacts upon waterfront land and other water users are avoided or minimised. In this instance, the relevant definition of waterfront land per the WM Act is: *"the bed of any river, together with any land lying between the bed of the river and a line drawn parallel to, and the prescribed distance inland of, the highest bank of the river…where the prescribed distance is 40m or (if the regulations prescribe a lesser distance…) that lesser distance"*.

Controlled activity means:

- Erection of a building;
- Carrying out a work;
- Removing material from waterfront land, such as vegetation or extractive material;
- Depositing material on waterfront land, such as extractive material; and
- Carrying out an activity which affects the quantity or flow of water in a water source.

An application for a 'controlled activity approval' will be refused if the Minister is not satisfied that adequate arrangements are in force to ensure that no more than minimal harm will be done to any waterfront land as a consequence of the carrying out of the proposed controlled activity.

2. Methodology

2.1. Desktop Assessment

A database analysis was conducted for the locality using both the NSW Department of Planning, Industry and Environment (DPIE) BioNet Atlas (EES 2020) and the Commonwealth Department of the Environment and Energy Protected Matters Search Tool (DotEE 2020). The locality is defined as the area within a 5 km radius of the subject site. The BioNet Atlas search was used to generate records of threatened flora and fauna species listed under the BC Act within the locality. The Protected Matters Search Tool generated a list of MNES listed under the EPBC Act potentially occurring within the locality. The lists generated from these databases were reviewed against available knowledge of the subject site, in conjunction with the abundance, distribution and age of records, to assess potential habitat for threatened species within the subject site.

A review of the DPIE''s Biodiversity Values Map through the Sharing and Enabling Environmental Data Portal was undertaken to determine whether land present within the subject site has been mapped as having high biodiversity values that is particularly sensitive to impacts from development and clearing. The map generated provides an outline of areas that fall within this classification.

Mapping layers from the *Remnant Vegetation of the western Cumberland subregion, 2013 Update. VIS_ID 4207* (OEH 2013a) which covers the subject site were reviewed to determine the potential vegetation communities, including those that align to Threatened Ecological Communities (TECs).

2.2. Field Surveys

2.2.1. Flora Surveys

A flora survey was conducted over three days by a botanist and ecologist on 14 and 15 January, and 21 April 2020. Surveys included vegetation mapping, flora plots and targeted threatened flora searches. The location of flora surveys is shown on **Figure 4**.

2.2.1.1. Vegetation Mapping

The vegetation within the subject site was ground-truthed to examine and verify the mapping of the condition and extent of the different plant communities. Mapping of plant communities within the subject site was undertaken by random meander searches 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 photographs. The resultant information was synthesised using Geographic Information Systems to create a spatial database that was used to interpret and interpolate the data to produce a vegetation map of the subject site. Vegetation communities were aligned with PCTs as defined in the BioNet Vegetation Classification database. Photographs were taken of vegetation to provide a visual documentation of types and condition of PCTs occurring within the subject site.

i. Classification of Threatened Ecological Communities

Following review of potentially occurring TECs, the plant communities identified within the subject site were examined against the listings of TECs listed under the BC Act and EPBC Act.

For TECs listed under the BC Act, vegetation communities were examined against the final determinations for potentially occurring TECs. A component of this analysis was to compare the species listed from the locally defined communities with the species lists provided in the final determinations. Additional information such as location and biophysical aspects of each final determination were also taken into account in the assessment.

For TECs listed under the EPBC Act, vegetation communities were examined against the Approved Conservation Advice and Listing Advice prepared by the Threatened Species Scientific Committee.

2.2.1.2. Flora Plots

Vegetation integrity assessments were undertaken in the subject site generally in accordance with the BAM. BAM requires the establishment of a 20 x 50 m plot with an internal 20 m x 20 m plot. The location of the floristic plots were areas considered to be most representative of the key vegetation zones identified during vegetation mapping.

The following data was collected within each of the plots:

- Composition for each growth form group by counting the number of native plant species recorded for each growth form group within a 20 m x 20 m floristic plot;
- Structure of each growth form group as the sum of all the individual projected foliage cover estimates of all native plant species recorded within each growth form group within a 20 m x 20 m floristic plot;
- Cover of 'High Threat Exotic' weed species within a 20 m x 20 m floristic plot;
- Assessment of function attributes within a 20 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 the 20 m x 50 m plot; and
- Number of trees with hollows that are visible from the ground within the 20 m x 50 m plot.

A total of eight plots were surveyed within the subject site and their locations are shown in **Figure 4**.

2.2.1.3. Threatened Flora Surveys

Targeted searches for threatened flora species recorded as occurring within the locality of the subject site were undertaken via random meanders. Threatened flora searches were conducted by a botanist and an ecologist, totalling 16 person hours. In addition to the random meanders, any threatened flora occurring within the BAM plots was also noted. The locations of threatened flora specimens observed during surveys were recorded using a hand-held GPS.

2.2.2. Fauna Surveys

Fauna surveys were conducted by an ecologist on 14 and 15 January 2020. Surveys consisted of a fauna habitat assessment and incidental observations. Further details of each of the survey methods are provided below.

2.2.2.1. Habitat Assessment

The fauna habitat assessment included consideration of important indicators of habitat condition and complexity including the occurrence of micro-habitats such as tree hollows, fallen logs, bush rock and wetland areas such as creeks and soaks. Structural features considered included the nature and extent of the understorey and ground stratum and extent of canopy. The survey also included an assessment of the presence of habitat features suitable for use by threatened fauna species known from the locality.

2.2.2.2. Incidental Fauna Observations

Any incidental fauna species that were observed, heard calling, or otherwise detected on the basis of tracks or signs, were recorded.

2.2.3. Inspection of Mapped Watercourses

Landscape features requiring consideration were initially determined via desktop assessment. Field surveys undertaken on 14 and 15 January, and 21 April 2020 sought to verify the condition and extent of the following landscape features:

- Rivers, streams and estuaries; and
- Dams.

The habitat assessment also included consideration of habitat condition and complexity of the mapped watercourses, including presence of:

- Flowing or standing water,
- Riparian vegetation / fringing dam vegetation e.g. grassy areas, rushes (particularly those containing bullrushes (*Typha* spp.) or spikerushes (*Eleocharis* spp.); and
- Shading.

2.3. Limitations

The weather conditions at the time of the flora surveys were generally favourable for plant growth and production of features required for identification of most species. Shrubs, grasses, herbs and creepers were readily identifiable in most instances. It is expected that not all flora species present would have been recorded during surveys. Despite this, it is considered that sufficient information has been collected to assess issues including conservation significance of the flora, condition and viability of vegetation and likely impact on native vegetation. An assessment of potential habitat for threatened flora species listed for the locality in the database searches was undertaken to supplement the flora surveys. The combination of these techniques is considered appropriate for assessing the habitat values of the site for threatened flora within the subject site.

Opportunistic observations of fauna provide a "snapshot" of some of the fauna present on a site that were active during the time of the survey. The data produced by the survey is intended to be indicative of the types of species that could occur and not an absolute census of all vertebrate fauna species occurring within the subject site. Therefore not all fauna utilising the subject site are likely to have been recorded during surveys. An assessment of potential habitat for threatened and migratory fauna species listed for the locality in the database searches was undertaken to supplement the fauna surveys. The combination of these techniques is considered appropriate for assessing the habitat values of the site for threatened fauna within the subject site.

3. Results

3.1. Vegetation Communities

Previous broad-scale mapping conducted by (OEH 2013b) indicates that Shale Plains Woodland, Alluvial Woodland, Western Sydney Dry Rainforest, Moist Shale Woodland and Shale Hills Woodland are present within the subject site.

Surveys conducted by Cumberland Ecology for this assessment refined the existing vegetation mapping of the subject site and identified the following vegetation communities:

- Shale Hills Woodland – Good and Low Condition;
- Shale Hills Woodland – Derived Native Grassland;
- Shale Plains Woodland;
- Alluvial Woodland;
- Planted Native Vegetation; and
- Grassland.

These vegetation communities are described in subsequent sections. The extent of vegetation communities within the subject site are detailed in **Table 1**. The distribution of vegetation communities is shown in **Figure 5**.

Table 1 Extent of vegetation communities within the subject site

Vegetation Community	PCT Name	PCT	EPBC Act	BC Act	Subject Site (ha)
Shale Hills Woodland - Good Condition	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	850	CEEC	CEEC	15.22
Shale Hills Woodland - Low Condition	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	850	CEEC	CEEC	4.21
Shale Hills Woodland - Derived Native Grassland	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	850	CEEC	CEEC	0.90
Shale Plains Woodland	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	849	-	CE	0.22
Alluvial Woodland	Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	835	-	EEC	0.18
Planted Native Vegetation		N/A	-	-	0.10

Vegetation Community	PCT Name	PCT	EPBC Act	BC Act	Subject Site (ha)
Pasture Improved Grassland		N/A	-	-	124.49
Dams		N/A	-	-	3.74

Key: CE = Critically Endangered Ecological Community, E = Endangered Ecological Community

3.1.1. Shale Hills Woodland – Good and Low Condition

BC Act Status: Critically Endangered Ecological Community - Cumberland Plain Woodland in the Sydney Basin Bioregion

EPBC Act Status: Critically Endangered Ecological Community - Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest

PCT: 850 - Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion

This community occurs within the subject site as a large patch in the north-west corner and generally as smaller scattered patches elsewhere across hilly areas which occur along the western and northern boundaries. The canopy is variously dominated by *Corymbia maculata* (Spotted Gum), *Eucalyptus moluccana* (Grey Box), and *Eucalyptus tereticornis* (Forest Red Gum). The midstorey consists of younger individuals of the canopy trees along with scattered occurrences of *Acacia implexa* (Hickory Wattle).

A native shrub layer is predominately absent from the community with the exception of shrub-sized individuals of *Acacia implexa* and isolated occurrences of *Indigofera australis* (Australia Indigo) and *Bursaria spinosa* (Blackthorn). The shrub layer in all patches is dominated by the exotic *Olea europaea* subsp. *cuspidata* (African Olive).

Two condition states of the community are present within the subject site which vary predominately in the composition of the ground layer. Areas mapped as "good" condition have a ground layer dominated by native grasses with commonly occurring native forbs. Areas mapped as "low" condition have a ground layer almost exclusively dominated by exotic grass species.

Native ground layer species within the community include the grasses *Themeda triandra* (Kangaroo Grass), *Aristida ramosa* (Purple Wiregrass), *Chloris ventricosa* (Tall Chloris), and *Microlaena stipoides* var. *stipoides* (Weeping Grass). Forbs include *Solanum prinophyllum* (Forest Nightshade), *Einadia nutans* subsp. *nutans* (Climbing Saltbush), *Ajuga australis* (Austral Bugle), and *Asperula conferta* (Common Woodruff).

Exotic species within the ground layer of the community include *Nassella neesiana* (Chilean Needlegrass) which dominates most of the low condition areas, *Cenchrus clandestinus* (Kikuyu), and *Dactylis glomerata* (Cocksfoot). Forbs include *Bidens subalternans* (Greater Beggar's Ticks), *Solanum linnaeanum* (Apple of Sodom), and *Sida rhombifolia* (Paddy's Lucerne). Examples of this community in low and good condition are shown in **Photograph 1** and **Photograph 2**, respectively.

This community corresponds to the BC Act listing of Cumberland Plain Woodland due to its woodland structure and the dominance of characteristic canopy species such as *Eucalyptus moluccana* (Grey Box), *Corymbia maculata* (Spotted Gum) and *Eucalyptus tereticornis* (Forest Red Gum) as well regrowing sub-canopy species, including *Acacia implexa* (Hickory Wattle), *Indigofera australis* (Australia Indigo) and *Bursaria spinosa* (Blackthorn). Additionally, the ground layer also includes characteristic species of Cumberland Plain Woodland such as *Themeda triandra* (Kangaroo Grass) and *Microlaena stipoides* var. *stipoides* (Weeping Grass (NSW Scientific Committee 2011a). The areas mapped as Cumberland Plain Shale Woodland – Good Condition correspond to the EPBC listing due having patch size greater than 0.5 ha as well as the presence of more than 50% native perennial understorey vegetation cover (Threatened Species Scientific Committee 2009). The Cumberland Plain Shale Woodland – Poor Condition also corresponds to the EPBC listing as the patch size is greater than 0.5 ha, 30% native perennial understorey vegetation cover is present and the patch is contiguous with native remnant vegetation that is at least 5 ha in area.

Photograph 1 Shale Hills Woodland (Good Condition)

Photograph 2 Shale Hills Woodland (Low Condition)

3.1.2. Shale Hills Woodland - Derived Native Grasslands

BC Act Status: Critically Endangered Ecological Community - Cumberland Plain Woodland in the Sydney Basin Bioregion

EPBC Act Status: Critically Endangered Ecological Community - Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest

PCT: 850 - Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion

Grasslands dominated by native grass species, derived from historical clearing of woodland persist as patches which have not been pasture improved. This community is restricted to three small patches are present in the north-western corner of the subject site, surrounded by areas of Cumberland Plain Woodland. Abundant regrowth is present in this area of native and exotic shrubs, predominately the native species *Acacia implexa* and the exotic species *Olea europaea* subsp. *cuspidata*.

The dominant native grasses in these patches are generally *Aristida ramosa*, *Themeda triandra, Microlaena stipoides* var. *stipoides*, and *Poa sieberiana*. Less frequently occurring species include *Eragrostis leptostachya* (Paddock Lovegrass), and *Rytidosperma racemosum*. Native forbs are common and species include *Oxytes brachypoda* (Large Tick-trefoil), *Brunoniella australis* (Blue Trumpet), and *Dichondra repens* (Kidney Weed).

Despite being dominated by native grasses, exotic species are common. Frequently occurring exotic species includes the grasses *Nassella neesiana, Cenchrus clandestinus*, and *Paspalum dilatatum*, and the forbs *Cirsium vulgare*, *Senecio madagascariensis*, and *Plantago lanceolata*. An example of this community is shown in **Photograph 4**.

Under the BC Act, this community can occur in which both the upper-storey and mid-storey are absent. Areas of Derived Native Grassland therefore correspond to the BC Act listing of Cumberland Plain Woodland is it contains characteristic non-woody species such as *Aristida ramosa*, *Themeda triandra* and *Microlaena stipoides* var. *stipoides* (NSW Scientific Committee 2011a). Although the Advice Listing for Cumberland Plain Shale Woodland states that derived grassland areas are not included in the EPBC Act listing of this community, they may be considered as part of the listed community if they are contiguous with areas that are listed (Threatened Species Scientific Committee 2009). For the purpose of this assessment, the areas of derived native grassland have been assessed as conforming to the EPBC Act listing.

Photograph 3 Derived Native Grassland

3.1.3. Shale Plains Woodland

BC Act Status: Critically Endangered Ecological Community - Cumberland Plain Woodland in the Sydney Basin Bioregion

EPBC Act Status: Listing Criteria not met - Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest

PCT: 849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion

This community occurs on lower elevations to Shale Hills Woodland within the subject site and historically would have had a similar species composition. However, due to grazing degradation and pasture improvement, the ground layer is dominated by exotic grasses. *Eucalyptus tereticornis* is the dominant canopy species within the patches of the community within the subject site. A mid-storey and shrub layer are absent.

The ground layer is dominated by the exotic grass *Cenchrus clandestinus*, with other species present including *Dactylis glomerata* and *Paspalum dilatatum* (Paspalum). Exotic forbs such as *Bidens subalternans*, *Plantago lanceolata* (Lamb's Tongues), and *Sida rhombifolia* are common. An example of this community is shown in **Photograph 3**.

This community corresponds to the BC Act listing of Cumberland Plain Woodland (CPW) due to its woodland structure and the dominance of characteristic canopy species such as *Eucalyptus tereticornis* (Forest Red Gum). However it does not correspond to the EPBC listing due to the patch size being below 0.5 ha as well as the presence of less than 30% native perennial understorey vegetation cover.

Photograph 4 Shale Plains Woodland

3.1.4. Alluvial Woodland

BC Act Status: Endangered - River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South

EPBC Act Status: Not Listed

PCT: 835 - Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin

A small patch of this community is present at the southern extent of the access to the subject site. The canopy consists of the native species *Eucalyptus amplifolia* subsp. *amplifolia* (Cabbage Gum) and *Casuarina glauca* (Swamp Oak). The exotic species *Olea europaea* subsp. *cuspidata* is common in the shrub layer and the native species *Microlaena stipoides* subsp. *stipoides* is common in the ground layer.

This community corresponds to the BC Act listing for River Flat Eucalypt Forest as it occurs as a woodland on periodically inundated alluvial flats and is it dominated by characteristic canopy species such as *Eucalyptus amplifolia* subsp. *amplifolia* (Cabbage Gum) as well as sub-canopy species including *Casuarina glauca* (Swamp Oak). Additionally, the ground layer contains characteristic species such as *Microlaena stipoides* subsp. *Stipoides (NSW Scientific Committee 2011b)*.

3.1.5. Planted Native Vegetation

BC Act Status: Not Listed

EPBC Act Status: Not Listed

PCT: Does not conform to a defined PCT

Several native trees species are planted surrounding the dwelling within the subject site. Species include *Casuarina cunninghamiana* subsp. *cunninghamiana* (River Oak) and *Eucalyptus cladocalyx* (Sugar Gum).

3.1.6. Pasture Improved Grassland

BC Act Status: Not Listed

EPBC Act Status: Not Listed

PCT: Does not conform to a defined PCT

This is the dominant vegetation community within the subject site and consists of pasture improved paddocks generally at lower elevations and at higher elevations on some hills. Grassland varies across the subject site; however this community is generally dominated by exotic species, including dense infestations of the exotic weed *Nassella neesiana*. Common exotic grasses in other areas include *Cenchrus clandestinus*, *Dactylis glomerata*, and *Paspalum dilatatum*.

Several scattered individuals of the species *Eucalyptus moluccana* and *Eucalyptus tereticornis* are present within this community in areas where they do not occur close enough to other trees to be considered part of woodland patches. An example of this community are shown in **Photograph 5**.

Photograph 5 Pasture Improved Grassland

3.1.7. Dams

BC Act Status: Not Listed

EPBC Act Status: Not Listed

PCT: Does not conform to a defined PCT

Fifteen agricultural dams of various sizes are located in the cleared areas of the subject site. The dams present are characterised by period freshwater inundation with little to no emergent vegetation. The dams within the subject site are not listed under the BC Act or EPBC Act. An example of the largest dam within the subject site is shown in **Photograph 6**.

Photograph 6 Largest dam within the subject site

3.2. Threatened Ecological Communities

Two TECs are found within the subject site, corresponding to the mapping units of Cumberland Plain Shale Woodland (both good and low conditions as well as Derived Native Grassland) and Alluvial Woodland. Cumberland Plain Woodland (including Derived Native Grassland) is listed as a CEEC under both the EPBC Act and BC Act. It is known as Cumberland Plain Woodland under the BC Act. River Flat Eucalypt Forest is listed as an EEC under the BC Act only.

3.3. Flora Species

3.3.1. General Species

Over 80 flora species were recorded within the subject site during surveys. The dominant plant families encountered within the subject site are consistently represented by the Poaceae, Fabaceae and Asteraceae families. Species present within the subject site consists of a mix of native (61%) and exotic species (39%). A list of all species encountered on the subject site can be found in **Appendix A**. This is not an exhaustive list of species, and therefore a suite of other flora species is expected to occur within the subject site.

3.3.2. Threatened Flora

No threatened flora species have been recorded within the subject site during surveys. Following a review of the threatened flora species recorded within the locality (see **Appendix C**), as well as an assessment of the vegetation within the subject site, four threatened flora species are considered to have the potential to occur (**Table 2**). Due to the generally degraded habitats throughout most of the subject site the majority of these species are not expected to occur.

Each of the species potential to occur within the subject site is discussed below.

Table 2 Flora species with potential habitat within the subject site

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Locality Records
Cynanchum elegans	White-flowered Wax Plant	E	E	19
Eucalyptus benthamii	Camden White Gum	V	V	342
Marsdenia viridiflora subsp. *viridiflora*	Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	E	-	27
Pomaderris brunnea	Brown Pomaderris	E	V	18

Key: E = Endangered, V = Vulnerable

3.3.2.1. White-flowered Wax Plant

BC Act Status: Endangered

EPBC Act Status: Endangered

The BioNet Atlas (EES 2020) indicates that the *Cynanchum elegans* (White-flowered Wax Plant) has previously been recorded in the locality of the subject site. This species is usually associated with dry rainforest vegetation and coastal communities; however it can also occur on open forests and woodlands associated with *Eucalyptus tereticornis* (Forest Red Gum) and *Corymbia maculata* (Spotted Gum) (DotE 2014) . Consequently, this species' potential habitat comprises the wooded areas of the subject site, including Cumberland Plain Woodland and River Flat Eucalypt Forest.

3.3.2.2. Camden White Gum

BC Act Status: Vulnerable

EPBC Act Status: Vulnerable

The BioNet Atlas (EES 2020) indicates that the *Eucalyptus benthamii* Camden White Gum has previously been recorded in the locality of the subject site. This species occurs in open woodland along the Nepean River and its tributaries around the Camden and Cobbitty area (NSW National Parks and Wildlife Service 1999).

Consequently, this species' potential habitat comprises the wooded areas of the subject site around Cobbitty Creek, especially River-flat Eucalypt Forest.

3.3.2.3. Marsdenia viridiflora

BC Act Status: Endangered

EPBC Act Status: Not listed

The BioNet Atlas (EES 2020) indicates that the *Marsdenia viridiflora* subsp. *viridiflora* has previously been recorded in the locality of the subject site. This species occurs in open shale woodland (DEC (NSW) 2005) and therefore has potential to occur within the subject site in areas of Cumberland Plain Woodland.

3.3.2.4. Brown Pomaderris

BC Act Status: Endangered

EPBC Act Status: Vulnerable

The BioNet Atlas (EES 2020) indicates that the Brown Pomaderris (*Pomaderris brunnea)* has previously been recorded in the locality of the subject site. This species occurs in moist woodland or forests on clay and alluvial soils of floodplains and creek lines surrounding the Nepean River (OEH 2014). Consequently, this species' potential habitat comprises the wooded areas of the subject site in the vicinity of Cobbitty Creek, including Cumberland Plain Woodland and River-flat Eucalypt Forest.

3.4. Fauna

3.4.1. Fauna Habitat

The majority of the subject site is comprised of cleared agricultural lands dominated by pasture improved grassland which has limited value for native fauna. There are, however, scattered patches of woodland that contain canopy species dominated by mature Eucalypts with many tree hollows which may provide habitat for microchiropteran bats and native birds. A number of trees had active bird nests.

There are also 15 man-made dams scattered across the subject site (~3.74 ha). These are primarily used by farm animals such as cattle. However, several larger dams within the subject site contain potential habitat for aquatic and terrestrial fauna species including fish, amphibians, reptiles, and water-birds. Furthermore, numerous terrestrial fauna species would regularly utilise these dams as a water source.

The existing dwellings within the subject site may also provide potential habitat for microchiropteran bats and native birds.

Habitat features recorded within the subject site include the following:

- Log / Rock outcrop– scattered throughout the subject site, these provide shelter for reptiles and, small birds and mammals;
- Hollow-bearing trees– provide roosting habitat for birds, arboreal mammals and microchiropteran bats. These features were primarily confined to the areas of remnant canopy trees;

- Nectar-producing trees and shrubs, including Eucalypts, that provide important food resources for microchiropteran bats, native birds, small mammals and Grey-headed Flying foxes;
- Roof cavities – provide potential roosting habitat for microchiropteran bats and native birds. These features were confined to the dwellings within subject site; and
- Riparian environments, including creeks and dams provide potential shelter, roosting, and foraging habitat for amphibians, birds, and reptiles when water is present.

3.4.2. General Species

Over 40 vertebrate species were recorded within the subject site during field surveys, comprising 36 bird species and five mammal species. A list of fauna species recorded within the subject site is provided in **Appendix B**. This is not an exhaustive list of species, and therefore a suite of other fauna species is expected to occur within the subject site.

3.4.3. Threatened Fauna

One threatened bird species was opportunistically observed during field surveys, the Dusky Woodswallow (*Artamus cyanopterus cyanopterus*). This species is listed as Vulnerable under the BC Act. The species is most commonly found in woodlands and dry open sclerophyll forests, usually dominated by eucalypts, and in shrubland and heathlands (OEH 2017a).

Additionally, following a review of the threatened fauna species recorded within the locality (see **Appendix C**), as well as an assessment of the habitat features within the subject site, threatened species are considered to have the potential to utilise the subject site for either foraging, breeding, roosting or nesting (**Table 3**).

Each of these species' potential habitat utilisation within the subject site is discussed below.

Table 3 Fauna species with potential habitat within the subject site

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Locality Records
Birds				
Artamus cyanopterus	Dusky Woodswallow	V	-	19
Chthonicola sagittata	Speckled Warbler	V	-	28
Daphoenositta chrysoptera	Varied Sittella	V	-	24
Lathamus discolor	Swift Parrot	E	CE	126
Gastropod				
Meridolum corneovirens	Cumberland Plain Land Snail	E	-	87
Mammals				
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V	-	284
Miniopterus orianae oceanensis	Large Bent-winged Bat	V	-	15

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Locality Records
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	26, 012
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	26

Key: CE = Critically Endangered, E = Endangered, V = Vulnerable

3.4.3.1. Woodland Birds

BC Act Status: Vulnerable

EPBC Act Status: Not listed

The BioNet Atlas (EES 2020) indicates a number of records of woodland birds previously recorded in the locality of the subject site, including the Dusky Woodswallow (*Artamus cyanopterus cyanopterus*), Speckled Warbler (*Chthonicola sagittata*) and Varied Sittella (*Daphoenositta chrysoptera*). These species are most commonly found in eucalyptus woodlands and open forest (OEH 2017b, 2018). Therefore, their preferred habitat comprises the wooded areas of the subject site, including Cumberland Plain Woodland and River-flat Eucalypt Forest.

3.4.3.2. Microchiropteran Bats

BC Act Status: Vulnerable

EPBC Act Status: Not listed

The BioNet Atlas(EES 2020) indicates a number of records of microchiropteran bats previously recorded in the locality of the subject site, including the Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*), Large Bent-winged Bat (*Miniopterus orianae oceanensis*) and Greater Broad-nosed Bat (*Scoteanax rueppellii*). The buildings found within the subject site provide potential roosting habitat for all three species (OEH 2019a, c, b). The potential habitat for species that roost in tree hollows, including the Eastern Coastal Free-tailed Bat and Greater Broad-nosed Bat, comprises primarily of the wooded areas located within the subject site.

3.4.3.3. Grey-headed Flying-fox

BC Act Status: Vulnerable

EPBC Act Status: Vulnerable

The BioNet Atlas (EES 2020) indicates that the Grey-headed Flying-fox (*Pteropus poliocephalus*) has previously been recorded within the subject site. All areas of wooded vegetation, including the areas of Cumberland Plain Woodland, River-flat Eucalypt Forest and Planted Native would provide suitable foraging habitat within the subject site. Therefore, although it is unlikely that the Grey-headed Flying-fox would utilise the vegetation within the subject site as roosting habitat, it is potentially utilising the trees for foraging purposes on occasion as part of a much broader foraging range.

3.4.3.4. Swift Parrot

BC Act Status: Endangered

EPBC Act Status: Critically Endangered

The BioNet Atlas (EES 2020) indicates that the Swift Parrot (*Lathamus discolor*) has previously been recorded in the locality of the subject site. The Swift Parrot does not breed on the Australian mainland and therefore no nesting habitat is expected to be present within the subject site. However, the flowering eucalypts found within the wooded areas of the subject site represent potential foraging habitat for the Swift Parrot.

3.4.3.5. Cumberland Plain Land Snail

BC Act Status: Endangered

EPBC Act Status: Not listed

The BioNet Atlas (EES 2020)indicates that the Cumberland Plain Land Snail (*Meridolum corneovirens*) has previously been recorded in the locality of the subject site. This species primarily inhabits the leaf litter of Cumberland Plain Woodland and has also been found on the margins of River-flat Eucalypt Forest (DPIE 2019). Therefore, the areas of Cumberland Plain Woodland and River-flat Eucalypt Forest within the subject site are considered potential habitat for the Cumberland Plain Land Snail.

3.5. Mapping of 1st Order Streams

During field surveys, all mapped 1st order streams within the subject site were thoroughly inspected to assess their compliance with the definition of 1st order streams as defined in the 'Guidelines for Controlled Activities on Waterfront Lands' (NRAR 2018). No discernible top of bank or channels were observed amongst any of the mapped 1st order streams (see **Photographs 7** and **8**). Consequently, the 1st order streams within the subject site are considered to be incorrectly mapped as water does not flow as described. As a result of considerable past modifications to the landform, the water now flows across flat areas and not within a stream as defined by 'Guidelines for Controlled Activities on Waterfront Lands' as the watercourses no longer exhibit features of a defined channel with bed and banks (NRAR 2018).

Although it is acknowledged that the 1st order streams within the subject site are mapped watercourses, these should be removed from mapping of the area, which is typically done at the Development Application stage of the project. With consideration of the above, all 1st order streams are considered exempt from assessment under the WM Act and therefore comprise a low constraint to future development.

Photograph 7 Mapped 1st order stream showing a lack of channel and banks

Photograph 8 Mapped 1st order stream showing a lack of channel and banks

4. Ecological Constraints

This chapter provides a summary of the potential impacts associated with future development of the subject site as well as a discussion of the ecological constraints to future development present within the subject site. The Planning Hub sought a preliminary ecological constraints assessment prior to the development of the proposed re-zoning plan. The proposed rezoning plan has avoided most areas of high biodiversity value, instead proposing these areas be rezoned as E2 – Environmental Conservation. Additionally, a large portion of the subject site has been proposed to be rezoned as E4 – Environmental Living which minimises the impacts existing biodiversity (**Figure 2**).

4.1. Potential Ecological Impacts

The subject site is approximately 149 ha and is proposed to be rezoned to provide for residential lots (600 – 2000 m^2). Any future development of the subject site will require some land clearance that has the potential to directly and indirectly impact biodiversity values within the subject site and surrounds. Potential impacts include:

- Removal of native vegetation;
- Removal of fauna habitat features such as, hollow-bearing trees, coarse woody debris, and blossom-producing trees and shrubs;
- Removal known habitat for threatened fauna species;
- Removal of potential habitat for threatened flora and fauna species;
- Modification of microhabitats through edge effects;
- Modification of habitat connectivity;
- Runoff, sedimentation and erosion;
- Weed invasion; and
- Injury or mortality to fauna species.

Such impacts would need to be assessed as part of the development application process. Future assessment requirements are detailed within ***Section 4.3***.

The majority of the subject site contains Pasture Improved Grassland; however, there are scattered areas of Cumberland Plain Woodland (woodland and derived native grassland forms)and River-flat Eucalypt Forest. Both communities are TECs listed under the BC Act, with Cumberland Plain Woodland also listed as a CEEC under the EBPC Act. A summary of the impact of the proposed rezoning on existing vegetation communities within the subject site is detailed in **Table 4**. Although it is acknowledged that not all vegetation within each zone, particularly areas zoned E4 – Environmental Living, will be removed, for the purpose of this analysis, it is assumed that all areas of vegetation within the subject site except for E2 – Environmental Conservation will be cleared.

Table 4 Vegetation impact summary of proposed rezoning

Vegetation Community	Subject Site (ha)	Retained (ha)	Impacted (ha)	Percent Impacted (%)
Shale Hills Woodland – Good	15.22	14.84	0.39	3
Shale Hills Woodland - Low	4.21	3.73	0.48	11
Shale Hills Woodland - Derived Native Grassland	0.90	0.90	0.00	0
Shale Plains Woodland	0.22	0.00	0.22	100
Alluvial Woodland	0.18	0.18	0.00	0
Planted Native Vegetation	0.10	0.10	0.00	0
Pasture Improved Grassland	124.49	13.31	111.18	89
Dam	3.74	1.80	1.94	52
TOTAL	**149.07**	**34.86**	**114.21**	**77**

4.2. Ecological Constraints

Key ecological constraints identified within the subject site include:

- Presence of native vegetation, including two TECs;
- Known and potential habitat for threatened species;
- Areas located on the Biodiversity Values Map;
- Land within riparian corridors; and
- SAII entities.

Each of these components is discussed further below and identified in **Figure 6.**

4.2.1. Native Vegetation

Any development being assessed under Part 4 of the EP&A Act that clears native vegetation above a threshold specified based on minimum lot size would automatically enter into the BOS. Given the proposed rezoning plan, most of the native vegetation is being retained as E2 – Environmental Conservation. However some native vegetation within areas zone as E4 – Environmental Living is likely to be required which may exceed the threshold and therefore require entry into the BOS.

Additionally, two TECs, Cumberland Plain Woodland and River-flat Eucalypt Forest have been identified as occurring within the subject site. The Cumberland Plain Woodland community is listed as an CEEC under both the BC Act and EPBC Act and River Flat Eucalypt Forest is listed as an EEC under the BC Act only. The majority of both of the TECs are currently included in the E2 -Environmental Conservation rezoning and are therefore proposed to be retained. Therefore, the impact of the project on native vegetation is not anticipated to be significant.

4.2.2. Threatened Species Habitat

A number of threatened fauna and flora species have been identified as potentially occurring within the subject site, including woodland birds, microchiropteran bats, Grey-headed Flying-fox (*Pteropus poliocephalus*), Swift Parrot (*Lathamus discolor*) and Cumberland Plain Land Snail (*Meridolum corneovirens*). One species, the Dusky Woodswallow (*Artamus cyanopterus*), has been recorded on the subject site. The main areas of habitat for these species occurs in the Cumberland Plain Woodland and River-flat Eucalypt Forest which contain hollow-bearing trees and logs, riparian corridors and rocky outcrops, as well as select dams with good fringing vegetation. All riparian corridors and the majority of the wooded area are being conserved under the proposed rezoning as E2 – Environmental Conservation, or the impact of the project mitigated under the rezoning of E4 – Environmental Living. Therefore, the impact of the project on threatened species habitat is not anticipated to be significant.

4.2.3. Biodiversity Values Map

Under the BC Act, any development being assessed under Part 4 (Local Development) of the EP&A Act that occurs within areas mapped on the Biodiversity Values Map would automatically enter into the BOS. Sections of the subject site are mapped on the Biodiversity Values Map (**Figure 6**) and impacting these areas would trigger entry into the BOS. Most of the areas of the subject site mapped on the Biodiversity Values Map have been mapped as E2 – Environmental Conservation under the proposed re-zoning plan. Therefore, impacts to these areas is anticipated to be minimal.

4.2.4. Riparian Corridors

The subject site contains riparian corridors represented by multiple unnamed water courses and Cobbitty Creek, which is situated along the southern boundary of the subject site. The unnamed water courses have been classified as 1st, 2nd, and 3rd order streams respectively and occur across the subject site (**Figure 6**). The unnamed water courses represent ephemeral creek lines that drain into the man-made dams on the property and nearby Cobbitty Creek, which has been classified as a 4th order stream under the WM Act.

Riparian corridors consist of the following components (DPI 2018):

- The channel which comprises the bed and banks of the watercourse (to the highest bank); and
- The vegetated riparian zone (VRZ) adjoining the channel.

The width of the VRZ is required to be measured from the top of the highest bank on both sides of the watercourse (DPI 2018). The NSW Office of Water's guidelines state that the following VRZ buffers should apply as 'prescribed distances', and are based on the watercourse order as classified under the Strahler System of ordering watercourses:

- 1st order watercourse: 10 m each side of watercourse (20 m + channel width);
- 2nd order watercourse: 20 m each side of watercourse (40 m + channel width);
- 3rd order watercourse: 30 m each side of watercourse (60 m + channel width); and

- 4th order watercourse and greater (including estuaries, wetlands, and any parts of rivers influenced by tidal waters): 40 m (80 m + channel width).

As such, riparian buffers of between 20 m to 30 m along unnamed water courses within the subject site as well as a 40 m buffer along Cobbitty Creek are be required to be established. Currently-mapped 1st order watercourses within the subject site are considered exempt from assessment under the WM Act (see ***Section 3.5***). All of the riparian buffers are being mapped as E2 – Environmental Conservation under the proposed rezoning plan. Consequently, the impacts of the project on riparian corridors is anticipated to be minimal.

The *Guidelines for controlled activities on waterfront land* (DPI 2018) permit developments to undertake non-riparian corridor works or development within the outer 50% of the VRZ if deemed suitable. Non-riparian uses, such as APZs are allowed within the outer 50 per cent of the VRZ, so long as offsets are provided in accordance with the averaging rule (DPI 2018). Non-riparian corridor works or development is considered suitable for cleared land, where an averaging rule is applied to ensure no net reduction in corridor width. However developments that contain existing native vegetation along the riparian corridor should seek to maintain the required VRZ width in accordance with the minimum requirements.

4.2.5. SAII Entities

One SAII entity, Cumberland Plain Woodland is known to occur within the subject site whilst one SAII fauna species, the Swift Parrot (*Lathamus discolor*) has the potential to occur. In order to minimise the risk of development being rejected on grounds of SAII, avoidance of clearing that may cause further decline or reductions in population size, such as, clearing of any preferred habitat areas is recommended. The proposed rezoning plan has included most areas of Cumberland Plain Woodland in the E2 – Environmental Living zone, conserving and minimising the impacts of the project on the SAII entity.

4.2.6. Summary and Classification of Ecological Constraints

This assessment has identified three levels of ecological constraint: high, moderate and low. The rationale for each level of constraint is provided below. **Table 5** sets out the area of each constraint category and **Figure 6** indicates where they occur within the subject site.

- **'High' Constraint** – Areas of wooded vegetation, including Cumberland Plain Forest, River-flat Eucalypt Forest, Planted Native Vegetation; areas of Derived Native Grassland; and/or within the inner 50% of each riparian buffer. Impacting these areas has the potential to:
    - Trigger entry into the BOS;
    - Result in a SAII on an SAII entity;
    - Require offsetting under the BC Act and WM Act; and
    - May require referral to the Commonwealth under the EPBC Act.
- **'Moderate' Constraint** - Areas located within the outer 50% of each riparian buffer, microhabitats suitable for native fauna, including threatened species. Impacting these areas has the potential to:

- Trigger entry into the BOS;
- Increase the risk of approval of future development (but to a lesser degree than areas mapped as 'High' Constraint); and
- May require offsetting costs (but to a lesser degree than areas mapped as 'High' Constraint).

- **'Low' Constraint** – Areas of non-native vegetation that do not provide preferred or important habitat for threatened fauna known to occur in the locality; currently-mapped 1st order streams. Impacting these areas is unlikely to significantly impact the biodiversity values of the subject site and development may be maximised.

Table 5 Total area of each ecological constraint categories

Ecological Constraint Category	Area (ha)
High	38.71
Moderate	12.20
Low	98.16

5. Future Assessment Requirements

This chapter discusses the future ecological impact assessment requirements.

5.1. EPBC Act Requirements

Threatened species, populations and communities listed under the EPBC Act that are considered to be directly or indirectly impacted by a development should be assessed in accordance with the *Matters of National Environmental Significance Significant Impact Guidelines 1.1* (DoE 2013). If a development is considered to significantly impact any MNES, then a referral would be required to be submitted to the Commonwealth Minister for Agriculture, Water and the Environment. Should the Minister determine the project to be a controlled action, then approval under the EPBC Act would be required. Areas of Cumberland Plain Woodland listed as a CEEC under the EPBC Act, are present within the subject site. Any impacts assessed as significant to this community would unlikely require a referral to the Commonwealth Minister.

A number of flora (**Table 2**) and fauna (**Table 3**) species listed under the EPBC Act, are considered to have potential habitat within the subject site. If any of these are utilising the subject site and are assessed as being significantly impacted by a future development as a result of the project, these would also necessitate a referral to the Commonwealth.

5.2. BC Act Requirements

5.2.1. Biodiversity Offset Scheme

Assessment of ecological impacts for future development applications within the subject site are required to be in accordance with the BC Act. If future developments were to be assessed under Part 4 (Local Development) of the EP&A Act, it is necessary to determine whether the project triggers entry into the BOS. For a project to trigger entry into the BOS, it would need to be considered as likely to significantly affect threatened species, which can occur as follows:

- It is likely to significantly affect threatened species or ecological communities, or their habitats, according to the Test of Significance in Section 7.3 of the BC Act; or
- It exceeds the biodiversity offsets scheme threshold according to Clause 7.1 of the BC Regulation, with the thresholds being:
    - The clearing of native vegetation of an area above a prescribed threshold based on the minimum lot size; or
    - The clearing of native vegetation, or other prescribed action, on land included on the Biodiversity Values Map; or
- It is carried out in a declared Area of Outstanding Biodiversity Value (AOBV).

If any of these criteria are triggered then the future development application would trigger entry into the BOS. Assessment under the BOS requires an assessment following the BAM by an accredited assessor and the preparation of a BDAR. The BAM will require detailed field surveys to be undertaken within the subject site, which will involve plot/transect based flora surveys, and targeted threatened species surveys. A future development would also need to demonstrate avoidance and mitigation measures. The requirement for offsets

is determined using the BAM and associated BAM calculator. Any one or a combination of the following options outlined within the BC Regulation can be used to meet the offset obligations:

- The retirement of the required number and class of like-for-like biodiversity credits;
- The retirement of the required biodiversity credits in accordance with the variation rules;
- The funding of a biodiversity conservation action that would benefit the relevant threatened species or ecological community and that is equivalent to the cost of acquiring the required like-for-like biodiversity credits as determined by the offsets payment calculator; and/or
- The payment of an amount into the Biodiversity Conservation Fund determined in accordance with the offsets payment calculator to satisfy the requirement to retire biodiversity credits.

5.2.1.1. Significant Impact to Threatened Species or Ecological Communities

If future development within the subject site resulted in sufficient impacts to TECs or threatened fauna, the development may be considered to have a significant impact on the community or species thus providing a trigger for entry into the BOS. Cumberland Plain Woodland and the Swift Parrot (*Lathamus discolor*) are also listed as an SAII entity (refer to ***Section 4.2.5***).

If impacts were deemed significant and subsequent entry into the BOS is required, consideration of ecosystem credits and species credit species would be required under the BAM. The list of species that could require consideration is determined through inputs into the BAM Calculator, and is based on native vegetation extent, PCTs, and habitat features. The list of potential species requiring consideration will be determined once a preliminary assessment according to the BAM is undertaken using the BAM calculator.

According to the BAM, each species identified would need to be assessed and appropriately surveyed for. Surveys are required to be undertaken within a specified timeframe (provided as months of a year within the BAM calculator), which can impact project timeframes. If a species is determined to be present within the impact area, there would be a requirement for provision of offsets for the species.

Any future development of the subject site would need to prepare a formal test of significance in accordance with Section 7.3 of the BC Act in the event that the BOS was not triggered by another mechanism or at the request of Council.

5.2.1.2. Native Vegetation Clearing Threshold

The project proposes to rezone the subject site into lots ranging from 600 to 2000 m^2. Based on the areas of clearing thresholds outlined within the BC Regulation, and reproduced in **Table 6**, the BOS would be triggered if the proposed development cleared ≥0.25 ha of native vegetation for lots under 1 ha and ≥0.5 ha for lots one 1 ha or more.

Table 6 Native Vegetation Clearing thresholds

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

Minimum Lot Size	Area of Clearing
Less than 40 hectares but not less than 1 hectare	0.5 hectare 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

5.2.1.3. Biodiversity Values Map

Under the BC Act, any development being assessed under Part 4 (Local Development) of the EP&A Act that occurs within areas mapped on the Biodiversity Values Map would automatically enter into the Biodiversity Offset Scheme. Sections of the subject site are mapped on the Biodiversity Values Map (**Figure 6**) and impacting these areas would trigger entry into the BOS. As the Biodiversity Values Map is subject to regular updates, it would need to be consulted during the development application process.

5.2.1.4. Area of Outstanding Biodiversity Value

AOBVs are special areas with irreplaceable biodiversity values that are important to the whole of NSW, Australia or globally. These areas are declared by the Minister for the Environment under the BC Act. Currently only four of these areas have been declared in NSW to protect habitat areas for the Little Penguin (*Eudyptula minor*), Gould's Petrel (*Pterodroma leucoptera*), Mitchell Rainforest Snail (*Thersites mitchellae*) and *Wollemia nobilis* (Wollemi Pine).

No AOBVs have been mapped as occurring across the subject site. Although unlikely to be included in the near future, the list of AOBVs would need to be consulted during the development application process.

5.2.1.5. SAII Entities

One SAII entity, Cumberland Plain Woodland is known to occur within the subject site whilst one SAII fauna species, the Swift Parrot (*Lathamus discolor*) has the potential to occur (see ***Section 4.2.5***). If future development triggers entry into the BOS and the preparation of a BDAR is required, then the BDAR must consider any potential impacts on any threatened communities and or species classified as Significant and Irreversible Impact (SAII) entities. Under the BOS, a consent authority (i.e. Council) is required to reject a Part 4 development that is considered to have an impact that is serious and irreversible on an SAII entity. Principles for determining whether or not an impact is considered to be serious and irreversible include the following four principles (clause 6.7 of the BC regulation):

- Will cause a further decline of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline, or
- Will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size, or
- Impact on the habitat of a species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution, or
- Impact on a species or ecological community that is unlikely to respond to measures to improve habitat and vegetation integrity and is therefore irreplaceable. The consent authority (i.e. Council) has the ability

to determine that a proposed development is not considered to be an SAII. In order for this to occur, an assessment would be required that demonstrates that the development is not in conflict with any of the four principles (clause 6.7 of the BC regulation) provided above.

5.2.2. WM Act Requirements

Should the project impact the VRZ, controlled activity approval would be required from the Natural Resources Regulator. Applications for controlled activities approvals are required to be prepared using the *Application for a Controlled Activity Approval for works on waterfront land* form and the *Guideline for completing an application for a Controlled Activity Approval*. Applications that do not conform to the *Guidelines for controlled activities on waterfront land* (DPI 2018) will be subject to merit assessment to ensure that the development application meets the requirements of the WM Act.

6. Conclusion and Recommendations

The entirety of the subject site is proposed to be rezoned in order to facilitate a sub-division of the subject site into lots of various sizes (600 – 2000 m^2) that will provide a transition from land to be developed under the South-Western Region Growth Centre and the soon to be gazetted OSO also known as the M9.

This assessment included an ecological investigation of the subject site to determine ecological constraints to the project. The key ecological constraints identified are summarised below:

- Presence of native vegetation, including two TECs;
- Land mapped on the Biodiversity Values Map;
- Known and potential habitat for threatened species;
- Land within riparian corridors; and
- SAII Entities.

In order to minimise impacts on the ecological constraints identified above it is recommended that all areas of Cumberland Plain Woodland and River-flat Eucalypt Forest, particularly areas of Cumberland Plain Woodland-Good Condition and Derived Native Grassland, be avoided as any impacts on this community may result in an SAII if determined by Camden Council or a referral to the Commonwealth in the case of the Cumberland Plain Woodland listed under the EPBC Act, , and both of these pathways increase the risk of securing development approvals. Although all clearance of native vegetation will need to be offset under the BOS, avoidance of Cumberland Plain Woodland and River-flat Eucalypt Forest , will also likely reduce offsetting costs.

It is also recommended that future development avoid the recommended VRZ buffers where possible as approval under the WM Act will be required if encroachment in such areas occurs and offsetting under the WM Act will be in addition to any offsetting under the BC Act using the BAM. If encroachment into VRZ buffers cannot be avoided, then impacts should be limited to the 50% outer area of VRZ buffer only as impacts to the 50% inner area of the VRZ buffer are unlikely to be approved.

In due diligence, the Planning Hub have first undertaken a preliminary constraints assessment to understand the ecological constraint features present within the subject site prior to the development of the rezoning plan. The proposed rezoning plan has incorporated the recommendations outlined in the preliminary constraints assessment by mostly avoiding areas identified as 'High' and 'Moderate' constraints, instead proposing to rezone those areas as E2-Environmental Conservation, whilst also incorporating a large portion of the subject site as E4 – Environmental Living where impacts to biodiversity will be minimised.

7. References

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APPENDIX A :
Flora Species List

Table 7 Flora species list recorded within the subject site

Family	Scientific Name	Common Name	Exotic
Acanthaceae	*Brunoniella australis*	Blue trumpet	
Apocynaceae	*Gomphocarpus fruticosus*	Narrow-leaved Cotton Bush	
Asteraceae	*Bidens pilosa*	Cobbler's Pegs	YES
Asteraceae	*Bidens subalternans*	Greater Beggar's Ticks	YES
Asteraceae	*Carthamus lanatus*	Saffron Thistle	YES
Asteraceae	*Cirsium vulgare*	Spear Thistle	YES
Asteraceae	*Conyza sumatrensis*	Tall fleabane	YES
Asteraceae	*Hypochaeris radicata*	Catsear	YES
Asteraceae	*Senecio madagascariensis*	Fireweed	YES
Asteraceae	*Senecio quadridentatus*	Cotton Fireweed	
Asteraceae	*Sonchus oleraceus*	Common Sowthistle	YES
Brassicaceae	*Brassica rapa*	Turnip	YES
Brassicaceae	*Lepidium africanum*	Common Peppercress	YES
Campanulaceae	*Wahlenbergia communis*	Tufted Bluebell	
Chenopodiaceae	*Dysphania pumilio*	Small Crumbweed	
Chenopodiaceae	*Einadia hastata*	Berry Saltbush	
Chenopodiaceae	*Einadia nutans subsp. nutans*	Climbing Saltbush	
Chenopodiaceae	*Einadia polygonoides*	Knotweed Goosefoot	
Chenopodiaceae	*Einadia trigonos*	Fishweed	
Clusiaceae	*Hypericum gramineum*	Small St John's Wort	
Convolvulaceae	*Convolvulus erubescens*	Pink Bindweed	
Convolvulaceae	*Dichondra repens*	Kidney Weed	
Cyperaceae	*Carex inversa*	Knob Sedge	
Cyperaceae	*Carex iynx*	-	
Cyperaceae	*Cyperus gracilis*	Slender Flat-sedge	
Cyperaceae	*Scleria mackaviensis*	-	
Fabaceae (Faboideae)	*Desmodium varians*	Slender Tick-trefoil	
Fabaceae (Faboideae)	*Glycine clandestina*	Twining glycine	
Fabaceae (Faboideae)	*Glycine microphylla*	Small-leaf Glycine	
Fabaceae (Faboideae)	*Glycine tabacina*	Variable Glycine	
Fabaceae (Faboideae)	*Indigofera australis*	Australian Indigo	
Fabaceae (Faboideae)	*Medicago polymorpha*	Burr Medic	YES
Fabaceae (Faboideae)	*Oxytes brachypoda*	Large Tick-trefoil	

Family	Scientific Name	Common Name	Exotic
Fabaceae (Mimosoideae)	*Acacia implexa*	Hickory Wattle	
Geraniaceae	*Geranium solanderi*	Native Geranium	
Iridaceae	*Romulea rosea*	Onion Grass	YES
Lamiaceae	*Ajuga australis*	Austral Bugle	
Lomandraceae	*Lomandra filiformis subsp. filiformis*	-	
Loranthaceae	*Amyema miquelii*	Box Mistletoe	
Malvaceae	*Abutilon spp.*	Lantern-bush	
Malvaceae	*Malva parviflora*	Small-flowered Mallow	YES
Malvaceae	*Modiola caroliniana*	Red-flowered Mallow	YES
Malvaceae	*Sida rhombifolia*	Paddy's Lucerne	YES
Myrtaceae	*Corymbia maculata*	Spotted Gum	
Myrtaceae	*Eucalyptus moluccana*	Grey Box	
Myrtaceae	*Eucalyptus tereticornis*	Forest Red Gum	
Oleaceae	*Olea europaea subsp. cuspidata*	African Olive	YES
Oleaceae	*Olea europaea subsp. europaea*	Olive	YES
Oxalidaceae	*Oxalis perennans*	-	
Phormiaceae	*Dianella longifolia*	Blueberry Lily	
Plantaginaceae	*Plantago lanceolata*	Lamb's Tongues	YES
Poaceae	*Aristida ramosa*	Purple Wiregrass	
Poaceae	*Bothriochloa decipiens*	Pitted Bluegrass	
Poaceae	*Briza subaristata*	-	YES
Poaceae	*Cenchrus clandestinus*	Kikuyu Grass	YES
Poaceae	*Chloris gayana*	Rhodes Grass	YES
Poaceae	*Chloris ventricosa*	Tall Chloris	
Poaceae	*Cynodon dactylon*	Common Couch	
Poaceae	*Dactylis glomerata*	Cocksfoot	YES
Poaceae	*Dichanthium sericeum*	Queensland Bluegrass	
Poaceae	*Eragrostis leptostachya*	Paddock Lovegrass	
Poaceae	*Microlaena stipoides*	Weeping Grass	
Poaceae	*Nassella neesiana*	Chilean Needle Grass	YES
Poaceae	*Panicum effusum*	Hairy Panic	
Poaceae	*Paspalum dilatatum*	Paspalum	YES
Poaceae	*Paspalum distichum*	Water Couch	

Family	Scientific Name	Common Name	Exotic
Poaceae	*Phalaris aquatica*	Phalaris	YES
Poaceae	*Poa labillardierei*	Tussock	
Poaceae	*Poa sieberiana*	Snowgrass	
Poaceae	*Rytidosperma racemosum*	Wallaby Grass	
Poaceae	*Setaria parviflora*	-	YES
Poaceae	*Sporobolus creber*	Slender Rat's Tail Grass	
Poaceae	*Themeda triandra*	-	
Polygonaceae	*Rumex brownii*	Swamp Dock	
Primulaceae	*Lysimachia arvensis*	Scarlet Pimpernel	YES
Rubiaceae	*Asperula conferta*	Common Woodruff	
Rubiaceae	*Sherardia arvensis*	Field Madder	YES
Solanaceae	*Lycium ferocissimum*	African Boxthorn	YES
Solanaceae	*Solanum campanulatum*	-	
Solanaceae	*Solanum cinereum*	Narrawa Burr	
Solanaceae	*Solanum linnaeanum*	Apple of Sodom	YES
Solanaceae	*Solanum prinophyllum*	Forest Nightshade	
Verbenaceae	*Lantana camara*	Lantana	YES
Verbenaceae	*Verbena bonariensis*	Purpletop	YES
Verbenaceae	*Verbena officinalis*	Common Verbena	YES

**HTW = High Threat Weed*

APPENDIX B :
Fauna Species List

Table 8 Fauna species list for the subject site

Scientific Name	Common Name	BC Act Status	EPBC Act Status
Birds			
Acridotheres tristis	Common Myna		
Alisterus scapularis	Australian King Parrot		
Anas superciliosa	Pacific Black Duck		
Anthus novaeseelandiae	Australasian Pipit		
Aquila audax	Wedge-tailed Eagle		
Ardea alba modesta	Eastern Great Egret		
Ardea pacifica	White-necked Heron		
Artamus cyanopterus	Dusky Woodswallow	V	
Ardea ibis	Cattle Egret		
Cacatua galerita	Sulphur-crested Cockatoo		
Chenonetta jubata	Australian Wood Duck		
Cormobates leucophaea	White-throated Treecreeper		
Corvus coronoides	Australian Raven		
Cygnus atratus	Black Swan		
Dacelo novaeguineae	Laughing kookaburra		
Eopsaltria australis	Eastern Yellow Robin		
Falco cenchroides	Nankeen Kestrel		
Grallina cyanoleuca	Magpie-lark		
Himantopus mexicanus	Black-necked Stilt		
Hirundo neoxena	Welcome Swallow		
Malurus cyaneus	Superb Fairywren		
Manorina melanocephala	Noisy Miner		
Manorina melanophrys	Bell Miner		
Ocyphaps lophotes	Crested Pigeon		
Pachycephala pectoralis	Golden Whistler		
Pardalotus punctatus	Spotted Pardalote		
Philemon corniculatus	Noisy Friarbird		
Platalea regia	Royal Spoonbill		
Platycercus eximius	Eastern Rosella		
Podiceps cristatus	Great Crested Grebe		
Poliocephalus poliocephalus	Hoary-headed Grebe		
Rhipidura albiscapa	Grey Fantail		

Scientific Name	Common Name	BC Act Status	EPBC Act Status
Strepera graculina	Pied Currawong		
Tachybaptus novaehollandiae	Australasian Grebe		
Taeniopygia bichenovii	Double-barred Finch		
Vanellus miles	Masked Lapwing		
Mammals			
Capra aegagrus hircus	Goat		
Macropus giganteus	Eastern Grey Kangaroo		
Macropus robustus	Common Wallaroo		
Oryctolagus cuniculus	European Rabbit		
Vulpes vulpes	European Fox		

Key: V = Vulnerable

APPENDIX C :
Threatened Species List

Table 9 Threatened flora species previously recorded within the locality

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Locality Records
Acacia bynoeana	Bynoe's Wattle	-	V	1
Allocasuarina glareicola	-	E	E	1
Cynanchum elegans	White-flowered Wax Plant	E	E	19
Eucalyptus benthamii	Camden White Gum	V	V	342
Genoplesium baueri	Yellow Gnat-orchid	E	E	1
Haloragis exalata subsp. *exalata*	Wingless Raspwort	V	V	1
Marsdenia viridiflora subsp. *viridiflora*	Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	E	-	27
Persicaria elatior	Knotweed	V	V	1
Persoonia hirsuta	Hairy Geebung	E	E	1
Persoonia nutans	Nodding Geebung	E	E	1
Pimelea spicata	Spiked Rice-flower	E	E	1
Pomaderris brunnea	Brown Pomaderris	E	V	18
Pterostylis saxicola	Sydney Plains Greenhood	E	E	1
Pultenaea pedunculata	Matted Bush-pea	E	-	3
Syzygium paniculatum	Magenta Lilly Pilly	E	V	1
Thelymitra kangaloonica	Kangaloon Sun Orchid	CE	CE	1
Thesium australe	Austral Toadflax	V	V	1

Key: CE = Critically Endangered; E = Endangered; V = Vulnerable

Table 10 Threatened fauna species previously recorded within the locality

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Locality Records
Anthochaera phrygia	Regent Honeyeater	CE	CE	1
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	-	19
Botaurus poiciloptilus	Australasian Bittern	E	E	1
Calidris ferruginea	Curlew Sandpiper	E	CE	1
Callocephalon fimbriatum	Gang-gang Cockatoo	V	-	3
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	1
Chthonicola sagittata	Speckled Warbler	V	-	28
Daphoenositta chrysoptera	Varied Sittella	V	-	24
Dasyurus maculatus	Spotted-tail Quoll	V	E	1
Gallinago hardwickii	Latham's Snipe	-	M	7
Glossopsitta pusilla	Little Lorikeet	V	-	3
Grantiella picta	Painted Honeyeater	V	V	1
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	C	8
Heleioporus australiacus	Giant Burrowing Frog	V	V	1
Hieraaetus morphnoides	Little Eagle	V	-	2
Hirundapus caudacutus	White-throated Needletail	-	V	1
Lathamus discolor	Swift Parrot	E	CE	126
Litoria aurea	Green and Golden Bell Frog	E	V	1
Lophoictinia isura	Square-tailed Kite	V	-	1
Macquaria australasica	Macquarie Perch	E*	E	1
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	V	-	2
Meridolum corneovirens	Cumberland Plain Land Snail	E	-	87
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V	-	284
Miniopterus orianae oceanensis	Large Bent-winged Bat	V	-	15
Myotis macropus	Southern Myotis	V	-	3
Ninox strenua	Powerful Owl	V	-	8
Numenius madagascariensis	Eastern Curlew	-	CE	1
Oxyura australis	Blue-billed Duck	V	-	1
Petauroides volans	Greater Glider	-	V	1
Petrogale penicillata	Brush-tailed Rock Wallaby	E	V	1
Petroica boodang	Scarlet Robin	V	-	1
Petroica phoenicea	Flame Robin	V	-	3

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Locality Records
Phascolarctos cinereus	Koala	V	V	3
Prototroctes maraena	Australian Grayling	E*	V	1
Pseudomys novaehollandiae	New Holland Mouse	-	V	1
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	26,012
Rostratula australis	Australian painted snipe	E	E	1
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-	1
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	26
Stagonopleura guttata	Diamond Firetail	V	-	1
Stictonetta naevosa	Freckled Duck	V	-	1
Synemon plana	Golden Sun Moth	E	CE	1

Key: CE = Critically Endangered; E = Endangered; V = Vulnerable, M = Migratory

** Listed as Endangered (Fisheries Management Act 1994)*

FIGURES

Legend

Subject Site

Coordinate System: MGA Zone 56 (GDA 94)

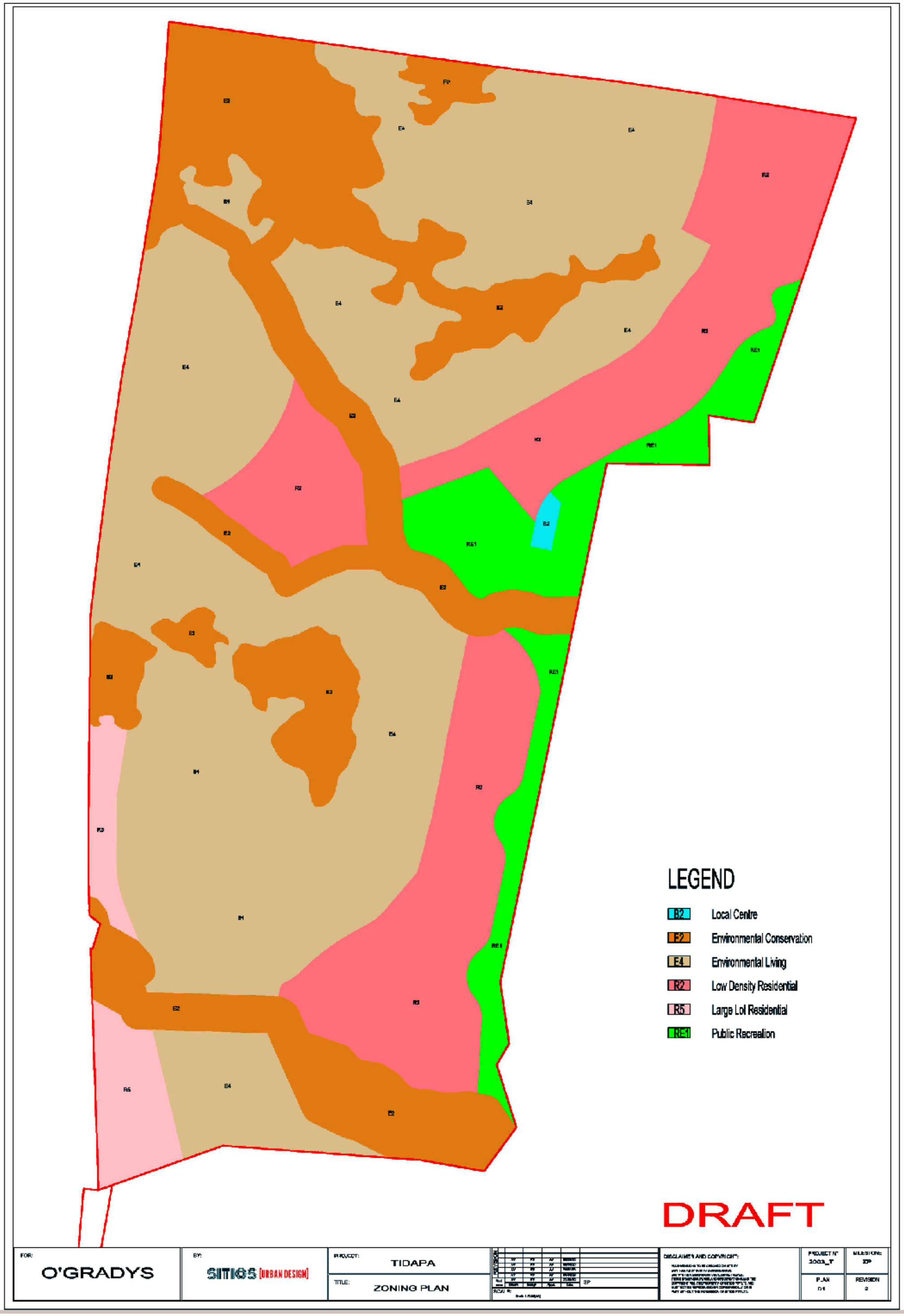
Data Source:
NSW Government Spatial Services
SIX Maps 'Clip and Ship'
Camden LGA

cumberland ecology

0 350 700 1,050 1,400 m

I:\...\19236\Figures\RP1\20200729\Figure 1. The subject site and locality

Figure 1. The subject site and locality



I:\...\19236\Figures\RP1\20200729\Figure 2. Proposed re-zoning plan

Figure 2. Proposed re-zoning plan

Image Source: Sitios Urban Design 2020

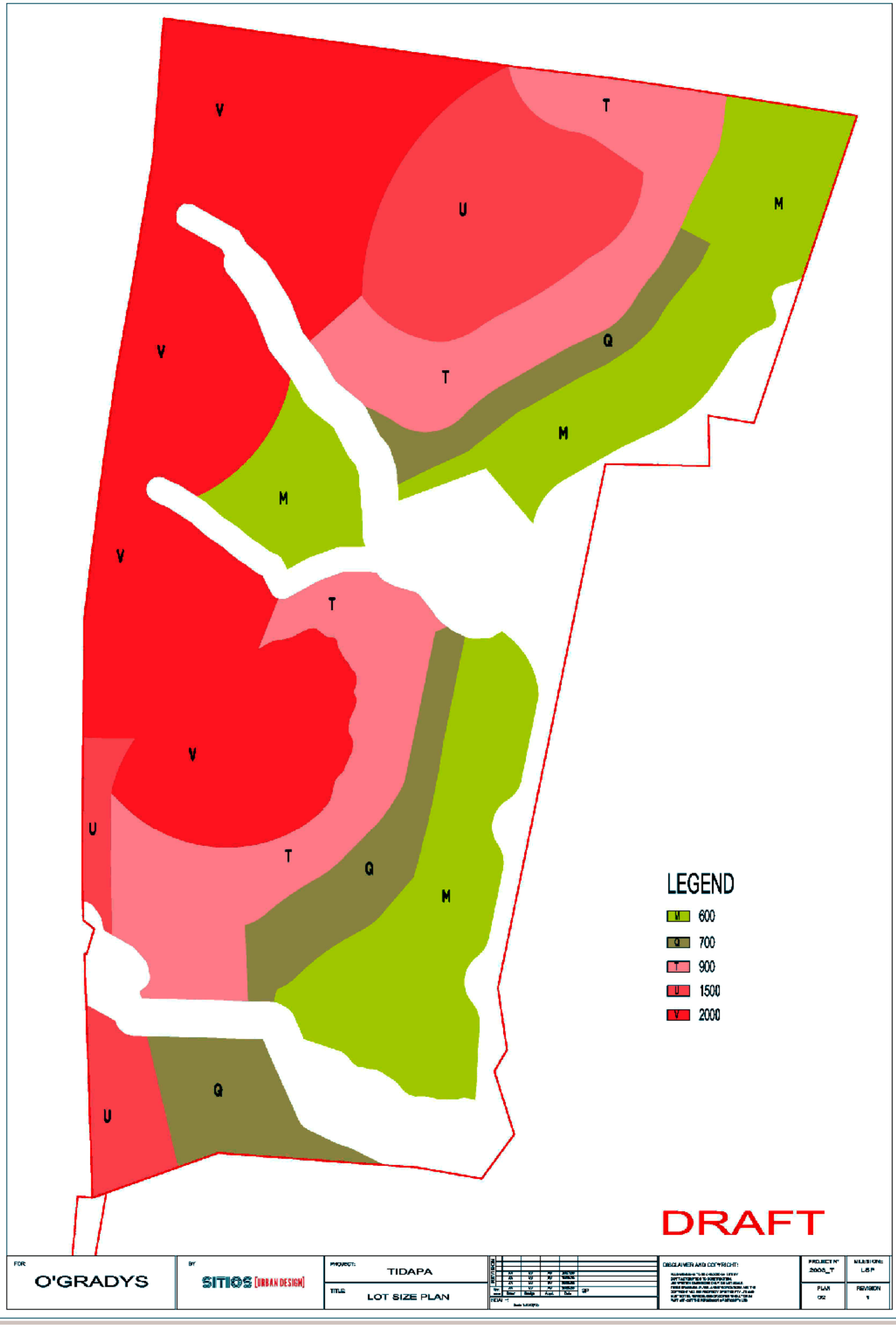


Image Source: Sitios Urban Design 2020

Figure 3. Proposed lot size plan

Figure 4. Survey locations within the subject site

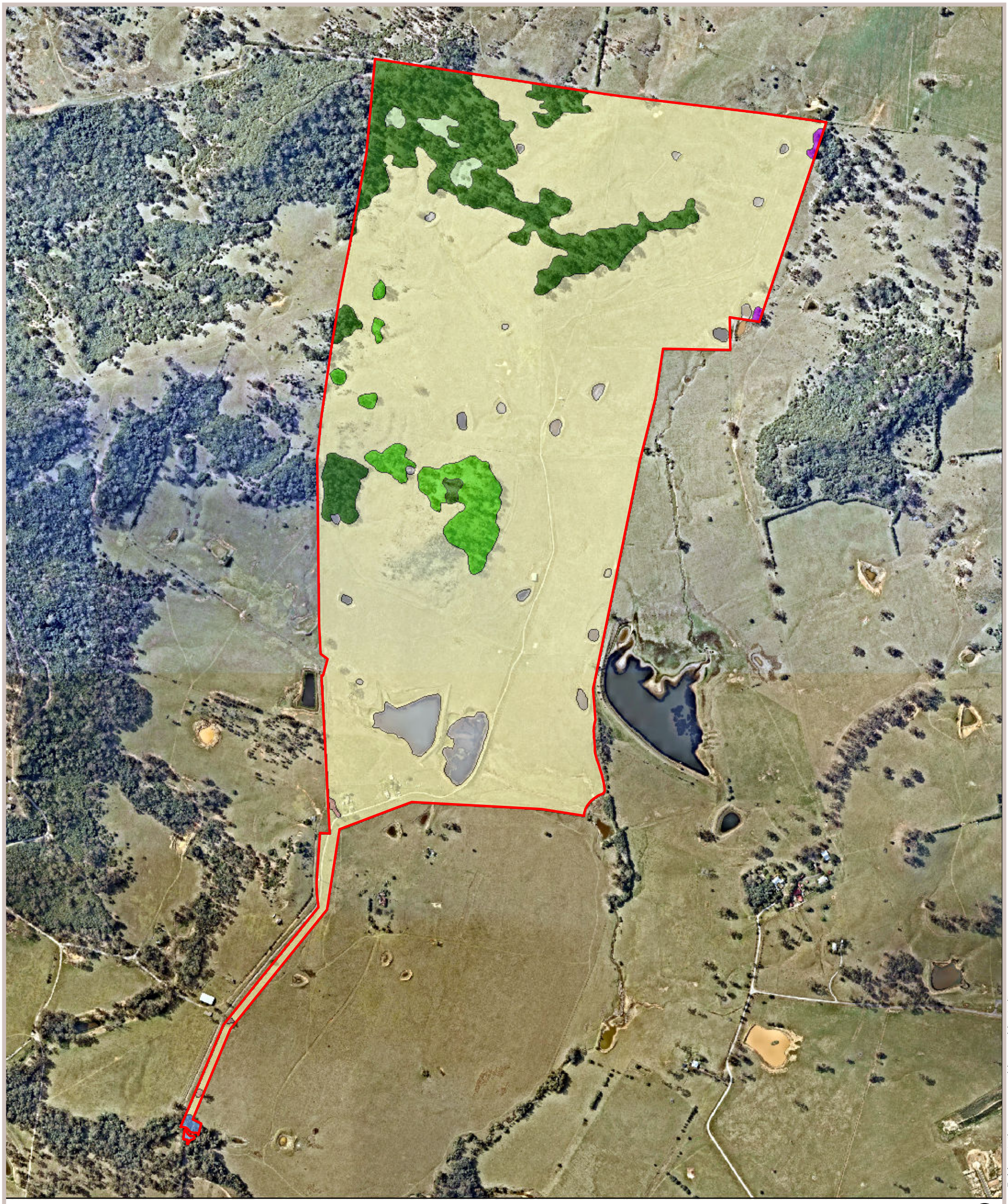


Figure 5. Vegetation communities within the subject site

Legend

- Subject Land
- Biodiversity Values Map

TEC Status

- BC Act and EPBC Act Listed Vegetation
- BC Act Only Listed Vegetation

Vegetation Community

- Shale Hills Woodland – Good
- Shale Hills Woodland - Low
- Shale Hills Woodland - Derived Native Grassland
- Shale Plains Woodland
- Alluvial Woodland
- Planted Native Vegetation
- Pasture Improved Grassland
- Dam

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
Image © NearMap 2020
Dated: 27/9/2019

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

cumberland ecology

I:\...\19236\Figures\RP1\20200731\Figure 6. Ecological constraints_subject site

Figure 6. Ecological constraints within the subject site

0 100 200 300 400 m

Legend

Subject Land

Ecological Constraint Category

High

Moderate

Low

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
Image © NearMap 2020
Dated: 27/9/2019

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

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I:\...\19236\Figures\RP1\20200731\Figure 7. Ecological constraints categories_subject site

Figure 7. Ecological constraints categories of the subject site

0 100 200 300 400 m