Orchard Hills Precinct Plan Biodiversity Conservation Assessment

FINAL REPORT

Prepared for New South Wales Department of Planning, Housing and Infrastructure

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Glossary

BC Act	*NSW Biodiversity Conservation Act 2016*
Biosecurity Act	*Biosecurity Act 2015*
BOS	Biodiversity Offsets Scheme
CBD	Central Business District
CEEC	Critically Endangered Ecological Community
Cth DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DCP	Development Control Plan
DPHI	NSW Department of Planning, Housing and Infrastructure
DPI	Department of Primary Industries
EEC	Endangered Ecological Community
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
FM Act	*Fisheries Management Act 1994*
GIS	Geographic Information System
LEP	Local Environmental Plan
LGA	Local Government Area
LLS	Local Land Services
MNES	Matters of National Environmental Significance
NorBE	Neutral or Beneficial Effect
NPW Act	*National Parks and Wildlife Act 1974*
NSW	New South Wales
NSW DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water, formerly Department of Planning and Environment (DPE)
PCT	Plant Community Type
SEPP	NSW State Environmental Planning Policy
SEI	Stream erosion index
SIC	Significant Impact Criteria
study area	The study area is defined as the whole planning proposal area, surrounded by the precinct boundary and provided in Figure 1.
TEC	Threatened Ecological Community
ToS	Test of Significance
VRZ	Vegetated Riparian Zone
WM Act	*Water Management Act 2000*

1. Introduction

Biosis Pty Ltd was commissioned by the New South Wales (NSW) Department of Planning, Housing and Infrastructure (DPHI) to complete a Biodiversity Conservation Assessment to describe the biodiversity values and constraints associated with the proposed precinct planning and rezoning of Orchard Hills Precinct, in NSW (Figure 1).

The objective of this assessment is to assist DPHI with their understanding of any ecological constraints associated with the site, while also providing conservation and management recommendations to inform precinct planning. This assessment was prepared using a combination of desktop assessment and rapid field-based assessment. The report builds upon the Orchard Hills Precinct Biodiversity Baseline Analysis (Biosis 2023a) and should be read in conjunction with the Orchard Hills Precinct Riparian Corridors Assessment (Biosis 2024).

1.1. Project background

The study area is defined by the Orchard Hills Precinct and a buffer area for assessment of indirect impacts, which covers approximately 1,570 hectares of private and public land and the adjacent road reserves. The Orchard Hills Precinct is approximately 1,315 hectares. The Orchard Hills Precinct is bounded by Caddens Road and the M4 Motorway to the north, the Defence Establishment, Orchard Hills and Patons Lane Resource Recovery Centre to the south, The Northern Road to the west and the Wianamatta – South Creek riparian corridor in the east.

DPHI has further delineated the study area to the Stage 1 rezoning area which is the subject site of this planning proposal. The Stage 1 rezoning area is 432 hectares in size and further broken down into three sub-stages.

Orchard Hills Precinct has been identified for growth and change following investigations of the Greater Penrith and Eastern Creek area (GPEC). The Orchard Hills Precinct has been identified as a high priority investigation area for future residential growth within Western Sydney, and as such, DPHI intend to progress with further Precinct Planning in the area. Biosis understands that DPHI are investigating potential for Orchard Hills Precinct to accommodate new development and are therefore preparing a precinct rezoning package to provide for new housing supported by transport and other infrastructure essential in Western Sydney.

1.2. Biodiversity certification

1.2.1. Cumberland Plain Conservation Plan

The Cumberland Plain Conservation Plan (CPCP) (DPE 2022a) obtained NSW State approval in August 2022, which provides biodiversity certification under Part 8 of the NSW *Biodiversity Conservation Act 2016* (the BC Act). The CPCP obtained Commonwealth approval in March 2024, which provides strategic assessment under Part 10 of the Commonwealth *Environmental Protection and Biodiversity Conservation Act* (EPBC Act). These approvals remove the need for landholders to seek their own biodiversity approvals under the BC Act and EPBC Act for development on certified - urban capable land, if they comply with the planning controls associated with the CPCP, as set out in Chapter 13 Strategic conservation planning of the State Environmental Planning Policy (Biodiversity and Conservation) 2021 (Biodiversity and Conservation SEPP). As a result, the

study area within the Orchard Hills Precinct is designated as certified – urban capable land, certified – major transport corridor, excluded land and/or avoided land under the CPCP and the associated Biodiversity Certification Order. An additional land category, Strategic Conservation Area, also applies to several sites within and adjoining the Blaxland Creek corridor, in the east of the Stage 1 rezoning area, all of which are also identified as avoided land, under the CPCP.

1.3. Scope of assessment

The objective of the assessment is to confirm existing biodiversity values including vegetation and waterways where possible, to inform the ecological constraints and design of the Orchard Hills Precinct. In addition, identify areas of high ecological value and, where applicable, assess the impacts of the project on any such species or their habitats, as listed under the EPBC Act and the BC Act.

Specifically, the scope of this investigation is to prepare a Biodiversity Conservation Assessment report to:

- Determine biodiversity values and ecological constraints within the Orchard Hills Precinct.
- Determine areas suitable for development with no or minimal ecological constraints.
- Determine areas of biodiversity value that should be considered for retention.
- Assess consistency with CPCP (DPE 2022a).

Biosis has undertaken consultation with DesignFlow and Rhelm regarding water cycle management and flood impact risk (DesignFlow 2023, Rhelm 2023) to ensure that biodiversity considerations have been integrated, where relevant.

1.3.1. CPCP modification

A CPCP modification process is currently in progress, which may impact the Orchard Hills Precinct, however there is currently no advice provided on potential areas of change. Biosis acknowledges the CPCP modification process and understands that this process may impact CPCP mapped avoided land boundaries. As this is a separate process, it will not impact rezoning of Orchard Hills Precinct at this point, however may impact land uses of areas marked as avoided land following rezoning, pending the outcome of the modification process.

1.3.2. Orchard Hills road network

DPHI is in the process of identifying areas where essential infrastructure will impact CPCP avoided land, such as roads, road widening, and stormwater. The road widening and potential links are subject to further traffic modelling. Biosis acknowledges the potential impacts on CPCP mapped avoided land by essential infrastructure, which will, if applicable, need to be consistent with the *CPCP Guidelines for Infrastructure Development* (DPE 2022b). If the essential infrastructure pathway is applied, there are essential requirements that would apply, which include formal notification and completion of a consistency statement which sets out whether the proposal is consistent with Section 2.3 of the infrastructure guidelines.

1.4. Location of the study area

The study area is located approximately 6 kilometres southeast of Penrith and approximately 46 kilometres west-north-west of the Sydney Central Business District (CBD) (Figure 1). It is currently zoned as primarily RU4 Primary Production Small Lots, with the remining area zoned as C2 Environmental Conservation, SP2 Infrastructure and RU2 Rural Landscape under the *Penrith Local Environment Plan 2010* (LEP). The

surrounding land use is comprised primarily of low and moderate density housing and public recreation areas such as recreation ovals and public parks.

The Orchard Hills Precinct has undergone extensive clearing and is now comprised of large residential lots and remnant vegetation. The landscape is highly fragmented, where remaining stands of native vegetation is concentrated around waterways, predominantly. The precinct area is intersected by two major waterways, Claremont Creek and Blaxland Creek, as well as several other small tributaries, which feed Wianamatta/South Creek. The riparian vegetation along Blaxland Creek is well connected to intact bushland around the Australian Defence site south of the Precinct's border.

The study area is located in the Cumberland Plain landscape, characterised by woodlands and open forests of Eucalypt species such as Grey Box *Eucalyptus moluccana,* Forest Red Gum *Eucalyptus tereticornis* and Narrow-leaved Ironbark *Eucalyptus crebra*, with a grassy to shrubby understorey. Soils are characterised by a combination of red and brown texture contrast soils on crests, yellow texture contrast soils in valleys, and pedal uniform red to brown clays on volcanic hills. This landscape has a general elevation of 30 to 120 metres, and is characterised by low rolling hills and valleys in a rain shadow area between the Blue Mountains and the coastal side of the Lapstone monocline (Mitchell 2002).

The study area is within the:

- Sydney Basin Bioregion and Cumberland Sub-bioregion.
- Hawkesbury River Basin (Hawkesbury catchment).
- Greater Sydney Local Land Services (LLS) Management Area.
- City of Penrith Local Government Area (LGA).

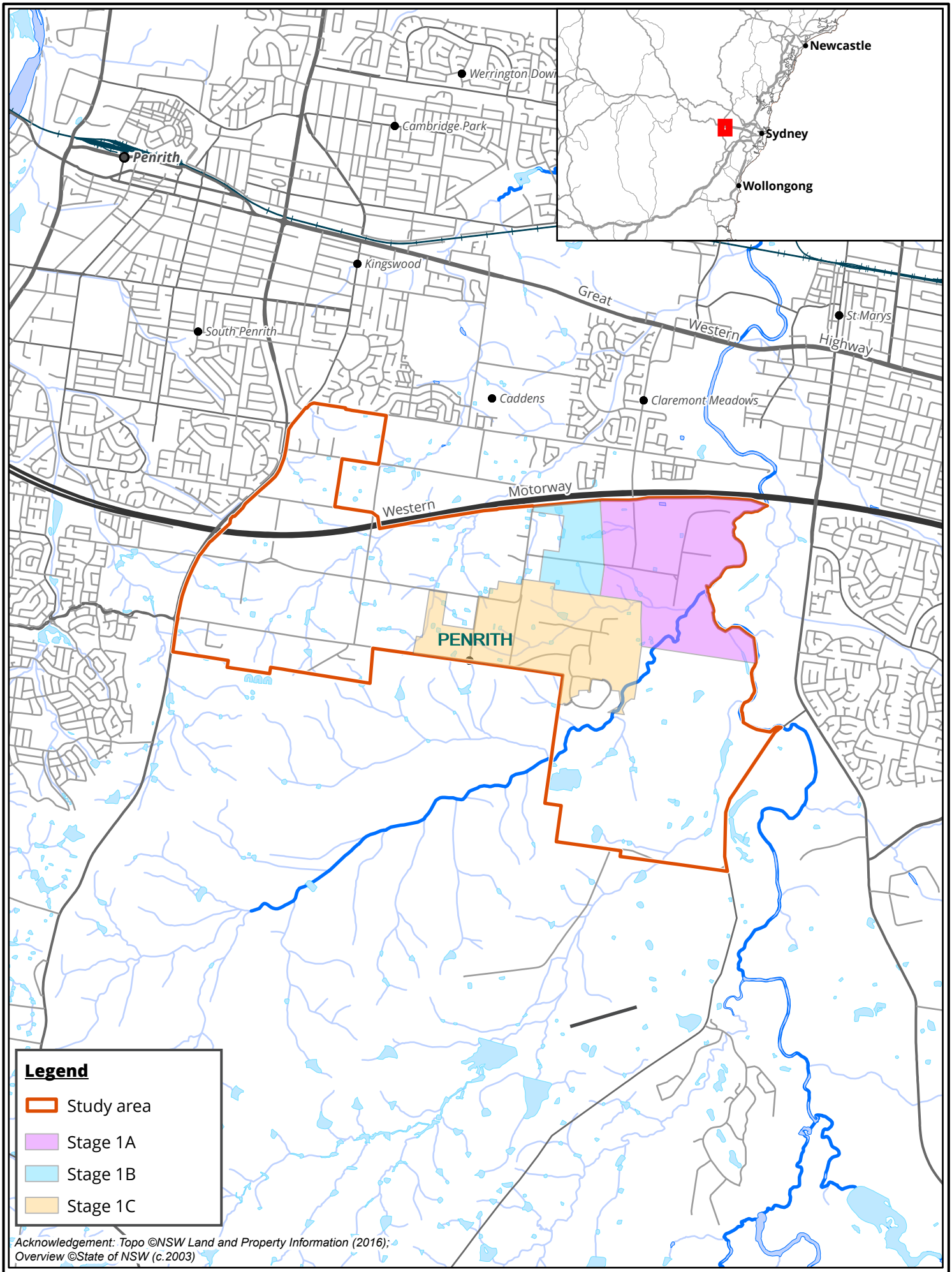

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Figure 1 Location of the study area

Matter: 37782
Date: 11 July 2024,
Prepared for KE, CH. Prepared by JET, HL. Last edited by: hliswoyo
Location:P:\37700s\37782\Mapping\37782_OrchardHills_2024.aprx
Layout: 37782_F1_Locality

0 400 800 1,200 1,600 2,000
Metres

N

Scale 1:50,000 @ A4, GDA2020 MGA Zone 56

2. Methods

2.1. Database and literature review

Prior to completing the field investigation, information provided by DPHI as well as other key information was reviewed, including:

- Commonwealth Department of Climate Change, Energy, the Environment and Water (Cth DCCEEW) Protected Matters Search Tool for matters protected by the EPBC Act.
- NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW) BioNet Atlas of NSW Wildlife, for items listed under the BC Act.
- The NSW Department of Primary Industries (DPI) Spatial Data Portal for *Fisheries Management Act 1994* (FM Act) listed threatened species, populations and communities.
- NSW DPI WeedWise database for *Biosecurity Act 2015* (Biosecurity Act) listed priority weeds for the Greater Sydney LLS region.
- Existing vegetation mapping, including *Native vegetation of the Cumberland Plain, Western Sydney* (NPWS 2013).
- *Cumberland Plain Conservation Plan* (DPE 2022a) and associated reports.
- *Cumberland Plain Conservation Plan Mitigation Measures Guideline* (DPE 2022c) (CPCP Mitigation Measures Guideline).
- List of reference studies and documents, as per Attachment 2 in the SOR *PROC2720 Part D*.
- Existing reports, including:
  - *Orchard Hills Precinct Riparian Corridors Baseline Analysis* (Biosis 2023b).
  - *Orchard Hills Precinct Biodiversity Baseline Analysis* (Biosis 2023a).
  - *Orchard Hills IWCM: Exhibition Report* (DesignFlow 2023).
  - *Orchard Hills Precinct – Exhibition Report* (Rhelm 2023).
- The implications for the project were assessed in relation to key biodiversity legislation and policy including:
  - *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act).
  - *Environmental Planning and Assessment Act 1979* (EP&A Act).
  - *Biodiversity Conservation Act 2016* (BC Act).
  - *Local Land Services Act 2013* (LLS Act).
  - *National Parks and Wildlife Act 1974* (NPW Act).
  - *Water Management Act 2000* (WM Act).
  - *Fisheries Management Act 1994* (FM Act).
  - *Biosecurity Act 2015* (Biosecurity Act).
  - State Environmental Planning Policy (Biodiversity and Conservation) 2021.
  - State Environmental Planning Policy (Resilience and Hazards) 2021.
  - *Penrith Development Control Plan 2014* (DCP).
  - *Penrith Local Environment Plan 2010* (LEP).

2.2. Field investigation

A field investigation of the study area was undertaken on 8 February 2023 by Rebecca Dwyer (Team Leader – Ecology [NSW]) and Kaisha Edwards (Graduate Botanist). Biosis undertook rapid vegetation validation predominantly from the road corridor and from drive-by survey within the vehicle due to site access restrictions (see Section 2.2.3 Limitations). This survey involved visual assessment of dominant species, particularly canopy species, at regular intervals and then confirming or assigning Plant Community Types (PCTs) as defined by the Biodiversity Assessment Method (BAM) (DPIE 2020), in consideration of the PCTs mapped by Biosis for the CPCP (DPE 2022a). No additional field investigation, such as BAM plot data collection, was undertaken as part of the current assessment due a lack of access to private property.

A 30 metre buffer either side of the edge of the road was considered appropriate to accurately assess the general condition of the vegetation from the road, and thus all vegetation within this buffer was included in the area assessed for the current field investigation.

2.2.1. Riparian zone mapping

Detailed survey is yet to be undertaken to determine the top of bank of waterways within the study area, riparian corridors were estimated by combining the mapped waterway lines from 1:25,000 topographic mapping, aerial photograph interpretation and modelling areas where the 1% Annual Exceedance Probability (AEP) occurred in association with topographic waterway lines. The 1% AEP areas were buffered by 10 metres to capture areas that could represent vegetated riparian zones. This was due to hydrological line work in the NSW Spatial Services Digital Topographic Database, which are used for statutory riparian buffer mapping, not matching with the 1% AEP polygons in some places. Where other important vegetation has been mapped in isolated patches, the 1% AEP polygons were also used to find areas of opportunity to create connectivity corridors between these patches.

2.2.2. Permits and licences

The biodiversity assessment was conducted under the terms of Biosis' Scientific Licence issued by the NSW DCCEEW under the *National Parks and Wildlife Act 1974* (SL100758, expiry date 30 June 2023). Fauna survey was conducted under approval CSB 17/892 from the NSW Animal Care and Ethics Committee (expiry date 31 January 2024).

2.2.3. Limitations

The Orchard Hills Precinct is comprised of several privately owned residential lots. Due to the number of private landowners in the Precinct and the size of the study area, organising access was complicated and extremely limited. Therefore, observations made during the field investigation were restricted to areas that could be accessed from roads and public land only (Figure 2.1 – Figure 2.7) and vegetation within a 30 metre buffer was the extent that was able to be validated. All vegetation mapped as avoided land that was not within the 30 metre buffer or could not be accessed from public roads was not able to be observed during field investigations and therefore, vegetation mapping within these areas could not be validated.

3. Results

The Orchard Hills Precinct is located approximately 48 kilometres from the Sydney CBD, where the primary land use is rural residential, and land zoning is comprised mostly of primary production, infrastructure, and rural landscape used for agriculture and primary industry production.

Regional soil landscape mapping indicates that the study area occurs on the Blacktown landscape of the Soil Landscapes of the Penrith 1:100,000 Sheet map and report (Bannerman & Hazelton 1990). The Blacktown soils landscape is characterised by gently undulating rises on Wianamatta Group shales, with broad rounded crests and ridges with gently inclined slopes. Soils are typically shallow to moderately deep texture contrast soils, with little existing erosion. The vegetation is characterised by predominantly cleared open forest and open woodland, comprised of several Eucalypt species. The composition of the soil is highly influential on the vegetation communities observed.

The Orchard Hills Precinct is highly fragmented, comprised of various remnant native communities, riparian vegetation, and exotic species.

3.1. Vegetation communities

Revised PCTs for Eastern NSW were publicly released in June 2022 by NSW DCCEEW. These PCTs will not apply to the Biodiversity Offset Scheme (BOS) until the commencement of the 'transitional period' to allow stakeholders to become familiar with the new scientific data. The transitional period commenced 23 February 2023, and as this project began before this transitional period the older 'legacy' PCTs remain current, and are the format referred to in this report. Future reporting such as any BDAR required to accompany an EIS may reference the revised PCTs. This will not have a material influence on the assessment or outcomes of future reporting and impact assessment, particularly given that the CPCP has been approved at the State and Commonwealth levels.

Various native vegetation communities have been identified in regional vegetation mapping (NPWS 2013) and in vegetation PCT mapping conducted by Biosis (Biosis 2021) to inform the CPCP (DPE 2022a). The vegetation mapped within the Orchard Hills Precinct under the CPCP (Figure 3.1 – Figure 3.2) includes:

- PCT 724 – *Broad-leaved Ironbark - Grey Box - Melaleuca decora grassy open forest on clay/gravel soils of the Cumberland Plain, Sydney Basin Bioregion.*
- PCT 725 – *Broad-leaved Ironbark - Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin Bioregion.*
- PCT 835 – *Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion.*
- PCT 849 – *Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion.*
- PCT 850 – *Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion.*
- PCT 1800 – *Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter valley.*
- Urban Native and Exotic vegetation.

Vegetation mapping provided in the CPCP includes four EPBC Act listed threatened ecological communities (TECs) and five BC Act listed TECs. The TECs mapped within the study area (Figure 3.1 – Figure 3.2) include:

- *Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion* (Endangered Ecological Community [EEC], BC Act and Critically Endangered Ecological Community [CEEC], EPBC Act).
- *Cumberland Plain Woodland in the Sydney Basin Bioregion* (CEEC, BC Act)
- *Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest* (CEEC, EPBC Act).
- *River-flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (Endangered Ecological Community [EEC], BC Act).
- *River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria* (CEEC, EPBC Act).
- *Shale Gravel Transition Forest in the Sydney Basin Bioregion* (EEC, BC Act).
- *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (EEC, BC Act).
- *Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community* (EEC, EPBC Act).

A key focus of the field investigation was to assess the vegetation mapping of the CPCP within the Orchard Hills Precinct in the context of precinct planning.

The vegetation observed within the study aligns with the vegetation communities mapped within the CPCP. Biosis confirmed the presence of all the above listed vegetation communities within a buffer of approximately 30 metres of the road corridor (shown in Figure 4) that was assessed during field investigations. The structure and floristic composition described in the NSW Bionet Vegetation Classification database (NSW DCCEEW 2024) is provided in the tables below, along with the condition and risk of Serious and Irreversible Impacts (SAII) of these communities as described in the CPCP native vegetation mapping.

Table 1 Floristic composition and description of PCT 724

PCT 724 – *Broad-leaved Ironbark - Grey Box - Melaleuca decora grassy open forest on clay/gravel soils of the Cumberland Plain, Sydney Basin Bioregion*	
PCT	724 – *Broad-leaved Ironbark - Grey Box - Melaleuca decora grassy open forest on clay/gravel soils of the Cumberland Plain, Sydney Basin Bioregion*
Vegetation class	Cumberland Dry Sclerophyll Forests
Vegetation formation	Dry Sclerophyll Forests (Shrub/grass sub-formation)
Estimate of per cent cleared	75%
Description	PCT 724 is one of two closely related ironbark forests found in western Sydney that occur on gravelly-clay soils. This community is characterised by an open Eucalypt Forest canopy, comprised of species such as Broad-leaved Ironbark *Eucalyptus fibrosa* predominantly, along with other Eucalypt species depending on the location, and taller White Feather Honeymyrtle *Melaleuca decora,* over a dense to sparse shrub cover of Native Blackthorn *Bursaria spinosa*, Gorse Bitter Pea *Daviesia ulicifolia* and Peach Heath *Lissanthe strigosa*. The groundcover is comprised of a range of grasses, herbs and sedges including species such as Weeping Grass *Microlaena stipoides,* Threeawn Speargrass *Aristida vagans,* Kangaroos Grass *Themeda triandra,* Many-flowered Mat-rush *Lomandra multiflora*, and Rock Fern *Cheilanthes sieberi* subsp. *sieberi.*

PCT 724 – *Broad-leaved Ironbark - Grey Box - Melaleuca decora grassy open forest on clay/gravel soils of the Cumberland Plain, Sydney Basin Bioregion*	
Condition	The community within the 30 m buffer that was validated during field investigations was mapped under the CPCP as in an intact and thinned condition state.
Associated soils, rainfall and landscape position	This community is associated with shale-influenced sandy soils and ironstone gravels. The soil composition can differ significantly with location, where low-lying Tertiary alluvium overlying shale soils are associated with the Bankstown area, and the northern Woronora Plateau where residual shale caps lie above bands of ironstone laterite and sandstone bedrock. This community occupies areas with a relatively low mean annual rainfall (800-900 mm).
Threatened ecological community	Commonwealth EPBC Act: *Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest* (Critically Endangered Ecological Community [CEEC], EPBC Act). NSW BC Act: *Shale Gravel Transition Forest in the Sydney Basin Bioregion* (Endangered Ecological Community [EEC], BC Act).
SAII status	N/A

Table 2 Floristic composition and description of PCT 725

PCT 725 – *Broad-leaved Ironbark – Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin Bioregion*	
PCT	725 – *Broad-leaved Ironbark – Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin Bioregion*
Vegetation class	Cumberland Dry Sclerophyll Forests
Vegetation formation	Dry Sclerophyll Forests (Shrub/grass sub-formation)
Estimate of per cent cleared	95%
Description	PCT 725 the other ironbark shrub-grass forest found in western Sydney. The most recorded canopy species within this community is Broad-leaved ironbark *Eucalyptus fibrosa,* although may be absent at some sites, and Woollybutt *Eucalyptus longifolia* which is commonly found. Canopy composition varies with subtle grades in soil, and as result, there can be localised occurrences of species uncommon in the community such as Hard-leaved scribbly gum *Eucalyptus sclerophylla*, Smooth-barked Apple *Angophora costata* and Narrow-leaved Apple *Angophora bakeri*. The understorey is comprised of a prominent small tree layer of White-feather Honeymyrtle, over a dense cover of shrubs including Prickly-leaved Paperbark *Melaleuca nodosa*, Native Blackthorn and Peach Heath. The ground layer is comprised of a sparse cover of grasses and forbs such as Wiry Panic Grass *Entolasia stricta*, Weeping Grass, Threeawn Speargrass, Rock Fern, and Many-flowered Mat-rush.
Condition	The community within the 30 m buffer that was validated during field investigations was mapped under the CPCP as in a thinned condition state.
Associated soils, rainfall and landscape position	This community is associated with clay soils derived from Tertiary alluvial deposits. This community is distributed throughout the Sydney Basing bioregion, primarily in the Sydney Cataract, Cumberland Plain and Yengo sub-bioregions.
Threatened ecological community	Commonwealth EPBC Act: *Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion* (CEEC, EPBC Act). NSW BC Act: *Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion* (EEC, BC Act).
SAII status	*Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion* is at risk of Serious and Irreversible Impacts (SAII).

Table 3 Floristic composition and description of PCT 835

PCT 835 – *Forest Red Gum – Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion*	
PCT	PCT 835 – *Forest Red Gum – Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion*
Vegetation class	Cumberland Dry Sclerophyll Forests
Vegetation formation	Dry Sclerophyll Forests (Shrub/grass sub-formation)
Estimate of per cent cleared	93%
Description	PCT 835 is an open eucalypt forest that typically occurs alongside streams and creeks within the Cumberland Plain. The canopy is typically comprised of Rough-barked Apple *Angophora floribunda,* Forest Red Gum *Eucalyptus tereticornis* and Cabbage Gum *Eucalyptus amplifolia*, over an open to sparse layer of small trees including species of paperbark and Acacias. The sparse shrubby layer commonly features species such as Native Blackthorn with a ground layer comprised of grasses, small herbs and ferns.
Condition	The community within the 30 m buffer that was validated during field investigations was mapped under the CPCP as in a thinned condition state.
Associated soils, rainfall and landscape position	This community occurs at locations with a mean annual rainfall of 750-1000 mm, on broad alluvial flats of the Hawkesbury and Nepean River systems.
Threatened ecological community	Commonwealth EPBC Act: *River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria* (CEEC, EPBC Act). NSW BC Act: *River-flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (EEC, BC Act).
SAII status	N/A

Table 4 Floristic composition and description of PCT 849

PCT 849 – *Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion*	
PCT	PCT 849 – *Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion*
Vegetation class	Coastal Valley Grassy Woodlands
Vegetation formation	Grassy Woodlands
Estimate of per cent cleared	93%
Description	Cumberland Shale Plains Woodland is an open grassy woodland with a canopy dominated by Grey Box *Eucalyptus moluccana*, Forest Red Gum *Eucalyptus tereticornis* and Thin-leaved Ironbark *Eucalyptus crebra.* The sparse to dense midstory comprises of Native Blackthorn, over a grassy groundcover of Weeping Grass, Kangaroo Grass, and Threeawn Speargrass, as well as herbs such as Kidney Weed.
Condition	The community within the 30 m buffer that was validated during field investigations was mapped under the CPCP as in a thinned condition state.
Associated soils, rainfall and landscape position	Rainfall is restricted to between 750 to 950 mm per year, and location occurs at elevations of less than 150 m above sea level. This community is associated with shale plains and a gentle topography.

PCT 849 – *Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion*	
Threatened ecological community	Commonwealth EPBC Act: *Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest* (CEEC, EPBC Act). NSW BC Act: *Cumberland Plain Woodland in the Sydney Basin Bioregion* (CEEC, BC Act).
SAII status	*Cumberland Plain Woodland in the Sydney Basin Bioregion* is at risk of Serious and Irreversible Impacts (SAII).

Table 5 Floristic composition and description of PCT 850

PCT 850 – *Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion*	
PCT	850 – Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion.
Vegetation class	Coastal Valley Grassy Woodlands
Vegetation formation	Grassy Woodlands
Estimate of per cent cleared	88%
Description	This community occurs as an open woodland, comprised of canopy species Grey Box and Forest Red Gum, with common occurrences of Narrow-leaved Ironbark. A small tree layer of Hickory wattle *Acacia implexa* occurs within this community, which helps to distinguish this community from PCT 849. An open shrub layer of Native Blackthorn and Native Raspberry *Rubus parviflorus* forms the mid storey layer, over a grassy groundcover of Weeping Grass, Purple Wiregrass *Aristida ramosa,* Kangaroo Grass and other species such Kidney Weed and Knob Sedge *Carex inversa.* The community occupies higher elevations associated with the hills and rises south from Prospect. It is most extensive in Campbelltown and Liverpool local government areas. It extends beyond the study area west across the Razorback range and once dominated the southern half of the Cumberland Plain. It is restricted to mean annual rainfall of between 750 and 900 millimetres and elevations between 50 and 350 metres above sea level (Tozer et al. 2010).
Condition	The community within the 30 m buffer that was validated during field investigations was mapped under the CPCP as in a thinned condition state.
Associated soils, rainfall and landscape position	This community typically occurs at higher elevations than PCT 849 and is associated with hills and a mean annual rainfall of 750 to 950 mm.
Threatened ecological community	Commonwealth EPBC Act: *Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest* (CEEC, EPBC Act). NSW BC Act: Cumberland Plain Woodland in the Sydney Basin Bioregion (CEEC, BC Act).
SAII status	*Cumberland Plain Woodland in the Sydney Basin Bioregion* is at risk of Serious and Irreversible Impacts (SAII).

Table 6 Floristic composition and description of PCT 1800

PCT 1800 – *Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter valley*	
PCT	1800 – *Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter valley*
Vegetation class	Coastal Floodplain Wetlands
Vegetation formation	Forested Wetlands

PCT 1800 – *Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter valley*	
Estimate of per cent cleared	60%
Description	PCT 1800 is characterised by prominent stands of Swamp Oak *Casuarina glauca,* with occurrences of Rough-barked Apple *Angophora floribunda*, Forest Red Gum and Grey Box. This community may comprise of a small tree and shrub layer of Melaleuca, Acacia and species common in the Cumberland Plain such as Native Blackthorn. The open understorey features a grassy and herbaceous species such as Weeping Grass, Bordered Panic *Entolasia marginata,* Berry Saltbush *Einadia hastata,* and Wandering Jew *Commelina cyanea,* among several others.
Condition	The community within the 30 m buffer that was validated during field investigations was mapped under the CPCP as in a thinned condition state.
Associated soils, rainfall and landscape position	This community is found on the riverflats of the Cumberland Plain, commonly found in slightly saline moist soils along waterways.
Threatened ecological community	Commonwealth EPBC Act: *Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community* (EEC, EPBC Act). NSW BC Act: *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (EEC, EPBC Act).
SAII status	N/A

3.2. Aquatic habitats

Several waterways were identified within the study area, including three major waterways intersecting the Precinct known as Blaxland Creek, Claremont Creek and an unnamed waterway (Figure 2.1 – Figure 2.7). Each of these waterways and smaller tributaries across the study area are connected to Wianamatta-South Creek, which is a 70 kilometre long creek that stretches from southwestern Sydney to its convergence with the Hawkesbury River near Windsor.

Due to access restrictions, only the watercourses that were able to be accessed from public roads were observed during the field investigations. The condition of the riparian areas around the waterways observed within the study area varied. Semi aquatic vegetation was present in some of the waterways, including species such as *Typha australis* and species of Juncus, along with structured banks and rocky terrain along the waterway. While other waterways intersected residential lots, and now occurred in an area of primarily manicured lawns and were subject to significant disturbance. Several waterways had been diverted and were no longer considered to possess the features of a natural waterway, while others had been piped and had become heavily invaded by exotic species.

An assessment of the riparian corridors in relation to the WM Act is provided in Section 3.1 of the associated Riparian Corridors Assessment Report (Biosis 2024).

3.3. Threatened entities

Background searches identified 36 threatened flora species and 67 threatened fauna species listed under the BC Act and EPBC Act recorded (DPE 2023a) or predicted to occur (Cth DCCEEW 2023) within 10 kilometres of the study area. A list of these species recorded or predicted to occur within 10 kilometres of the Orchard Hills Precinct study area is provided in Appendix A and Appendix B.

The vegetation within the study area is considered to provide marginal habitat for a range of fauna, including threatened microbats, threatened birds including large Forest Owls, as well as other species of avifauna. The study area also contained several culverts over ephemeral waterways that may provide habitat for species of threatened microbats such as Southern Myotis *Myotis macropus.* In addition, the Cumberland Plain Land Snail *Meridolum corneovirens* is endemic to the Cumberland Plain region and is typically found in Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest, present within the study area. Vegetation within the study area also provides potential habitat for EPBC Act listed species such as Swift Parrot *Lathamus discolor* (Critically Endangered, EPBC Act and BC Act), including mapped important habitat. Foraging habitat for Grey-headed Flying Fox *Pteropus poliocephalus* (Vulnerable, EPBC Act) occurs within larger patches of native vegetation occurring in areas of avoided land and riparian zones.

Vegetation within the study area is also associated with threatened flora species such as Juniper-leaved Grevillea *Grevillea juniperina* subsp. *juniperina* and Matted Bush-pea *Pultenaea pedunculata.*

No threatened species were observed during field investigations, however, desktop research indicates that several threatened species have previously been recorded within the study area (DPE 2023a). Assessment of the likelihood of occurrence of these species is provided in Appendix A (flora) and Appendix B (fauna).

3.4. Fauna utilising the study area

Orchard Hills occurs as a semi-rural landscape, comprised of smaller agricultural enterprises, large lot residential areas and borders Defence land to the south. Scattered vegetation throughout the landscape, as well as patches of remnant vegetation, particularly those adjoining the Defence land, contain habitat suitable for common fauna species. Open grassy areas adjoining Defence land are noted as being utilised by Eastern Grey Kangaroo *Macropus giganteus*. It is reasonable, given the context of the study area in the broader landscape, to assume that the population of Eastern Grey Kangaroo within the Orchard Hills precinct is not disjunct to the broader population occurring throughout eastern NSW.

Detailed information of the Eastern Grey Kangaroo occurring in the Orchard Hills area would require further investigation, with longer-term studies being required to determine the population size and movement patterns of the species. Although the species is not listed under the BC Act or EPBC Act, precinct planning has the potential to impact on resident individuals which may come into conflict with increased vehicle movement from future development. Given that the resident Eastern Grey Kangaroo population in the study area may be impacted by precinct planning and increased development, mitigation measures are recommended to protect this population are outlined in Section 9.2.

Areas mapped as avoided land under the CPCP may require fencing in accordance with the CPCP Mitigation Measures Guideline (DPE 2022c), which may limit movements of fauna in Orchard Hills Precinct. Fencing styles should be fauna friendly, where possible, to allow for connectivity between patches of retained habitat. However, where there is a potential risk of vehicle collision with ground-dwelling and arboreal fauna, fences should exclude fauna access to roads and funnel dispersal through fauna-friendly road crossings. All fence designs should be developed to suit broad fauna of concern, and to align with the CPCP.

3.5. Biodiversity values

There are several areas of mapped biodiversity values across the study area, as identified on the Biodiversity Values Map (DPE 2023b). These areas relate to:

- Biodiverse riparian land.
- Threatened species or communities with potential for serious and irreversible impacts.

Areas of mapped biodiversity values are largely present within riparian corridors proposed to be retained and CPCP mapped avoided land. If vegetation removal is proposed in areas of excluded land or certified – urban capable land, further assessment under the EPBC Act will be required, to confirm biodiversity values. The CPCP removes the need for landholders to seek their own biodiversity approvals under the BC Act and EPBC Act for development on certified - urban capable land, if they comply with the planning controls associated with the CPCP as set out in the Biodiversity and Conservation SEPP. If vegetation removal is proposed in areas of excluded land further assessment under the BC Act and EPBC Act may be required, to confirm biodiversity values and required approvals.

3.6. Priority weeds

The field investigation for this Biodiversity Conservation Assessment was conducted as a drive-by survey, where assessment of vegetation was undertaken from the road due to access restrictions. Therefore, no priority weeds for the Greater Sydney Region, which includes the Penrith LGA, were recorded. A list of potential priority weeds within the Greater Sydney Region are provided in Appendix A.2.

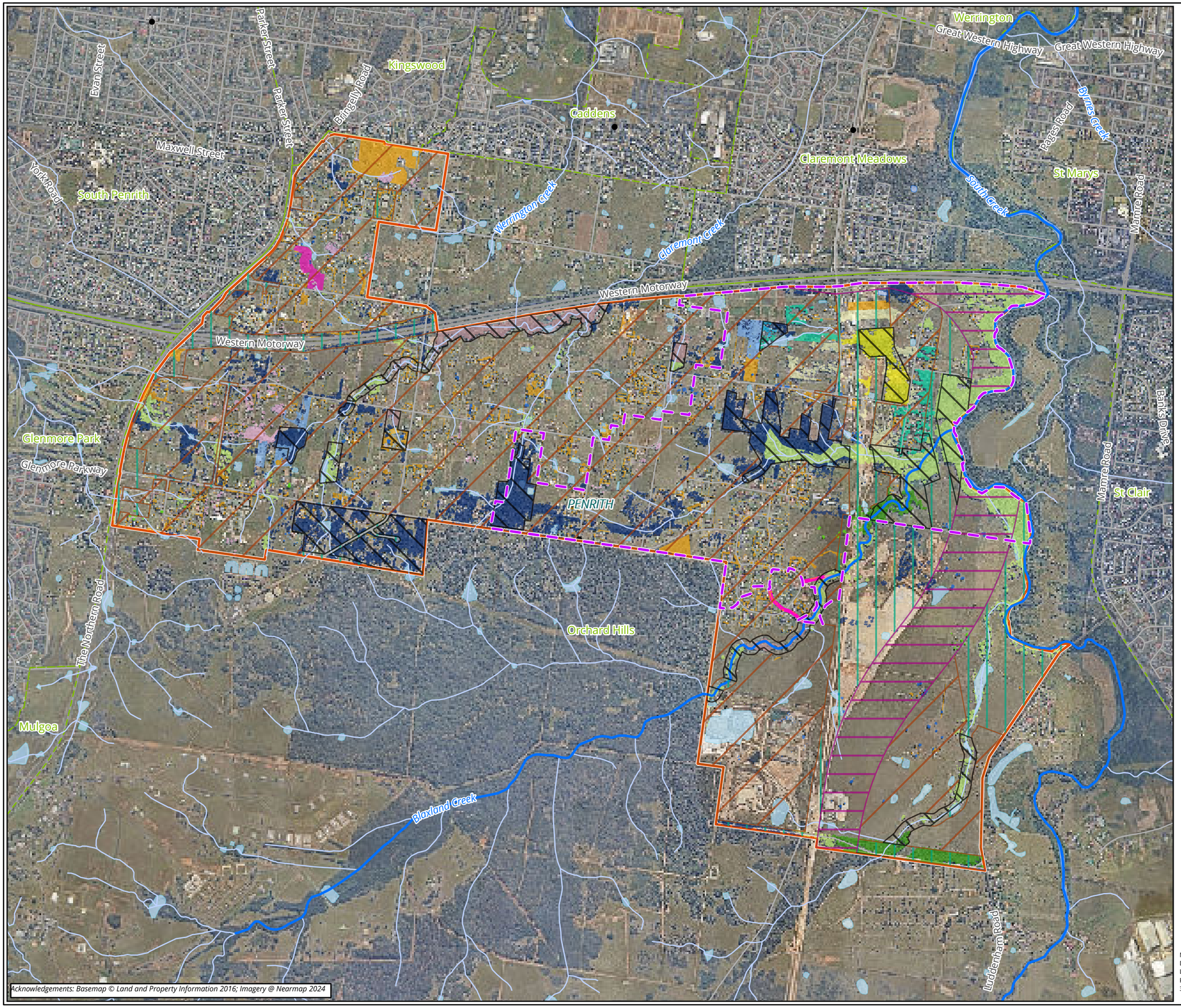
If any priority weeds for the Greater Sydney Region are encountered, they should be controlled in accordance with their relevant Biosecurity Duty (DPI 2020) under the *Biosecurity Act 2015.*

The Biosecurity Act provides for the identification, classification and control of priority weeds with the purpose of determining if a biosecurity risk is likely to occur. A priority weed is any weed identified in a local strategic plan, for a region that includes that land or area, as a weed that is or should be prevented, managed, controlled, or eradicated in the region.

The General Biosecurity Duty as outlined in the Biosecurity Act states:

> *All plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.*

To prevent biosecurity impacts from occurring due to any listed priority weeds that may occur within the study area, all practical steps should be taken to control and eradicate the weeds from the study area as per the relevant biosecurity duties, or prior to or during any future vegetation removal.



Legend

- Study area
- Stage 1 rezoning area

Land category

- Avoided land
- Certified - major transport corridor
- Certified - urban capable land
- Excluded land

Waterway

- Non perennial
- Perennial
- Waterway (Biosis 2023)
- Canal-Drain
- NaturalWatercourse

Plant community type

- Urban native / exotic
- 1800 Thinned
- 724 Intact
- 724 Scattered Trees
- 724 Thinned
- 725 Thinned
- 835 Intact
- 835 Scattered Trees
- 835 Thinned
- 849 DNG
- 849 Intact
- 849 Scattered Trees
- 849 Thinned
- 850 DNG
- 850 Scattered Trees
- 850 Thinned

Figure 2.1
Ecological features - CPCP Vegetation mapping

0 200 400 600 800

Metres

Scale: 1:23,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

N

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Matter: 37782, Date: 12 July 2024,
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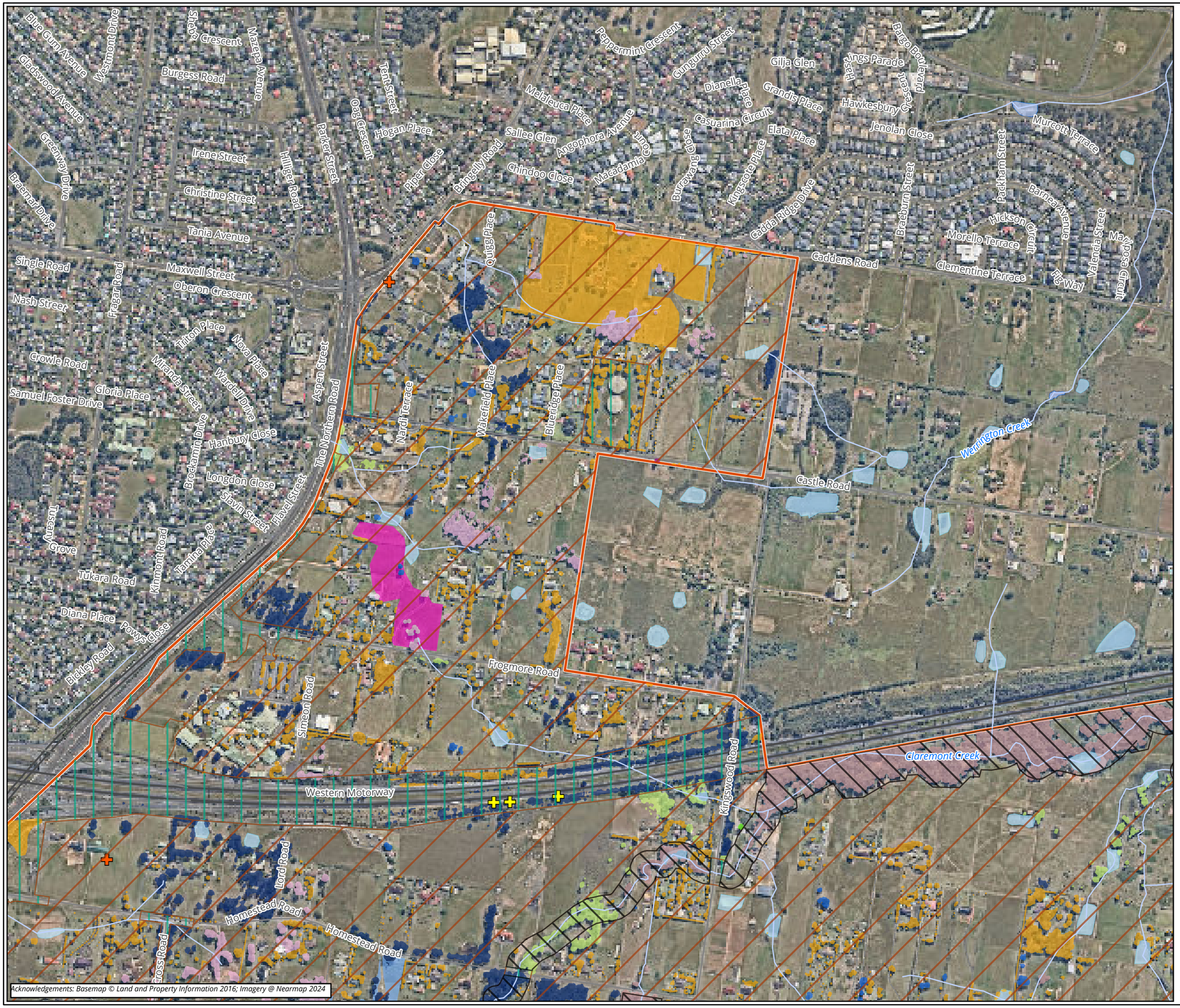

Acknowledgements: Basemap © Land and Property Information 2016; Imagery @ Nearmap 2024

Legend

Study area

Land category

- Avoided land
- Certified - urban capable land
- Excluded land

Waterway

- Non perennial
- Canal-Drain
- NaturalWatercourse

Plant community type

- Urban native / exotic
- 1800 Thinned
- 835 Scattered Trees
- 835 Thinned
- 849 DNG
- 849 Scattered Trees
- 849 Thinned
- 850 DNG
- 850 Scattered Trees
- 850 Thinned

Threatened fauna - Bionet

- Cumberland Plain Land Snail
- Grey-headed Flying-fox

Figure 2.2
Ecological features - CPCP Vegetation mapping

0 200

Metres

Scale: 1:8,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

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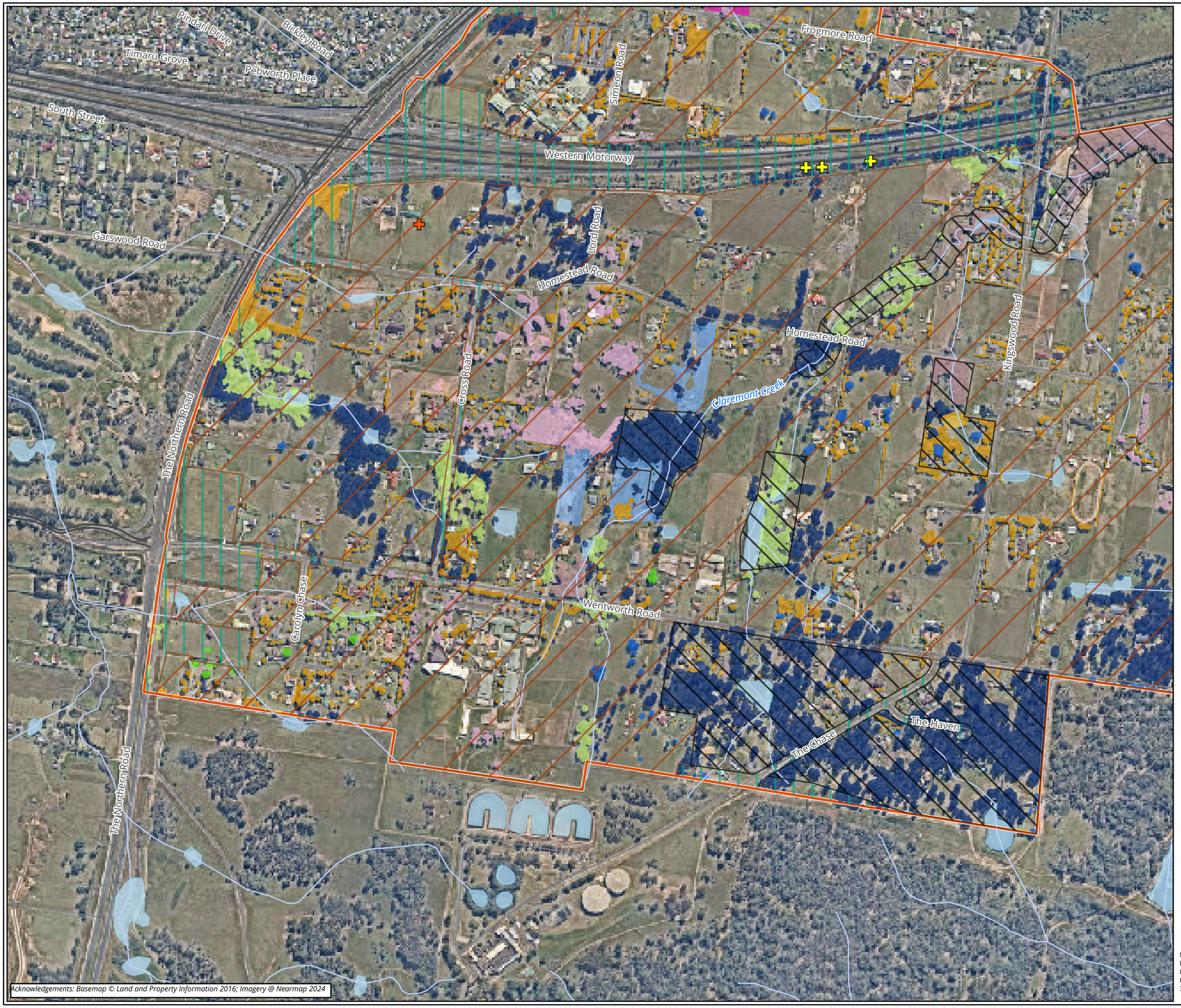

Legend

Study area

Land category

Avoided land
Certified - urban capable land
Excluded land

Waterway

Non perennial
Canal-Drain

Plant community type

Urban native / exotic
1800 Thinned
835 Scattered Trees
835 Thinned
849 DNG
849 Scattered Trees
849 Thinned
850 DNG
850 Thinned

Threatened fauna - Bionet

Cumberland Plain Land Snail
Grey-headed Flying-fox

Figure 2.3
Ecological features - CPCP
Vegetation mapping

0 200
Metres
Scale: 1:8,000 @ A3
Coordinate System: GDA2020 MGA Zone 56

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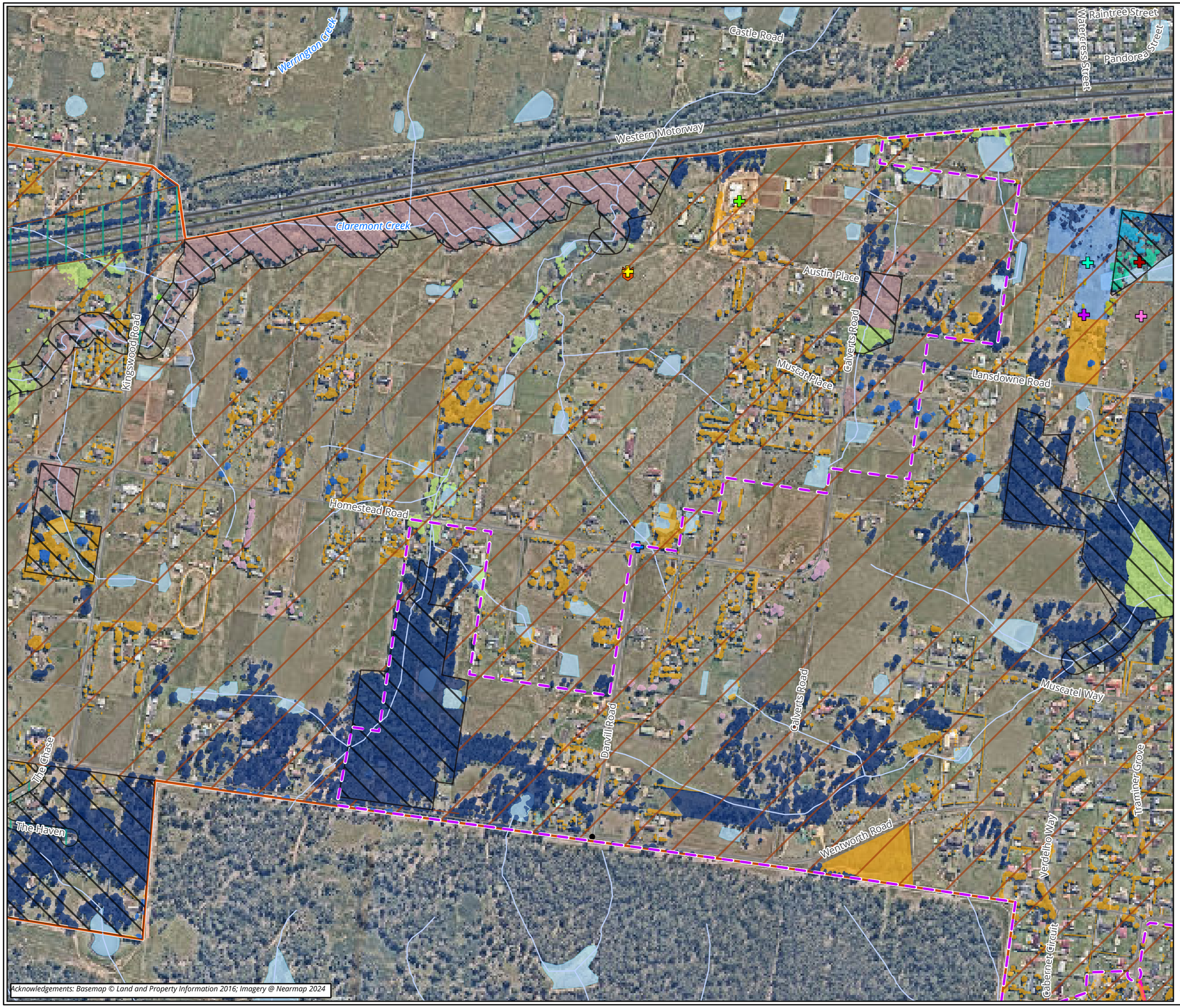

Legend

- Study area
- Stage 1 rezoning area

Land category

- Avoided land
- Certified - major transport corridor
- Certified - urban capable land
- Excluded land

Waterway

- Non perennial
- Waterway (Biosis 2023)
- Canal-Drain

Plant community type

- Urban native / exotic
- 1800 Thinned
- 724 Scattered Trees
- 725 Thinned
- 835 Scattered Trees
- 835 Thinned
- 849 DNG
- 849 Intact
- 849 Scattered Trees
- 849 Thinned
- 850 Thinned

Threatened fauna - Bionet

- Barking Owl
- Cumberland Plain Land Snail
- Greater Glider
- Green Turtle
- Large Bent-winged Bat
- Masked Owl
- Yellow-bellied Glider

Threatened flora - Bionet

- Juniper-leaved Grevillea

Figure 2.4
Ecological features - CPCP Vegetation mapping

0 200

Metres

Scale: 1:8,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

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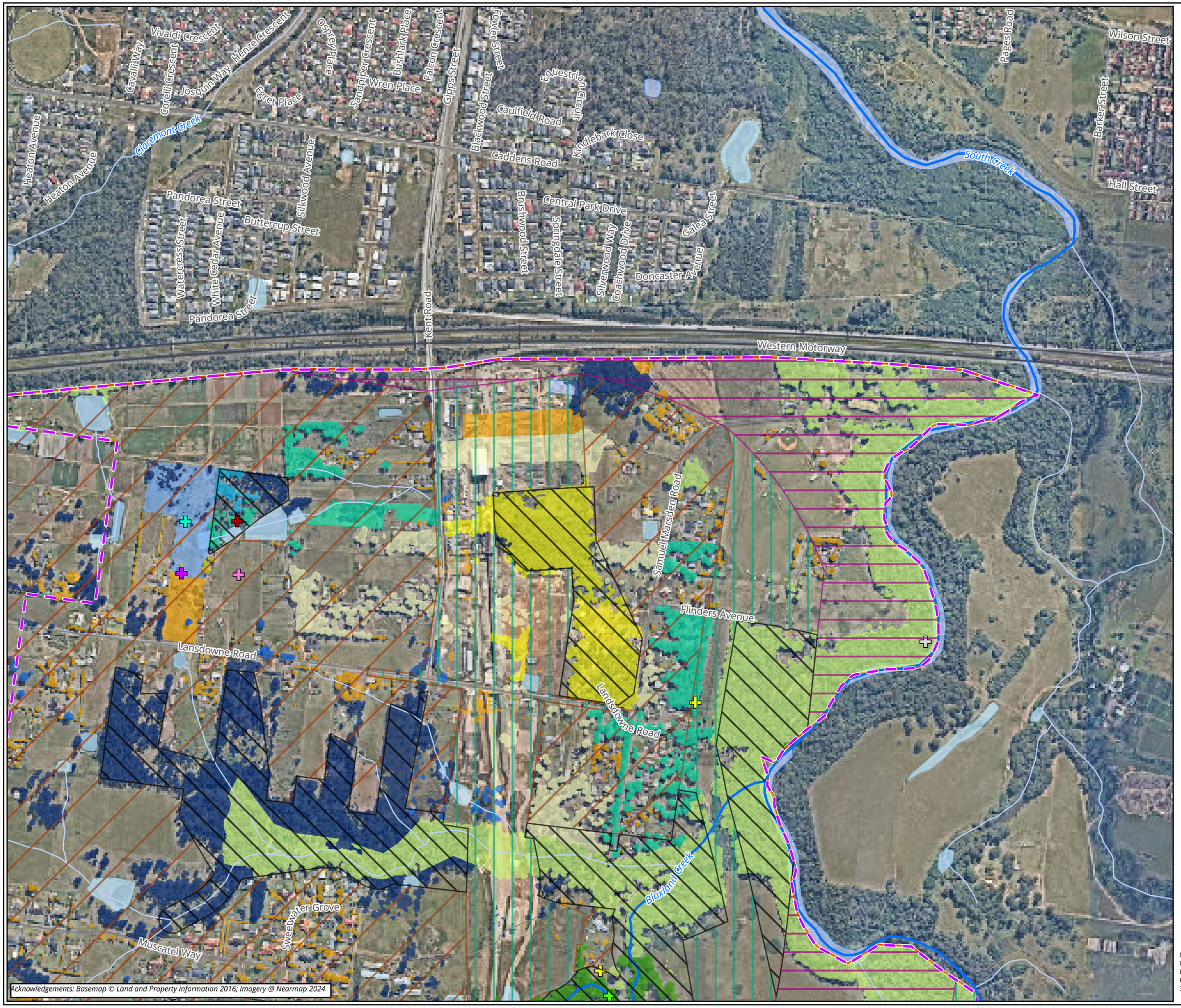

Legend

- Study area
- Stage 1 rezoning area

Land category

- Avoided land
- Certified - major transport corridor
- Certified - urban capable land
- Excluded land

Waterway

- Non perennial
- Perennial
- Canal-Drain
- NaturalWatercourse

Plant community type

- Urban native / exotic
- 1800 Thinned
- 724 Intact
- 724 Scattered Trees
- 724 Thinned
- 725 Thinned
- 835 Intact
- 835 Scattered Trees
- 835 Thinned
- 849 DNG
- 849 Intact
- 849 Scattered Trees
- 849 Thinned

Threatened fauna - Bionet

- Barking Owl
- Cumberland Plain Land Snail
- Greater Glider
- Large Bent-winged Bat
- Masked Owl
- Varied Sittella
- Yellow-bellied Glider

Figure 2.5
Ecological features - CPCP Vegetation mapping

0 200

Metres

Scale: 1:8,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

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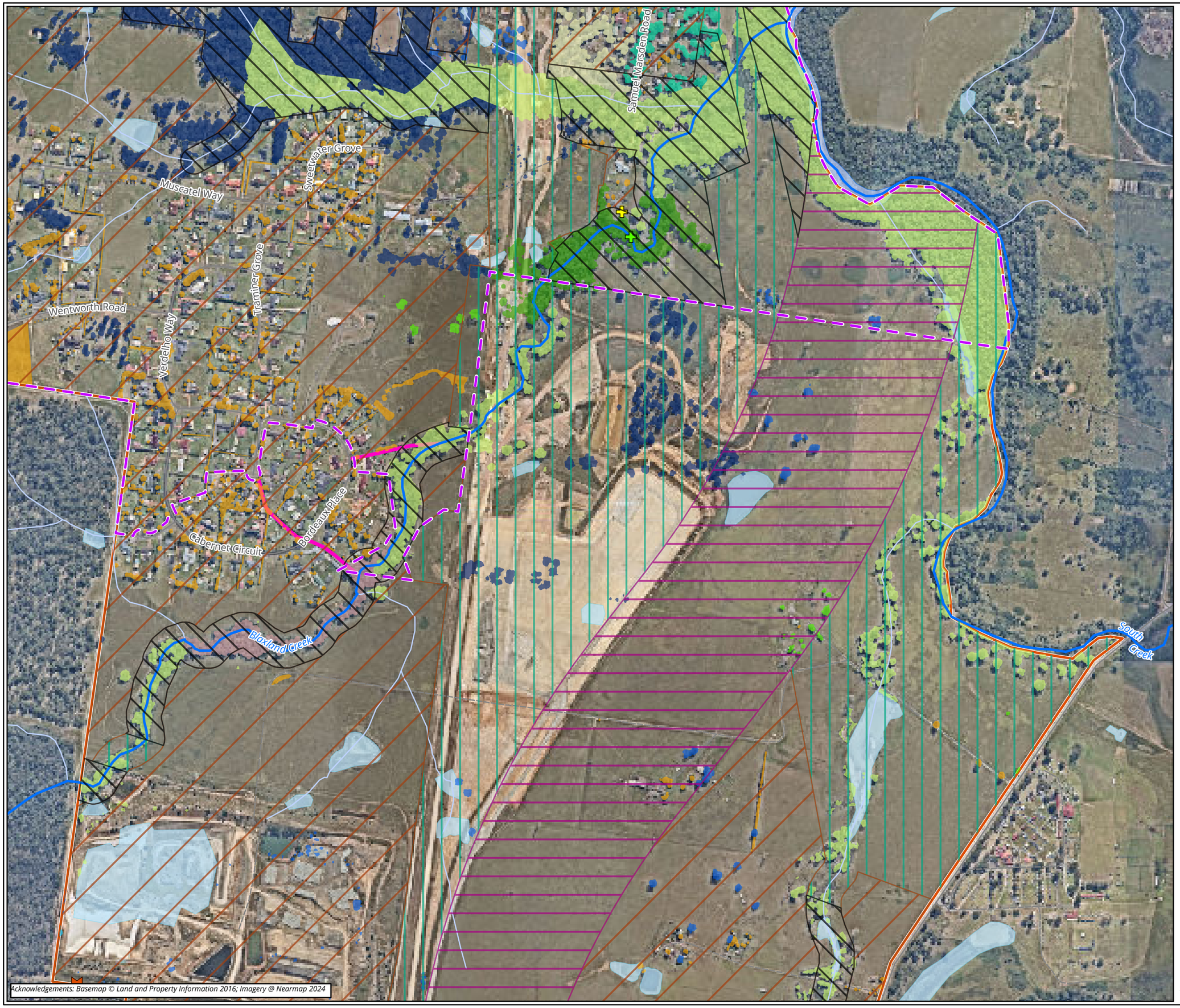

Legend

Study area

Stage 1 rezoning area

Land category

Avoided land

Certified - major transport corridor

Certified - urban capable land

Excluded land

Waterway

Non perennial

Perennial

Waterway (Biosis 2023)

Canal-Drain

NaturalWatercourse

Plant community type

Urban native / exotic

1800 Thinned

724 Thinned

725 Thinned

835 Intact

835 Scattered Trees

835 Thinned

849 Intact

849 Scattered Trees

849 Thinned

Threatened fauna - Bionet

Cumberland Plain Land Snail

Large Bent-winged Bat

Threatened flora - Bionet

Juniper-leaved Grevillea

Figure 2.6
Ecological features - CPCP
Vegetation mapping

0 200

Metres

N

Scale: 1:8,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

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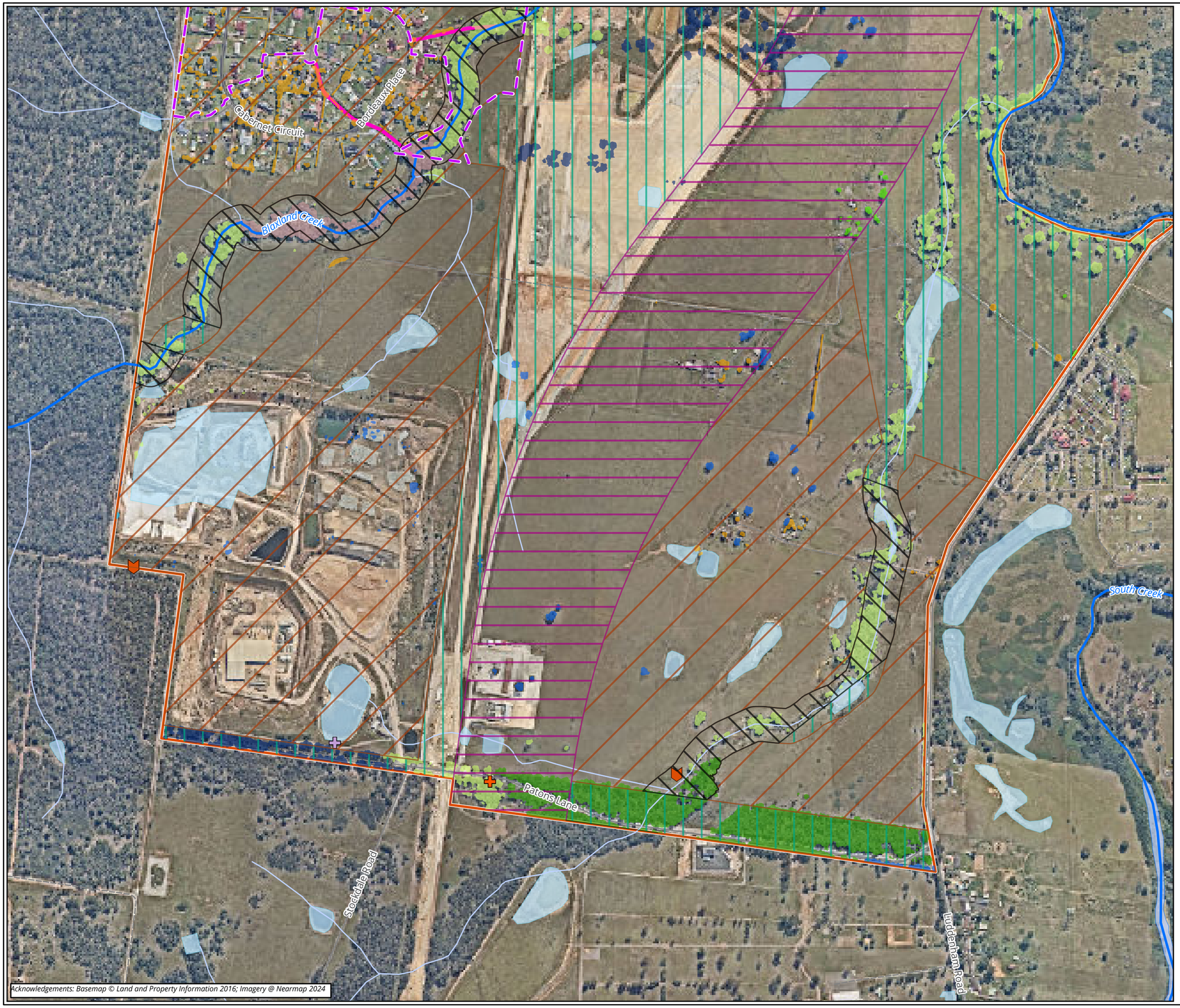

Legend

- Study area
- Stage 1 rezoning area

Land category

- Avoided land
- Certified - major transport corridor
- Certified - urban capable land
- Excluded land

Waterway

- Non perennial
- Perennial
- Waterway (Biosis 2023)
- Canal-Drain
- NaturalWatercourse

Plant community type

- Urban native / exotic
- 1800 Thinned
- 835 Intact
- 835 Scattered Trees
- 835 Thinned
- 849 Intact
- 849 Scattered Trees
- 849 Thinned

Threatened fauna - Bionet

- Eastern Freetail-bat
- Grey-headed Flying-fox

Threatened flora - Bionet

- Juniper-leaved Grevillea

Figure 2.7
Ecological features - CPCP
Vegetation mapping

0 200
Metres
Scale: 1:8,000 @ A3
Coordinate System: GDA2020 MGA Zone 56

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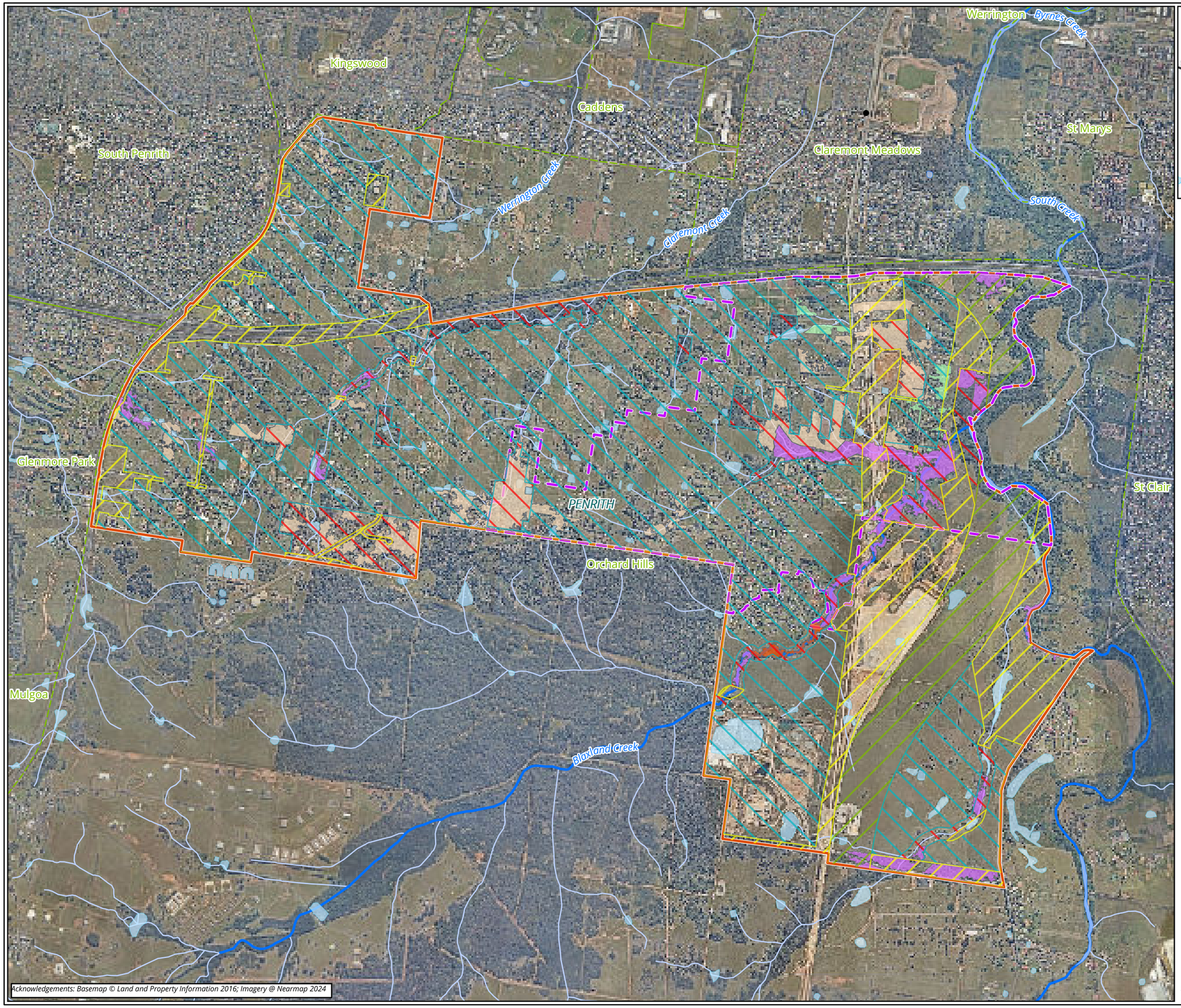

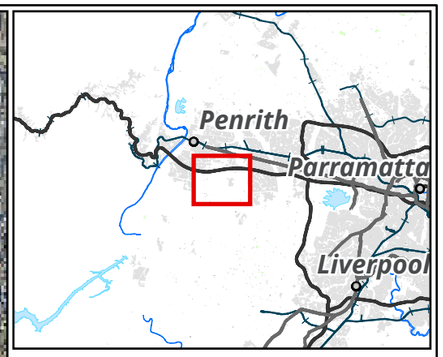

Legend

- Study area
- Stage 1 rezoning area

Land category

- Avoided land
- Certified - major transport corridor
- Certified - urban capable land
- Excluded land

EPBC Act - TEC

- Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community
- Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion
- Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest
- River-flat Eucalypt Forest

Figure 3.1
TECs within the study area - CPCP Threatened ecological community mapping - EPBC Act

0 200 400 600 800

Metres

Scale: 1:22,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

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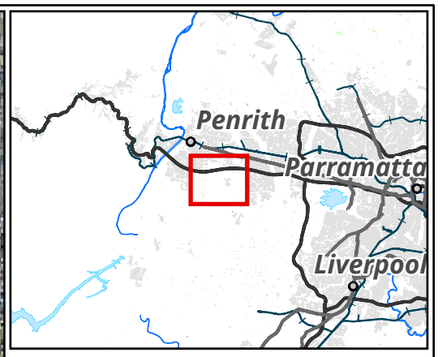

Legend

- Study area
- Stage 1 rezoning area

Land category

- Avoided land
- Certified - major transport corridor
- Certified - urban capable land
- Excluded land

BC Act - TEC

- Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion
- Cumberland Plain Woodland in the Sydney Basin Bioregion
- River-flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions
- Shale Gravel Transition Forest in the Sydney Basin Bioregion
- Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions

Figure 3.2
TECs within the study area - CPCP Threatened ecological community mapping - BC Act

0 200 400 600 800
Metres
Scale: 1:22,000 @ A3
Coordinate System: GDA2020 MGA Zone 56

N

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Acknowledgements: Basemap © Land and Property Information 2016; Imagery @ Nearmap 2024

4. Ecological impacts

Key considerations for ecological impacts include:

- Land categories defined under the Cumberland Plain Conservation Plan (CPCP), particularly
  - Mapped avoided land.
  - Mapped Strategic conservation areas.
  - Excluded land containing native vegetation.
- Matters of National Environmental Significance (MNES), listed under the EPBC Act, including:
  - TECs.
  - Threatened flora species and their habitats.
  - Threatened and migratory fauna species and their habitats.
- Rivers, creeks, lakes, wetlands, and associated riparian corridors within the study area which may provide connectivity of biodiversity values through the precinct and broader landscape, with implications for development under the WM Act.
- Native vegetation listed as a TEC under the BC Act.
- Habitat for threatened flora and fauna species listed under the BC Act and EPBC Act.

A summary of native vegetation and threatened fauna habitat currently proposed to be impacted within the study area is outlined in Table 7 and Table 8. A summary of native vegetation currently proposed to be impacted within the Stage 1 rezoning area is outlined in Table 9. No threatened fauna habitat is proposed to be impacted within the Stage 1 rezoning area.

Table 7 Summary of direct impacts to native vegetation and threatened fauna habitat within the study area

PCT	PCT name	Area within study area (ha)	
		All vegetation (BC Act and EPBC Act)	Portion of area that is listed under EPBC Act
PCT 724	*Broad-leaved Ironbark - Grey Box - Melaleuca decora grassy open forest on clay/gravel soils of the Cumberland Plain, Sydney Basin Bioregion*	17.83	15.03
PCT 725	*Broad-leaved Ironbark - Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin Bioregion*	7.91	5.42
PCT 835	*Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion*	76.49	38.72
PCT 849	*Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion*	97.42	45.22
PCT 850	*Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion*.	9.08	1.52
PCT 1800	*Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter valley*	13.84	2.00

Table 8 Summary of direct impacts to threatened fauna habitat within the study area

Species	Area within study area (ha)
Swift Parrot (mapped important area) (DPE 2023c)	25.40

Table 9 Summary of direct impacts to native vegetation and threatened fauna habitat within the Stage 1 rezoning area

PCT	PCT name	Total area within Stage 1 rezoning area (ha)		Area impacted within Stage 1 rezoning area (ha)	
		All vegetation (BC Act and EPBC Act)	Portion of area that is listed under EPBC Act	All vegetation (BC Act and EPBC Act)	Portion of area that is listed under EPBC Act
PCT 724	*Broad-leaved Ironbark - Grey Box - Melaleuca decora grassy open forest on clay/gravel soils of the Cumberland Plain, Sydney Basin Bioregion*	17.83	15.03	9.99	7.34
PCT 725	*Broad-leaved Ironbark - Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin Bioregion*	7.91	5.42	6.77	4.78
PCT 835	*Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion*	48.22	22.75	3.34	2.27
PCT 849	*Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion*	45.16	23.25	21.88	5.91
PCT 850	*Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion.*	0.41	0.00	0.20	0.00
PCT 1800	*Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter valley*	0.26	0.23	0.01	0.00

5. Assessment against key biodiversity legislation

5.1. Cumberland Plain Conservation Plan

The CPCP is a strategic conservation plan developed to support residential and infrastructure growth in the Western Parkland City area, while also identifying important areas of biodiversity value and developing strategies aimed at protecting and conserving these areas. The CPCP has been designed to implement a conservation program aimed at protecting and maintaining biodiversity, and to offset biodiversity impacts from new development in the Western Parkland City.

The CPCP has been developed to allow for strategic biodiversity certification under the BC Act and strategic assessment under the EPBC Act of four growth areas. The growth areas are:

- Greater Macarthur Growth Area
- Greater Penrith to Eastern Creek Investigation Area
- Western Sydney Aerotropolis
- Wilton Growth Area

The study area, Orchard Hills, is within the GPEC Investigation Area.

5.1.1. Land categories

The CPCP has developed land categories within its framework that describe how development within these nominated growth areas will occur (Figure 2.1 – Figure 2.7). This is based on whether high biodiversity values are present. In areas where important biodiversity values were recorded through a strategic conservation planning process, development should be avoided. The CPCP defines these areas as avoided land and includes land that is not certified for future development. These areas will be subject to development controls that will be applied via the State Environment Planning Policy (Biodiversity and Conservation) 2021 (Biodiversity and Conservation SEPP), and any development within these areas will require approval.

The CPCP also describes land suitable for future development (subject to any other approvals) within the nominated growth areas, defined as certified – urban capable land or certified – major transport corridors. Development in certified – urban capable land or certified – major transport corridors will not require further biodiversity approvals or assessment under the EPBC Act or BC Act, if development is in accordance with the CPCP. Part of the CPCP avoided land adjoining the Stage 1 rezoning area is also identified as a Strategic Conservation Area.

Excluded land is defined as land not included in the strategic biodiversity certification that forms part of the CPCP. Excluded land is generally land that has existing development approval or was using a different pathway for biodiversity approvals at the time the CPCP was developed. As such, excluded land is outside the scope of the CPCP.

The overall CPCP is supported by two sub-plans, which focus on the implementation of different parts of the CPCP. Sub-Plan A focuses on the implementation of the conservation plan (DPIE 2022a), while Sub-Plan B focuses on the protection and conservation of the Southern Sydney Koala (DPIE 2022b).

The CPCP land categories within the study area are provided in Figure 2.1 – Figure 2.7.

5.1.2. Development within CPCP land

For development on certified – urban capable land a biodiversity report or species impact statement is not required. However, a biodiversity report or species impact statement is required for development on avoided land or within the strategic conservation area.

The CPCP outlines several commitments and actions for development within the CPCP areas. A number of those relating to the precinct planning for Orchard Hills are described below.

Commitment 2:

- Avoid and minimise impacts of up to 4,510 hectares of high biodiversity value area (the avoided land) through strategic conservation planning in the nominated areas.

Commitment 2.1:

- Limit cumulative direct impacts over the life of the CPCP from essential infrastructure to the following EPBC Act-listed threatened ecological community in the avoided land:
  - *Shale Sandstone Transition Forest.*
  - *Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest.*
  - *River-flat Eucalypt Forest.*
  - *Coastal Swamp Oak (Casuarina glauca) Forest.*
  - *Cooks River Castlereagh Ironbark Forest Western Sydney Dry Rainforest and Moist Woodland on Shale.*

Given these commitments, the project should aim to conserve avoided land, particularly land containing the listed TECs. To minimise the impact of development on biodiversity values, the initial stage of rezoning responds to the CPCP by focusing proposed urban development within the CPCP certified – urban capable land. The remainder of the avoided land will be excluded from the initial rezoning process, to allow several current and proposed initiatives to be finalised. However, there may be future opportunities to include low impact passive recreation and ancillary land uses consistent with the retention and protection of biodiversity on avoided land.

There are several small sections of CPCP avoided land in the Stage 1 rezoning area that are proposed for rezoning from RU4 Primary Production Small Lots to SP2 Special Purpose, for critical new and widened roads. These areas of mapped avoided land may be subject to vegetation clearance. This rezoning is to support the establishment of the Council-delivered road network in the Stage 1 rezoning area and will be identified on the Penrith LEP land acquisition map and local contributions plan. These areas will need to be either included in a future CPCP modification or, alternatively, Council will need to assess impacts at the time of development. Areas of CPCP avoided land proposed for rezoning are shown on Figure 1 and Figure 2.1 – Figure 2.7.

The CPCP outlines five planning controls that support the implementation of biodiversity and development commitments of the Cumberland Plain Conservation Plan (the CPCP). The planning controls apply to land identified as avoided land, certified – urban capable land and land in a strategic conservation area.

The five planning controls relevant to the CPCP land are:

1. Strategic Conservation Planning Chapter of SEPP (Biodiversity and Conservation) 2021.
2. Section 9.1 Ministerial Direction (Strategic Conservation Planning).
3. Environmental Planning and Assessment Amendment (Avoided land) Regulation 2022.
4. *CPCP Guidelines for Infrastructure Development* (DPE 2022b):

- The *CPCP Guidelines for Infrastructure Development* (DPE 2022b) aim to ensure infrastructure development and activities are consistent with the CPCP's commitments and actions, and maintain outcomes consistent with the Strategic Conservation Planning 2022. They identify when and how essential infrastructure is covered by the CPCP's strategic assessment approval under Part 10 of the EPBC Act – pending Commonwealth CPCP approval.
- The guidelines also set out the requirements to avoid, minimise and mitigate impacts on biodiversity from infrastructure activities carried out under Part 5 of the EP&A Act on land identified as avoided land, strategic conservation area and certified – urban capable land.

5. CPCP Mitigation Measures Guideline (DPE 2022c):

- The Mitigation Measures Guidelines apply to Part 4 development carried out on certified – urban capable land within GPEC Investigation Area and development on certified - major transport corridors under the CPCP.

Land categorised as excluded land under the CPCP will require assessment and development approval through relevant development pathways in accordance with State (BC Act) and Commonwealth (EPBC Act) legislation.

5.2. Environment Protection and Biodiversity Conservation Act 1999 (Cth)

Any action likely to cause a significant impact to MNES require further assessment in the form of an assessment against the Significant Impact Criteria (SIC) assessment guidelines (DoE 2013) under the EPBC Act. If the SIC assessment determines that a significant impact is likely, then the project requires a referral to the Commonwealth Minister for the Environment and Energy.

MNES under the EPBC Act include the following:

- World Heritage properties.
- National Heritage places.
- Wetlands of international importance.
- Listed threatened species and ecological communities.
- Listed migratory species.

Several threatened species listed under the EPBC Act were identified as having a medium or greater likelihood of occurring within the Orchard Hills Precinct study area (see Appendix A and Appendix B). Four TECs listed under the EPBC Act have been recorded in the study area under the CPCP vegetation mapping (Figure 3.1 – Figure 3.2). The CPCP identifies areas where development may occur without further approval or assessment of impacts on biodiversity values, known as certified – urban capable land. SIC assessments may be required for the species listed under the EPBC Act with a moderate or higher likelihood of occurring within CPCP mapped avoided land, if proposed to be impacted. If development within mapped avoided land is likely to result in a significant impact on a MNES, then the development may not commence until approval of the CPCP under Commonwealth legislation is in place.

If a significant impact is deemed unlikely following a SIC assessment for the EPBC Act listed threatened entities with a moderate or higher likelihood of occurring within the study area, then development may proceed in mapped avoided land in accordance with any other environmental or planning approvals that are required.

A summary of the MNES relevant to the Orchard Hills study area are summarised in Table 10.

Table 10 Assessment of MNES within the study area against the EPBC Act

MNES	Occurrence within the study area	Assessment against EPBC Act
Threatened species	Up to 36 threatened flora species and 67 threatened fauna species have been recorded or are predicted to occur within 10 km of the study area. An assessment of the likelihood of these species occurring in the study area is provided in Appendix A (flora) and Appendix B (fauna).	Eight threatened flora and nine threatened fauna species listed under the EPBC Act were determined to have a moderate of greater likelihood of occurrence within the study area. The study area contained mapped important habitat for the Swift Parrot listed as Critically Endangered under the EPBC Act.
Threatened ecological communities	The following EPBC Act listed TECs have been recorded within the Orchard Hills study area: • *Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion.* • *Cumberland Plain Woodland in the Sydney Basin Bioregion.* • *River-flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions.* • *Shale Gravel Transition Forest in the Sydney Basin Bioregion.* • *Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community.*	As part of the CPCP vegetation mapping, several threatened ecological communities listed under the EPBC Act were identified within the study area. Following field investigations, Biosis confirmed the vegetation mapping within the CPCP and subsequently, the presence of the TECs. SIC assessments will need to be prepared for all TECs mapped within avoided land prior to any development.
Migratory species	Up to 23 migratory species have been recorded or are predicted to occur in the locality (Appendix B).	While some of these species may use the study area on occasions, it is unlikely that the study area would provide important habitat for an ecologically significant proportion of these species.
Wetlands of international importance (Ramsar wetlands)	There are 12 Ramsar sites in NSW, the closest one being Towra Point Nature Reserve in Kurnell, south of Sydney city.	The study area is approximately 70 km northwest of this Ramsar site, and therefore will not result in a significant impact.

5.2.1. Key Threatening Processes

There are currently 39 Key Threatening Processes (KTPs) listed under the BC Act, 21 KTPs under the EPBC Act, and eight listed under the FM Act. Several KTPs are listed under more than one Act. KTPs relevant to the project are discussed in Table 11. Mitigation measures to limit the impacts of these KTPs are detailed in Section 7.

Table 11 KTPs potentially introduced or impacted by the proposed modification

Key threatening process	Status	Proposed impacts
Native vegetation and terrestrial habitat impacts		
Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners *Manorina melanocephala* (Latham, 1802)	EPBC Act BC Act	The project is not likely to increase the effect of this KTP within the study area due to the already fragmented nature of the landscape. Habitat modifications that would preferentially favour this species should be avoided where possible.
Bushrock removal	BC Act	The study area is unlikely to support bushrock and therefore this KTP would not likely be increased by the project. Mitigation measures are outlined in Section 7 to limit the potential for impacts as a result of this KTP.
Land clearance/Clearing of native vegetation	EPBC Act BC Act	Clearing of native vegetation would likely occur as a result of the project. Mitigation measures are outlined in Section 7 to limit the potential for impacts as a result of this KTP.
Loss or degradation (or both) of sites used for hill-topping by butterflies	BC Act	There is unlikely to be impacts to potential hill-topping sites, as the study area has already been subject to extensive development in the past. Topographical changes that would result in loss or degradation of hill-topping sites are unlikely.
Loss of hollow-bearing trees	BC Act	Clearing of native vegetation would likely occur as a result of the project, which may include hollow-bearing trees. An assessment of the presence of hollow-bearing trees may be required to assess the impact of the project on this KTP. Mitigation measures are outlined in Section 7 to limit the potential for impacts as a result of this KTP.
Removal of dead wood and dead trees	BC Act	Vegetation to be removed may contain dead wood. Mitigation measures are outlined in Section 7 to limit the potential for impacts as a result of this KTP.
Biosecurity impacts		
Competition and grazing by the feral European Rabbit *Oryctolagus cuniculus*	EPBC Act BC Act	The project may lead to increased competition and grazing pressures exhibited by European Rabbit due to the decrease in native vegetation available for foraging habitat for native species. Mitigation measures are outlined in Section 7 to limit the potential for impacts as a result of this KTP.
Competition and habitat degradation by Feral Goats *Capra hircus*	EPBC Act BC Act	The project is unlikely to result in a significant increase of this KTP due to the urban land use surrounding the study area.
Competition from feral Honey Bees *Apis mellifera*	BC Act	The project is unlikely to cause a significant increase in competition from feral Honey Bees.
Forest eucalypt dieback associated with over-abundant psyllids and Bell Miners *Manorina melanophrys*	BC Act	The project is unlikely to result in a significant increase in psyllid and Bell Miner activity that would result in this KTP.
Habitat degradation and loss by Feral Horses (brumbies, wild horses) *Equus caballus*	BC Act	The project is unlikely to result in a significant increase of this KTP due to the urban land use surrounding the study area.
Herbivory and environmental degradation caused by feral deer	BC Act	The project is unlikely to result in a significant increase of this KTP due to the urban land use surrounding the study area.

Key threatening process	Status	Proposed impacts
Infection by Psittacine Circoviral (beak and feather) disease affecting endangered psittacine species and populations	EPBC Act BC Act	The project is unlikely to result in a significant increase of this KTP.
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis	EPBC Act BC Act	Construction work has the potential to introduce amphibian chytrid to the study area, which could lead to death of frogs and tadpoles. Mitigation measures are outlined in Section 7 to limit the potential for impacts as a result of this KTP.
Infection of native plants by *Phytophthora cinnamomi*	EPBC Act BC Act	Increased human visitation and movement as well as increased vehicle traffic around the study area has the potential to introduce or spread the pathogen *Phytophthora cinnamomi*. Mitigation measures are outlined in Section 7 to limit the potential for impacts as a result of this KTP.
Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae	BC Act	Increased human visitation and movement as well as increased vehicle traffic around the study area has the potential to introduce or spread pathogens. Mitigation measures are outlined in Section 7 to limit the potential for impacts as a result of this KTP.
Invasion and establishment of exotic vines and scramblers	BC Act	Vegetation within the study area has the potential to be invaded by exotic vines and scramblers. Vehicles and plant have the potential to introduce propagules of exotic vines and scramblers, as could soil disturbance during construction work. Mitigation measures are outlined in Section 7 to limit the potential for impacts as a result of this KTP.
Invasion and establishment of Scotch Broom *Cytisus scoparius*	BC Act	The project is unlikely to result in a significant increase of this KTP. Biosecurity measures outlined in Section 7 would ensure this does not occur.
Invasion and establishment of the Cane Toad	EPBC Act BC Act	The KTP is not relevant to the project.
Invasion, establishment and spread of Lantana	BC Act	Lantana is already prevalent within urban vegetation. This KTP is likely to be exacerbated on-site without the implementation of weed management. Biosecurity measures to mitigate the establishment and spread of weed species are made in Section 7.
Invasion of native plant communities by African Olive *Olea europaea* subsp. *cuspidata*	BC Act	The project is unlikely to result in a significant increase of this KTP.
Invasion of native plant communities by *Chrysanthemoides monilifera*	BC Act	The project is unlikely to result in a significant increase of this KTP. Biosecurity measures in Section 7 would help mitigate this KTP.

Key threatening process	Status	Proposed impacts
Invasion of native plant communities by exotic perennial grasses	BC Act	Parts of the study area have likely been subject to previous disturbances (including existing road corridors, industrial work, and residential housing), as a result there are likely exotic weed species already present in the study area. Weeds may also be introduced due to an increase in edge areas as part of construction. Vehicles and plant could further spread exotic grass species, as could soil disturbance during vegetation clearing and construction. There is also the potential for perennial exotic grasses to invade retained and nearby native vegetation through proposed modification work. Mitigation measures are outlined in Section 7 to limit the potential for impacts as a result of this KTP.
Invasion of the Yellow Crazy Ant	BC Act	The KTP is not relevant to the project.
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants	EPBC Act BC Act	The project may result in an increase in the effect of this KTP. Mitigation measures are outlined in Section 7 to limit the potential for impacts as a result of this KTP.
Predation and hybridisation by Feral Dogs *Canis lupus familiaris*	BC Act	The project may lead to an increase in the incidence of this species by providing an increase in access routes through the study area, but any increase is not expected to be significant relative to current levels.
Predation by European Red Fox	EPBC Act BC Act	The project may lead to an increase in the incidence of this species by providing an increase in access routes through the study area, but any increase is not expected to be significant relative to current levels.
Predation by the Feral Cat *Felis catus*	EPBC Act BC Act	The project may lead to an increase in the incidence of this species by providing an increase in access routes through the study area, but any increase is not expected to be significant relative to current levels.
Predation, habitat degradation, competition and disease transmission by Feral Pigs *Sus scrofa*	EPBC Act BC Act	The project is unlikely to result in a significant increase of this KTP due to the urban land use surrounding the study area.
Aquatic impacts		
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands	BC Act	There are several waterways within the study area, however exacerbation of this KTP will be prevented by maintaining riparian corridors and incorporating appropriate stormwater management (DesignFlow 2023, Rhelm 2023). Mitigation measures are outlined in Section 7 to limit the potential for impacts as a result of this KTP.
Degradation of native riparian vegetation along New South Wales water courses	FM Act	There are several waterways within the study area. Mitigation measures are outlined in Section 7 to limit the potential for impacts as a result of this KTP.
Installation and operation of instream structure and other mechanisms that alter natural flow regimes of rivers and streams	FM Act	There are several waterways within the study area. Mitigation measures are outlined in Section 7 to limit the potential for impacts as a result of this KTP.
Introduction of fish to waters within a river catchment outside their natural range	FM Act	There are several waterways within the study area, however it is unlikely that this KTP will be exacerbated by the project.

Key threatening process	Status	Proposed impacts
Predation by *Gambusia holbrooki*	BC Act	Construction and vegetation clearing adjacent to waterways both have the potential to introduce and/or spread Eastern Gambusia between waterways, however it is unlikely that this KTP will be exacerbated by the project due to the retention of riparian vegetation.
Removal of large woody debris from New South Wales rivers and streams	FM Act	There are several waterways within the study area. Mitigation measures are outlined in Section 7 to limit the potential for impacts as a result of this KTP.
Anthropogenic impacts		
Anthropogenic Climate Change	EPBC Act BC Act FM Act	The project would be constructed utilising primarily diesel-powered machinery and plant. While all machinery would be operated and maintained in good operational working order to reduce emission, construction would result in the emission of greenhouse gases and would therefore contribute to climate change.
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition	BC Act	The project is unlikely to result in a significant increase of this KTP.

5.3. NSW Environmental Planning and Assessment Act 1979

Tests of Significance (ToS) assessments for threatened species listed under the BC Act are not required for development in areas identified as certified – urban capable land under the CPCP.

ToS may be required for the species listed under the BC Act with a moderate or higher likelihood of occurring within CPCP mapped avoided land, if proposed to be impacted. If development within mapped avoided land is likely to result in a significant impact on a threatened entity, then the development may not commence until approval of the CPCP under the state legislation is in place.

If a significant impact is deemed unlikely following a ToS for the BC Act listed threatened entities with a moderate or higher likelihood of occurring within the study area, then development may proceed in mapped avoided land in accordance with any other environmental or planning approvals that are required.

5.4. NSW Biodiversity Conservation Act 2016

Several threatened entities, including species of flora, fauna and TECs listed under the BC Act were identified as having a medium or greater likelihood of occurring within the Orchard Hills Precinct study area (see Appendix A and Appendix B). Typically, further assessment to evaluate the significance of impacts would be required for each of these entities in the form of a ToS in accordance with the BC Act. However, the study area is mapped within the CPCP, which has been developed to meet the requirements for biodiversity certification under the BC Act. The CPCP identifies areas that are suitable for development, known as urban capable areas, and any development within these nominated areas does not require additional approval. Therefore, further assessment of impacts to these entities is not required.

5.4.1. Key Threatening Processes

KTPs listed under the BC Act are addressed in Section 5.2.1 above.

5.5. State Environmental Planning Policies

5.5.1. Biodiversity and Conservation SEPP 2021

Chapter 2: Vegetation in non-rural areas

This chapter aims to protect the biodiversity values of trees and other vegetation in non-rural areas of NSW and to preserve the amenity of non-rural areas through the preservation of trees and other vegetation by ensuring that the BOS will apply to all clearing of native vegetation that exceeds the offset thresholds in urban areas and environmental conservation zones that do not require development consent.

This chapter applies to land zoned in the Penrith LGA as defined in Clause 2.3. Under this chapter, consent is required for clearance of vegetation within land zones and LGAs to which this chapters applies. This chapter does not apply to CPCP certified – urban capable land.

Chapter 3: Koala Habitat Protection 2020

This chapter applies to land zoned RU1, RU2 or RU3. The Orchard Hills Precinct study area comprised predominantly of land zoned RU4 under the *Penrith LEP 2010,* however, a portion of the Orchard Hills Precinct study area occurs on land zoned as RU2, therefore these areas will be subject to requirements laid out by this chapter.
Under part 3.2 of this Chapter, it must first be determined if the land is potential koala habitat. If the area is identified as potential Koala habitat, then it must be assessed if whether the area represents core Koala habitat.

Core Koala habitat means:

> *An area of land which has been assessed by a suitably qualified and experienced person as being highly suitable koala habitat and where koalas are recorded as being present at the time of assessment of the land as highly suitable koala habitat, or*
>
> *An area of land which has been assessed by a suitably qualified and experienced person as being highly suitable koala habitat and where koalas have been recorded as being present in the previous 18 years.*

Under Part 3.8, if the land represents core Koala habitat, then a plan of management must be prepared that applies to the land in accordance with Part 3.

Chapter 4: Koala Habitat Protection 2021

Chapter 4 Koala Habitat Protection aims to encourage the conservation and management of areas of natural vegetation that provide habitat for koalas to support a permanent free-living population over their present range and reverse the current trend of koala population decline.

The study area is located within the Penrith Council (Council) LGA. Penrith Council is not listed under Schedule 2, Chapter 4 of SEPP, and therefore is not subject to the requirements laid out by the policy. This chapter does not apply to CPCP certified – urban capable land.

Chapter 13: Strategic conservation planning

This chapter aims to facilitate appropriate development on biodiversity certified land. It requires asset protection zones (APZ) (associated vegetation clearance) to be wholly located on certified – urban capable land and the approved mitigation measure be complied with. As the study area is located on land mapped

under the CPCP, the land has been strategically biodiversity certified under Part 8.1 of the BC Act, available to planning authorities. Therefore, the study area is subject to the requirements laid out by this Chapter.

Under this Chapter, development consent must not be granted on land mapped as avoided land, unless the consent authority has considered whether the development is likely to have an adverse impact on the following:

- Threatened species and their habitats, and TECs, within the impact area and on adjoining avoided land.
- Habitat connectivity and fauna movement, including koala and wildlife corridors within the impact area and on adjoining avoided land.
- The integrity and resilience of the biophysical, ecological and hydrological environments, including surface and groundwater, and the quality of the natural flow of water in a riparian corridor.
- Any MNES set out in the EPBC Act of the Commonwealth, Chapter 2, Part 3, Division 1.

In addition, development consent must not be granted on land mapped as certified - urban capable land for the following:

- If development involves an asset protection zone (APZ), development consent must not be granted unless the APZ is located wholly within certified – urban capable land.
- Development consent must not be granted unless the consent authority has considered whether the development is consistent with the *Cumberland Plain Conservation Plan Mitigation Measures Guideline.*

Precinct planning should take these development controls into consideration to inform the broader location of residential, retail, open space and infrastructure, and associated developable land yields.

5.5.2. Resilience and Hazards SEPP 2021

The Resilience and Hazards SEPP commenced in March 21 and consolidates three existing SEPPs into Chapters. The new Resilience and Hazards SEPP includes provisions previously included in the now repealed Coastal Management SEPP 2018, as well as the Hazard and Offensive Development SEPP and the Remediation of Land SEPP. No coastal management areas identified under the new SEPP are present within the study area.

5.6. Fisheries Management Act 1994

The purpose of the FM Act is to conserve fishery resources in NSW, and to develop and share such resources for the benefit of everyone, including present and future generations. One of the main objectives of the FM Act is to conserve 'Key Fish Habitats' (KFH). Vegetation removal is proposed within some riparian areas for consideration under the FM Act.

5.6.1. Key Fish Habitat

To protect and conserve these resources, DPI have defined KFH (DPI 2024) as:

> *Those aquatic habitats that are important to the sustainability of the recreational and commercial fishing industries, the maintenance of fish populations generally, and the survival and recovery of threatened aquatic species.*

Any activities that may cause harm to KFH must be referred to the NSW DPI, and if a significant adverse impact is likely, DPI will advise the consent authority and approval will likely not be granted for the proposed

works. Any works that may harm marine vegetation, obstruct fish passage, involve dredging or reclamation, or cultivation of fish or marine vegetation for commercial purposes will require a permit under the FM Act.

Four watercourses within the Orchard Hills Precinct are mapped as KFH, Werrington Creek, Claremont Creek, Blaxland Creek, and one undefined waterway, as well as an additional waterway, South Creek, which borders the Precinct. Due to access restrictions, these waterways could only be observed where the waterway was intersected by public roads or could be accessed via public roads.

An assessment of KFH in accordance with the *NSW Policy and Guidelines for Fish Habitat Conservation and Management* (Fairfull 2013) is provided in Section 3.2 of the associated Riparian Corridors Assessment report (Biosis 2024).

5.7. Water Management Act 2000

Impacts to riparian zones are also protected under the WM Act, guided by the *Guidelines for controlled activity on waterfront land – Riparian corridors* (DPE 2022d). Works within 40 metres of the top bank of mapped watercourses (NSW Spatial Services 1:25,000 Digital Topographic Database) require a vegetation riparian zone (VRZ) to be preserved within the riparian corridor. The VRZ buffer is measured from top of bank and includes the vegetation on both sides of the watercourse. The size of the VRZ buffer is based on the watercourse Strahler order. The buffers required are as follows:

- Strahler order one – 10 m buffer (each side).
- Strahler order two – 20 m buffer (each side).
- Strahler order three – 30 m buffer (each side).
- Strahler order four and greater – 40 m buffer (each side).

If any development occurs inside the riparian corridor as identified in relation to the WM Act, a Controlled Activity Approval under s91 of the WM Act is required. An assessment of the VRZ buffer for waterways within the study area is provided within Section 3.1 of the Riparian Corridors Assessment report (Biosis 2024).

Due to access restrictions, several waterways could not be observed during field investigations. Therefore, it is recommended that a detailed riparian assessment be conducted within the Orchard Hills Precinct study area (refer to Section 5 of the associated Riparian Corridors Assessment report (Biosis 2024)).

5.8. Penrith Development Control Plan 2014

5.8.1. Development Consent

Under Section 2.2 of the DCP, controls for development consent are outlined for biodiversity corridors and areas of remnant vegetation. This section of the DCP aims to reinforce development controls for biodiversity corridors and areas of remnant native vegetation outlined in the Penrith LEP. Development consent is required for several activities in areas mapped as Natural Resources Sensitive Land on the Natural Resources Sensitivity Land Map, under the clause outlined in Part 7.3 of the Penrith LEP. Development consent is required for the following development and activities:

- Subdivision.
- Earthworks.

- The carrying out of work.
- Clearing of vegetation in preparation of development.
- Irrigation with treated effluent.

5.8.2. Protecting and Enhancing Biodiversity Corridors and Areas of Remnant Native vegetation

Under Section 2.2.4 of the DCP, no native vegetation clearance should occur in biodiversity corridors or areas containing remnant native vegetation. Measures must be taken to avoid fragmentation of vegetation by roads, tracks, services, and other forms of development. Where possible, the DCP recommends that:

- Natural regeneration is the preferred method of rehabilitation following disturbance to biodiversity corridors and areas of remnant native vegetation. If regeneration is unlikely, locally native species must be used for revegetation and restoration.
- It is recommended that native revegetation occurs in areas connected to isolated patches of vegetation to enhance the network of biodiversity corridors, where possible.
- All weed species should be removed from site and disposed of appropriately to avoid spread of reproductive material.
- Development within or near these areas should be designed to minimise adverse impacts on native vegetation and habitat, where possible.
- Development and any associated fire protection zones must be positioned within existing cleared land and not within biodiversity corridors and areas of remnant native vegetation, where possible.

5.8.3. Erosion and Sedimentation

All applications for subdivision and development that involve disturbance to soil and substrate must be accompanied by an Erosion and Sediment Control Plan (ESCP), unless the development involves:

- The construction of minor structures such as carports, pergolas, verandas, garden sheds, etc..
- Additions and/or alterations to existing dwellings where Council is satisfied that it will not likely cause erosion and sediment loss from the site.

5.9. Penrith Local Environmental Plan 2010

Under the Penrith LEP, local provisions are outlined for several areas within the Penrith LGA. Part 7.20 of the Penrith LEP outlines development controls for area identified as Orchard Hills. Under this part, prior to granting development consent within Orchard Hills and adjacent to or immediately opposite the M4 Motorway or The Northern Road, the consent authority must be satisfied that the following will be carried out:

- The external facade of any habitable room would not be exposed to an 18 hour traffic noise level exceeding 63 dBA.
- Appropriate noise attenuation measures have been or will be carried out that will reduce the internal noise level to meet AS 3671—1989 in accordance with *Acoustics—Road traffic noise intrusion—Building siting and construction.*
- In addition, development consent must not be granted for a building within Orchard Hills subject to flooding or in a watercourse unless the consent authority is satisfied that:

  - No practical alternative location exists for the proposed building.
  - The building is not likely to be threatened by flood flow.
  - The construction location or use of the building will not divert flood flows or adversely affect drainage flows.
  - The construction location will not cause soil erosion.
- Following the repeal of Chapter 6 (Bushland in Urban Areas) of the Biodiversity and Conservation SEPP 2021, the protection of public bushland within the Greater Sydney region is now addressed in the LEPs.

Under Part 5.23 of the Penrith LEP, development consent is required for any development that will disturb, or likely disturb, public bushland, unless the development is for the following purposes:

- The construction, operation or maintenance of pipelines to carry water, sewerage or gas or pipelines licensed under the *Pipelines Act 1967*.
- The construction, operation or maintenance of electricity or telecommunication lines.
- Bush fire hazard reduction.
- The construction or maintenance of classified road.
- Facilitating the recreational use of the public bushland.
- Development listed above is permitted without consent only if the development is carried out in accordance with a plan of management for public bushland, adopted by the Council in the same way a plan of management is required to be adopted for community land under the *Local Government Act 1993.* This includes provisions for the following:
  - The recreational use of the land.
  - Bush fire hazard reduction.
  - The prevention of degradation, including the alteration of drainage patterns, rubbish dumping, vehicle intrusion and infestation with weeds or non-native plants.
  - The remediation of degraded public bushland.
- Under this part, if the purpose of the development is not listed above, development consent is required. Development consent cannot be granted unless the consent authority is satisfied that:
  - The disturbance of the bushland is essential for a purpose in the public interest.
  - There is no reasonable alternative to the disturbance.
  - The development minimises the amount of bushland to be disturbed,
  - The development includes measures to remediate the disturbed bushland.
  - Development consent is not required for clearing native vegetation that is authorised under the *Local Land Services Act 2013.*

5.10. Potential stormwater impacts to biodiversity values

Urbanisation is known to increase the volume of stormwater runoff due to the replacement of vegetated ground with impervious materials associated with urban infrastructure (ARMCANZ 2000). The project is likely to increase stormwater runoff and discharge in the Orchard Hills Stage 1 area due to the increase in impervious surface areas including roads, pavements and roofs, which will prevent the natural absorption of water through soils and vegetated areas. Increased stormwater flows can result in a number of impacts to biodiversity values, including:

- Increased erosion.
- Increased spread of exotic weeds or pest species.

- Water inundation or depletion of soil and native plant communities (depending on if water is diverted away from an area or increased flow is discharged into an area).
- Release of pollutants, nutrients (e.g., phosphorus) and unpredictable mixtures of chemicals.
- Increased water flows in waterways.
- Increased sedimentation.

The increased stormwater flows in the Orchard Hills Stage 1 area have the potential to cause impacts to native vegetation and TECs. Impacts associated with the increased stormwater runoff include changes in hydrological regimes, increased spread of exotic weeds and pest species, and increased levels of pollutants and nutrients. Each TEC will be impacted differently by stormwater runoff due to their varying dependency on groundwater and waterways for survival and growth. Certain PCTs are associated with Groundwater Dependent Ecosystems (GDEs), which are environments that depend on groundwater to survive, and GDEs are highly sensitive to changes to their hydrological regime. Table 12 summarises the potential stormwater impacts on the PCTs and TECs within the study area, based on the relevant Conservation Advice and their GDE probabilities (as detailed in DPE Water (2022)).

Table 12 Potential stormwater impacts on PCTs and TECs within the study area

PCTs	TECs	GDE association (DPE Water 2022)	Potential stormwater impacts
724	*Shale Gravel Transition Forest in the Sydney Basin Bioregion* and *Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest*	Yes: • High probability GDE: – 4.92 ha within study area. – Not within Stage 1 rezoning area. • Medium probability GDE: – 5.09 ha within study area. – Not within Stage 1 rezoning area. • Low probability GDE: – 152.73 ha within study area. – 0.02 ha within Stage 1 rezoning area.	• Increased erosion. • High nutrient loads in runoff, high levels of inorganic nitrogen and phosphorus in stormwater runoff are a particular threat to this TEC as it favours the growth of exotic species. • Increased weed invasion.
725	*Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion*	Yes: • High probability GDE: – 2.31 ha within study area. – Not within Stage 1 rezoning area. • Medium probability GDE: – 3.08 ha within study area. – Not within Stage 1 rezoning area. • Low probability GDE: – 58.45 ha within study area. – 0.01 ha within Stage 1 rezoning area.	• Increased erosion. • High nutrient and sediment loads in runoff, high levels of phosphorus in stormwater runoff is a particular threat to this TEC. • Increased weed invasion.

PCTs	TECs	GDE association (DPE Water 2022)	Potential stormwater impacts
835	*River-flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* and *River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria*	Yes: • High probability GDE: – 309.11 ha within study area. – 0.01 ha within Stage 1 rezoning area. • Medium probability GDE: – 56.98 ha within study area. – Not within Stage 1 rezoning area. • Low probability GDE: – 28.04 ha within study area. – 0.01 ha within Stage 1 rezoning area.	• Increased erosion resulting in changes to hydrological flow. This may result in the diversion of water away from this water dependent TEC, leading to declines in TEC ecological function. • High nutrient loads in runoff, high levels of inorganic nitrogen and phosphorus in stormwater runoff are a particular threat to this TEC as it favours the growth of exotic species and eventual replacement of native species. • Increased weed invasion. • Diversion of stormwater as a result of the construction of sealed surfaces can also lead to the disruption of natural water flow and reduce hydrological connectivity between floodplain/riparian vegetation. This can cause declines in this TEC which relies on specific water flows and water absorption in the soil.
849	*Cumberland Plain Woodland in the Sydney Basin Bioregion* and *Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest*	Yes: • High probability GDE: – 6.70 ha within study area. – 0.01 within Stage 1 rezoning area. • Medium probability GDE: – 1.04 ha within study area. – Not within Stage 1 rezoning area. • Low probability GDE: – 57.98 ha within study area. – 0.01 ha within Stage 1 rezoning area.	• Increased erosion. • High nutrient loads in runoff, high levels of inorganic nitrogen and phosphorus in stormwater runoff are a particular threat to this TEC as it favours the growth of exotic species. • Increased weed invasion.
850	*Cumberland Plain Woodland in the Sydney Basin Bioregion* and *Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest*	No	• Increased erosion. • High nutrient loads in runoff, high levels of inorganic nitrogen and phosphorus in stormwater runoff are a particular threat to this TEC as it favours the growth of exotic species. • Increased weed invasion.

PCTs	TECs	GDE association (DPE Water 2022)	Potential stormwater impacts
1800	*Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* and *Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community*	No	• Reduced water flows due to the diversion of stormwater as a result of the construction of sealed surfaces and impermeable terrain. The disruption in normal water flow and reduction in water availability to this water dependent TEC can have adverse impacts to this floodplain vegetation, changing the vegetation structure and composition. • Increased erosion resulting in changes to hydrological flow. This may result in the diversion of water away from this water dependent TEC, leading to declines in TEC ecological function. • Increased weed invasion

An integrated water cycle management (IWCM) strategy has been developed for the Orchard Hills Stage 1 area (DesignFlow 2024). The design is predicted to achieve stormwater water quality targets for discharges into Wianamatta-South Creek in accordance with Penrith DCP and *Wianamatta-South Creek stormwater management targets* (DPE 2022e).

The design implements a number of mitigation measures which will control runoff and ensure it is treated and discharged in a manner that will not impact upon the flow regime or water quality of riparian areas. The design implements the following mitigation measures, including:

- Detention basins.
- Wetland bioretention systems to treat stormwater.
- Collection of runoff from impermeable surfaces, such as apartment roofs, into rainwater tanks.
- Prevention of encroachment onto Cumberland Plan avoided land.

These stormwater mitigation measures will need to ensure the hydrological regime within the Orchard Hills Stage 1 area is not altered in a way that will impact upon the TECs and GDEs within the area.

We understand that stormwater flow from the proposed development has been modelled by Rhelm for pre-development and post-development conditions. Flow increases are largely directed to stormwater detention basins or treatment areas to the west of the Stage 1 area. Peak flow is not anticipated to increase to the east of the Stage 1 area and therefore it is understood that detention is not required for the eastern catchment. Basins and storages will mitigate flows at points of discharge. Flood basins are proposed for the western catchment, and a small part of the eastern catchment where downstream flows will cross the Defence Force Establishment Orchard Hills site, before discharging into Blaxland Creek. These detention basis have been designed to withstand and manage events up to 1% AEP, while stormwater treatment basins are designed to manage regular events up to 39% AEP. Basins are located outside of mapped avoided land and riparian areas and will assist with minimising flows.

The stream erosion index (SEI) is anticipated to be met at all relevant points of discharge. Stormwater discharges from the treatment basins is to be adequately treated across the precinct to protect downstream environments as per the *Wianamatta-South Creek stormwater management targets* (DPE 2022e), which satisfy the Neutral or Beneficial Effect (NorBE) on water quality guidelines. Some untreated flows may occur to the centre of the Stage 1 rezoning area along the east-west tributary due to its occurrence downstream of an urban environment but upstream of treatment system D.

Based on the current assessments, the impacts on biodiversity resulting from untreated flows in portions of the study area as a result of the proposed Orchard Hills precinct is unclear. Further assessment by a technical specialist may be required to clarify biodiversity impacts, however the project is demonstrated to achieve the *Wianamatta-South Creek stormwater management targets* (DPE 2022e).

A detailed stormwater plan is recommended to be implemented to provide mitigation measures and controls for managing stormwater runoff, flow and nutrient and pollutant loads to guide further stages of the Orchard Hills precinct. The Integrated water cycle management (IWCM) strategy (DesignFlow 2024) may be adapted to include all receiving environments, or alternatively, a plan be prepared that focuses on biodiversity mitigation to reduce the impacts of the increased stormwater runoff on TECs, GDEs, native vegetation, waterways and Key Fish Habitat. This plan should be developed in accordance with the following guidelines and documents:

- Landcom's *Managing Urban Stormwater: Soils and Construction* (2004).
- Penrith Council's *Stormwater Drainage Guidelines for Building Developments* and any other management plans or stormwater guidelines (Penrith City Council 2016).
- *Controlled activities – Guidelines for outlet structures on waterfront land* (DPE 2022f).
- *Wianamatta-South Creek stormwater management targets* (DPE 2022e).

Rhelm has applied a set of assumptions to its modelling that assume piping of riparian areas within areas mapped as avoided land under the CPCP (Rhelm 2023). The IWCM strategy developed for the Orchard Hills Stage 1 area (DesignFlow 2024) states that the only piped watercourses that are intended to be constructed are those that serve catchments of less than 15 hectares. It is understood that it is intended that riparian areas within CPCP avoided land will remain in their natural state, and therefore this approach should be reflected in both the final stormwater and flood impact assessment reports. This discrepancy may influence the flood modelling undertaken by Rhelm, including flow velocity, and as such we recommend that modelling be repeated post-exhibition to clarify impacts.

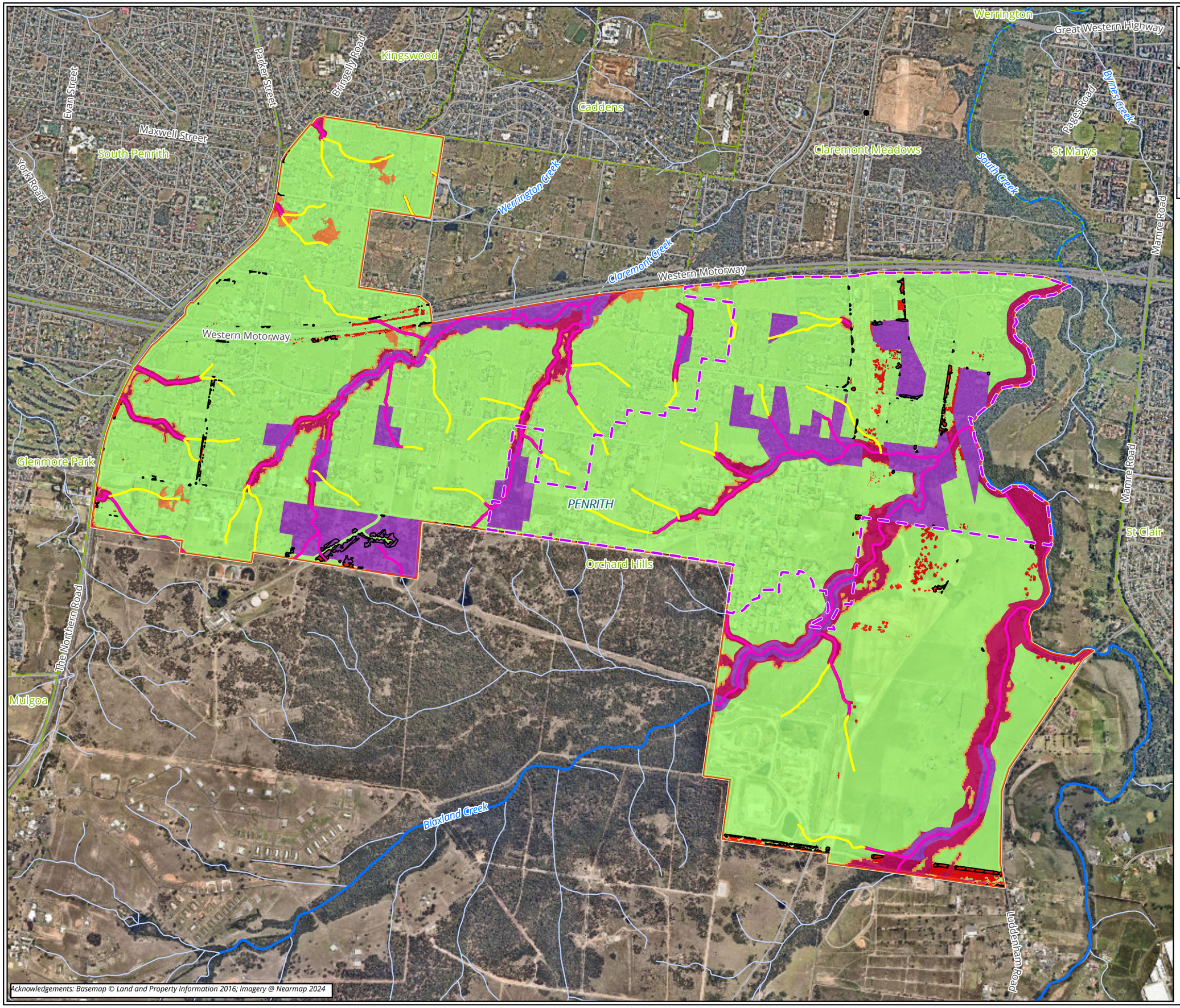
6. Constraints assessment

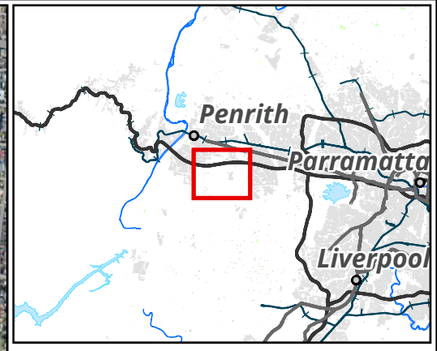
The ecological constraints within the study area are provided in Figure 4. These constraints are ranked as no-go, high, moderate or low, based on the criteria outlined below in Table 13.

Table 13 Ecological constraints in the study area

Constraint	Value	Justification	Recommendations
No-Go	CPCP mapped avoided land with mapped TECs	• The avoided lands are comprised of riparian corridors around major waterways, which provide important habitat for a range of fauna. • The avoided land also includes areas of intact and thinned vegetation communities listed as Critically Endangered under BC Act and EPBC Act. • Mapped Cumberland Plain Woodland is known habitat for the Cumberland Plain Land Snail which is listed as endangered under the BC Act. • Contains habitat for the Swift Parrot.	• Impact to these areas should be avoided. • Opportunities to include low-impact passive recreation and ancillary land uses consistent with the retention and protection of biodiversity on avoided land.
	CPCP mapped avoided land with no mapped TECs	• Lower retention value than CPCP mapped TEC areas. • Provides connectivity to higher quality areas. • Development in avoided land restricted to essential infrastructure.	
	1% AEP on CPCP mapped avoided land	• Requires a vegetated riparian zone to be maintained.	
High	CPCP mapped native vegetation on CPCP excluded land	• Impacts to these areas require additional biodiversity assessment and approvals in accordance with the BC Act, EPBC Act, Water Management Act, Fisheries Management Act. • Provides potential habitat for threatened species. • Provides vegetation connectivity.	• Impact to these areas should be avoided, where possible.
	Waterways with a Strahler order of two or more and Strahler order one streams with a >15 ha catchment	• Provides potential habitat for threatened flora and fauna species. • Provides connectivity for biodiversity values through the landscape. • Requires a vegetated riparian zone to be maintained. • Requires a permit for works to be conducted on waterfront land.	
	1% AEP on CPCP excluded land and certified land	• Requires a vegetated riparian zone to be maintained.	

Constraint	Value	Justification	Recommendations
Moderate	Half-canopies of CPCP mapped native vegetation listed as threatened under the EPBC Act that occurs on CPCP excluded land (for investigation)	• Assessment is required in accordance with the EPBC Act. • Tree trunk may be situated on CPCP certified – urban capable land, however canopy extends to CPCP excluded land.	• Impacts to areas should be minimised where possible. • Measures to mitigate impacts on these areas should be implemented where required.
	Swift Parrot mapped important area (DPE 2023c)	• Contains habitat for the Swift Parrot.	
	1% AEP flood mapping buffer	• Conservative buffer to retained Strahler stream orders (as listed above) and the 1% flood zone (excluding 1% flood zone). • Provides a biodiversity corridor opportunity for consideration to be retained.	
Low	CPCP certified – urban capable land	• Development suitable for these areas. • While it is development-suitable and covered by biodiversity approvals, there are still mitigation measures required under the CPCP to avoid impacts on surrounding avoided land.	• Development suitable within these areas. • Development in these areas may proceed in accordance with the CPCP, and environmental or planning approvals that are required. • Consultation with NRAR should be sought regarding first order waterways being declassified.
	CPCP certified – major transport corridors		
	CPCP excluded land with no mapped native vegetation or mapped urban native/exotic vegetation		
	First order waterways with no defined channel (where accessible during field visit), or with a catchment <15 ha, located on CPCP mapped urban capable land, and where the waterway is not intersecting with contiguous 1% AEP flood mapping		
	Dams, first order waterways with a catchment <15 ha and associated riparian zones on certified - urban capable land	• May require a permit for works to be conducted on waterfront land. • May require application for re-classification. • Ground truthing of dams and first order waterways required to determine final vegetated riparian zone widths on retained waterways.	





Legend

- Study area
- Stage 1 rezoning area
- Declassify
- Retain
- Moderate constraint (for investigation)

Constraint level

- No-Go - CPCP Avoided lands
- High - Protected riparian areas WM act
- High - Native vegetation on CPCP excluded land
- Moderate - Swift Parrot habitat
- Moderate - 1% AEP buffer
- Moderate - EPBC Act vegetation (For investigation)
- Low; Low - EPBC Act vegetation

Figure 4 Constraints scenario mapping

0 200 400 600 800 1,000

Metres

Scale: 1:22,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

N

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Matter: 37782, Date: 12 July 2024,
Drawn by: JET, Checked by: SA, Last edited by: hliswoyo
Layout: 37782_F4_Constraints
Project: P:\37700s\37782\Mapping\37782_OrchardHills_2024.aprx

7. Review and assessment of Stage 1 rezoning area

Potential impacts to biodiversity values occur in urban areas from residential and commercial land uses and include noise and light spill, impacts to native fauna from domestic pets (particularly in areas adjoining retained native vegetation), disturbance and trampling of native vegetation through creation of walking paths, and rubbish dumping. The placement of areas zoned as such, in relation to retained biodiversity values has implications for the long-term conservation of these values.

The following points include the identified benefits of the Orchard Hills Precinct Plan, and ways in which biodiversity and riparian corridor constraints and opportunities have been incorporated and retained within the Stage 1 rezoning area. An assessment of impacts for further stages would be required.

7.1. Open spaces

Open spaces within the study area have been placed in areas adjoining avoided land or riparian corridors, where possible. In the eastern portion of the Stage 1 rezoning area, local open species are placed adjacent to a riparian corridor, to provide a buffer between residential development and the waterway and because this is where larger areas of flat land that is conducive to active open space (including sporting fields) occurs. In the western portion of the Stage 1 rezoning area, district and local open spaces include the hill top park, and adjoin riparian areas, with scattered occurrences between riparian zones that provide opportunities for connectivity.

Some areas mapped as avoided land under the CPCP may require fencing, which should be developed to suit a broad range of relevant fauna and align with the requirements of the CPCP. However, there may also be opportunities to include low impact passive recreation and ancillary land uses consistent with the retention and protection of biodiversity on avoided land. Fauna crossings that support fauna movement between patches of retained vegetation (including avoided land and riparian areas) are also recommended (Figure 5).Swift Parrot habitat within the north and central portions of the study area are avoided by the Stage 1 rezoning area, currently enabling protection of crucial habitat (Figure 2.1 – Figure 2.7).

Riparian corridors contain vegetation, some of which is proposed to be retained, providing connectivity and a buffer to areas of high biodiversity value within avoided land, which in turn promotes connection to the natural environment within the precinct. The placement of district and local open spaces provides buffers between areas designated for residential or commercial development and retained biodiversity values. These district and local open spaces provide an opportunity to retain additional vegetation (Figure 5).

Mitigation measures (Section 8) includes preparation of a habitat protection and enhancement strategy in the form of a Biodiversity Management Plan (BMP). The district open spaces provide the optimal interface between actions which could be undertaken as part of this, including education opportunities, visual amenity and community monitoring/maintenance programs which foster ownership of the unique biodiversity values within the Orchard Hills precinct.

7.2. Neighbourhoods

The boundaries of the neighbourhoods outside of the Stage 1 rezoning area within the Orchard Hills Precinct Plan have been aligned with riparian corridors, providing natural boundaries and opportunities to retain biodiversity values and habitat connectivity through the precinct. These natural delineations also provide for

planning of neighbourhood walking paths, boundaries with a natural aesthetic, and options for integration of stormwater retention and treatment which align with biodiversity value, visual amenity and community use.

7.3. Education facilities

The proposed school site has been sited near avoided land. Such placement will benefit both the environment and the school, providing a natural aesthetic and visual barrier to the school, while reducing potential impacts on the ecological values through adjoining land use.

Schools are generally well-fenced and provide barriers to areas of retained native vegetation. In addition, school zones implement low speed during times of peak traffic movement, which can reduce the potential for vehicle strike on local fauna. Placing schools near or adjacent to retained native vegetation also provides educational and engagement opportunities for school children and may foster a sense of ownership and care for the local environment within the community.

7.4. Station precinct

The station precinct occurs south of the M4 motorway, to the east of Kent Road and provides the highest density urban development area within the Stage 1 rezoning area. Several sensitive ecological values occur in this area, with areas of mapped avoided land to the west, east and south. The high-density station precinct adjoining areas mapped as avoided land has considered connectivity between the patches of avoided land.

Ongoing protection of the avoided land will be a key action in ensuring the long-term conservation of retained biodiversity values, particularly in areas planned for high density development such as the station precinct. Revegetation along retained waterways is also an opportunity to maintain biodiversity values and improve connectivity (Figure 5). Avoided land may also provide an opportunity for a range of low impact passive recreation and ancillary land uses consistent with the retention and protection of biodiversity. A precinct wide BMP would assist in providing controls to prevent encroachment (such as fencing), opportunities for community engagement and actions required for ongoing maintenance and improvement of biodiversity values within the precinct.

7.5. Community

The largest community use zone is placed near the metro site and adjoining land mapped as avoided land. Appropriate controls such as fencing, educational signage, and placement of community resources near the avoided land assists in creating a buffer between high density residential and commercial land uses. These land uses are often prone to encroachment into retained native vegetation through creation of walking paths or bike tracks, disturbance from domestic pets and rubbish dumping. Community-based land use can promote understanding and protection of the environment and areas of high biodiversity value, however the implementation of any passive recreation land uses should ensure the retention and protection of biodiversity values. Provision of a precinct-wide BMP would need to incorporate these areas to ensure maintenance and improvement of areas of high biodiversity value.

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8. Minimisation, mitigation and management of impacts

8.1. Actions to avoid/minimise project impacts

Measures to reduce impacts to biodiversity should be employed where possible and are provided in Table 14 below.

Table 14 Measures to minimise impacts

Value	Recommendation
CPCP mapped excluded land and Certified - urban capable land containing native vegetation	In addition to the CPCP Mitigation Measures Guideline (DPE 2022c), the following measures should be applied, wherever possible: • Retain hollow-bearing trees. • Retain moderate and high-quality vegetation and threatened species habitat, to provide future connectivity (see Figure 5). • Retain and improve connectivity between patches of vegetation (see Figure 5).
CPCP mapped avoided land	• Retain areas mapped as avoided land, where possible. • If mapped avoided land is required to be accessed for providing essential infrastructure, retention of EPBC listed vegetation should be prioritised. • Where this land can be brought into public ownership, retain as regional open space such as parks, visual reserves, or adjoining education facilities to promote community engagement and education opportunities. • Retain and improve connectivity between isolated patches through revegetation of strategic corridors i.e., largely following waterways/existing native vegetation (see Figure 5).
Waterways	• Retain and revegetate waterways in areas identified as opportunities to improve connectivity (Figure 5). • Retain VRZs in accordance with the riparian corridor matrix: – Second order: 20 m VRZ (40 m + width of channel). – Third order: 30 m VRZ (60 m + width of channel). – Fourth order and above: 40 m VRZ (80 m + width of channel).

The Stage 1 Rezoning area ILP aims to retain the native vegetation shown in Table 15. Additional opportunities to retain native vegetation are shown on Figure 5, which should be considered prior to development.

Table 15 Summary of native vegetation and fauna habitat proposed to be retained within the Stage 1 rezoning area

PCT	PCT name	Total area retained within Stage 1 rezoning area (ha)	
		All vegetation (BC Act and EPBC Act)	Portion of area that is listed under EPBC Act
PCT 724	*Broad-leaved Ironbark - Grey Box - Melaleuca decora grassy open forest on clay/gravel soils of the Cumberland Plain, Sydney Basin Bioregion*	7.84	7.68

PCT	PCT name	Total area retained within Stage 1 rezoning area (ha)	
		All vegetation (BC Act and EPBC Act)	Portion of area that is listed under EPBC Act
PCT 725	*Broad-leaved Ironbark - Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin Bioregion*	1.13	0.64
PCT 835	*Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion*	44.89	20.48
PCT 849	*Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion*	23.28	17.34
PCT 850	*Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion*.	0.22	-
PCT 1800	*Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter valley*	0.24	0.23

8.2. Mitigation and management of impacts

Once all practicable steps to avoid or minimise impacts have been implemented at the detailed design phase, mitigation and management measures would be implemented to further lessen the potential ecological impacts of the project. Mitigation measures would be implemented during construction and would be outlined in a Construction Environmental Management Plan (CEMP).

Mitigation measures should consider the CPCP Mitigation Measures Guideline (DPE 2022c).

Identification of measures to mitigate or manage impacts should include considerations such as:

- Techniques, timing, frequency and responsibility.
- Identification of measures for which there is risk of failure.
- Evaluation of the risk and consequence of any residual impacts.
- Documentation of any adaptive management strategy proposed.

Identification of measures for mitigating impacts related to:

- Displacement of resident fauna.
- Indirect impacts on native vegetation and habitat.
- Details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain.

Mitigation measures for the project are detailed in Table 16 below.

Table 16 Measures to mitigate and manage impacts

Measures	Action	Outcome	Timing	Responsibility
General protection of threatened entities	A CEMP should be implemented that would include the following sub-plans or protocols: • Vegetation clearance protocol.	Mitigate risk of impact to environmental controls during	Ongoing/throughout earthworks.	Construction contractor.

Measures	Action	Outcome	Timing	Responsibility
	• Weed and Pathogen Management Plan. • BMP: A Kangaroo Management Strategy (forming a component of a BMP) is recommended to outline mitigation measures to prevent impacts to the resident Eastern Grey Kangaroo population from construction and increased traffic movements (See Section 8.2.1 below). • Hollow-bearing tree removal specification. • Fauna injury protocol. • Nest Box Management Plan.	project construction.		
	Incorporation of provisions for landscape design to utilise flora species native to the area to provide and improve habitat availability and natural vegetation aesthetic throughout the precinct in landscaping at public facilities, walking paths, open space, community centres, schools.	Mitigate impacts to resident fauna.	Ongoing.	Construction contractor.
Displacement of resident fauna	Any hollow-bearing trees marked for removal should be removed according to a vegetation clearance protocol to ensure no injury or loss of fauna, including: • Hollow-bearing trees to be inspected immediately prior to removal, by a qualified ecologist.	No direct impact to resident fauna during vegetation removal.	Immediately prior to vegetation removal.	Qualified ecologist and construction contractor.
	Any hollow-bearing trees to be removed should be placed in areas of retained vegetation to provide additional fauna habitat.	Mitigate impacts to resident fauna.	Immediately following vegetation clearance.	Qualified ecologist and construction contractor.
	Nest boxes should be installed in retained vegetation to compensate for loss of hollows from the subject site. A Nest Box Management Plan should be implemented.	Mitigate impacts to resident fauna.	Prior to vegetation clearance/Ongoing.	Qualified ecologist and construction contractor.
	Any bush rock identified during construction should be stockpiled and placed adjacent to retained habitats to create supplementary habitat.	Mitigate impacts to resident fauna.	Prior to vegetation clearance/Ongoing.	Construction contractor.
	Roads adjacent to large, retained patches of habitat designated low speed to prevent vehicle strike on wildlife (such as Eastern Grey Kangaroo) known to occur in the area, including extension of any existing school speed zone, where relevant.	Mitigate impacts to resident fauna.	Prior to vegetation clearance/Ongoing.	Construction contractor.

Measures	Action	Outcome	Timing	Responsibility
	Where modification of speed zones is not able to be achieved adjacent to retained habitat, fauna underpasses and fencing can be integrated to the road to prevent potential vehicle strike.	Mitigate impacts to resident fauna.	Prior to vegetation clearance/Ongoing.	Construction contractor.
	Install fauna crossings/connectivity linkages between patches of vegetation where roads may hinder movement (see Figure 5).	Mitigate impacts to resident fauna.	Prior to vegetation clearance/Ongoing.	Construction contractor.
Indirect impacts on native vegetation and habitat	Install appropriate stormwater, sediment, and erosion controls (e.g., silt fences, sediment traps). on site to ensure that discharges to drainage channels/waterways are consistent with existing conditions. These should conform to relevant guidelines, should be maintained throughout the construction period, and should be carefully removed following the completion of works.	No further degradation to retained vegetation and habitats, including waterways	Ongoing/Throughout construction.	Construction contractor.
	Installation of appropriate exclusion fencing around trees and vegetation to be retained in the study area: • The radius of the tree protection zone (TPZ) is calculated for each tree by multiplying its diameter at breast height by 12, in accordance with the Standards Australia Committee (2009). • A TPZ should not be less than 2 m, or greater than 15 m, except where crown protection is required (Standards Australia 2009). • This would include appropriate signage such as 'No Go Zone' or 'Environmental Protection Area'. • Identify the location of any 'No Go Zones' in site inductions and a Construction Environmental Management Plan.	No further degradation to retained vegetation and habitats.	Before and throughout construction.	Construction contractor.
	Reduction of impacts resulting from external lighting is recommended, and can be adapted from Part 4 (good lighting design principles) of the Dark Sky Planning Guideline (DPE 2016), including: • Installing light fitting shields with an opaque cover, mounted horizontally across the top of the lighting module. These shielding attachments allow only the downward projection of light.	No indirect impact to fauna in retained vegetation and habitats.	Ongoing.	Construction contractor.

Measures	Action	Outcome	Timing	Responsibility
	• Direct lights downwards and avoid shining directly onto the public amenities, which have the potential to reflect light skywards. • Utilise low beam angles that are close to vertical where possible to minimise light glare.			
	All material stockpiles, vehicle parking and machinery storage will be located within cleared areas proposed for clearing, and not in areas of native vegetation that are to be retained.	No further degradation to retained vegetation and habitats.	Ongoing/Throughout construction.	Construction contractor.
	Where appropriate native vegetation cleared from the study area should be mulched for re-use on the site, to stabilise bare ground.	No further degradation to retained vegetation and habitats.	Ongoing/Throughout construction.	Construction contractor.
	Works areas should be wet down to reduce dust generation during construction.	No further degradation to retained vegetation and habitats.	Ongoing/Throughout construction.	Construction contractor.
	Works should be restricted to daylight hours.	Reduce impacts to nocturnal species.	Ongoing/throughout construction.	Construction contractor.
	A Weed and Pathogen Management Plan should be prepared for the proposed development to minimise impacts associated with priority weeds and pathogens.	No further degradation to retained vegetation and habitats.	Ongoing/Throughout construction.	Construction contractor.
	Retained native vegetation (riparian corridors and avoided land in particular) should be fenced and educational signage installed regarding its importance to biodiversity to prevent impacts associated with dumping of rubbish (including unwanted garden/aquatic plants), collection of firewood, encroachment/disturbance through creation of walking/bike tracks and release of exotic fish.	No further degradation to retained vegetation and habitats.	Ongoing/Throughout construction.	Construction contractor.
	Educational signage to promote community engagement and ownership of biodiversity values unique to Western Sydney, throughout the neighbourhoods.	No further degradation to retained vegetation and habitats.	Ongoing/Throughout construction.	Construction contractor.
	Restoration and maintenance of avoided land to remove weed species, dumped rubbish, informal walking tracks etc.	Improvement to retained vegetation and habitats.	Ongoing/Throughout construction.	Construction contractor.

Measures	Action	Outcome	Timing	Responsibility
	Maintenance and revegetation of riparian corridors to remove weed species, dumped rubbish, prevent erosion, and improve connectivity and reliance of waterways in line with a Riparian Vegetation Management Strategy (REF).	Improvement to retained vegetation and habitats.	Ongoing/Throughout construction.	Construction contractor.
Koala Protection (DPE 2022c)	Design subdivision layout, including perimeter roads and asset protection zones, to reduce impacts on, and protect areas of, adjacent koala habitat.	Mitigate impacts to resident fauna.	Ongoing/Throughout construction.	Construction contractor.
	Signpost areas adjoining Koala habitat to identify that Koalas are in the area and the associated penalties for non-compliance.	Mitigate impacts to resident fauna.	Ongoing/Throughout construction.	Construction contractor.
	Do not plant Koala use tree species in open space, recreation areas and urban streets.	Mitigate impacts to resident fauna.	Ongoing/Throughout construction.	Construction contractor.
	An ecologist must be present throughout the duration of any preclearance Koala surveys and vegetation clearing works to maintain oversight of, and responsibility for, the activities and Koala translocation.	Mitigate impacts to resident fauna.	Ongoing/Throughout construction.	Qualified ecologist and construction contractor.
Koala Protection (DPE 2022c) – Where a Koala-exclusion fence is not installed	Prepare a pre-clearance Koala survey immediately before the removal of native vegetation to ensure minimal disturbance to Koala habitat. Implement a translocation plan if they are found. Translocation may require a licence from the NSW DCCEEW under the Translocation Operational Policy.	Mitigate impacts to resident fauna.	Prior to vegetation clearance.	Qualified ecologist and construction contractor.
	Implement a tree-felling protocol to avoid impacts to Koalas that are in trees to be cleared.	Mitigate impacts to resident fauna.	Prior to vegetation clearance.	Qualified ecologist and construction contractor.
	Enforce vehicle wash-down points for machinery, equipment and tyres before entering and leaving the construction site to control the spread of vegetation pathogens known to affect trees from which Koalas feed.	Mitigate impacts to resident fauna.	Ongoing/Throughout construction.	Construction contractor.
	Erect temporary protective fencing designed for Koalas' safety to protect adjacent Koala habitat on or immediately adjoining the site before construction.	Mitigate impacts to resident fauna.	Ongoing/Throughout construction.	Construction contractor.
	Design and construct public dog recreation areas with secure containment fencing.	Mitigate impacts to resident fauna.	Ongoing/Throughout construction.	Construction contractor.

Measures	Action	Outcome	Timing	Responsibility
	Design residential lots with dog containment fencing in accordance with Council requirements.	Mitigate impacts to resident fauna.	Ongoing/Throughout construction.	Construction contractor.
	Manage roadside vegetation to increase the visibility of Koalas.	Mitigate impacts to resident fauna.	Ongoing/Throughout construction.	Construction contractor.
	Implement 40 km/hr speed limit restrictions on local roads adjacent to Koala habitat.	Mitigate impacts to resident fauna.	Ongoing/Throughout construction.	Construction contractor.
	Install Koala information signposts on perimeter roads around development footprints and roads adjacent to wildlife habitat areas, in accordance with Austroads, Roads and Maritime Services (RMS) technical guidelines, council guidelines and relevant Australian Standards.	Mitigate impacts to resident fauna.	Ongoing/Throughout construction.	Construction contractor.
	Install traffic-calming devices such as speed humps and audible surfacing along perimeter roads adjacent to Koala habitat.	Mitigate impacts to resident fauna.	Ongoing/Throughout construction.	Construction contractor.
	Install Koala-friendly road design structures such as underpasses, fauna bridges and overpasses as required. Refer to the RMS Biodiversity Guidelines.	Mitigate impacts to resident fauna.	Ongoing/Throughout construction.	Construction contractor.
Threats to threatened ecological communities (DPE 2022c)	Erect temporary protective fencing around retained biodiversity onsite to be protected, or biodiversity immediately adjoining the site, before construction begins.	Mitigate impacts to retained vegetation and fauna habitat.	Prior to vegetation clearance/Ongoing.	Qualified ecologist and construction contractor.
	Implement an open structure design for roads adjacent to known populations of Cumberland Plain land snail, in accordance with actions under the Save our Species Program.	Mitigate impacts to resident fauna.	Ongoing/Throughout construction.	Construction contractor.
	Prepare a pre-clearance native fauna survey immediately before the clearing of native vegetation to ensure that arboreal mammals, roosting and hollow-using birds, bats and reptiles are restricted from accessing any vegetation to be cleared and are translocated clearing. Translocation may require a licence from the department's Environment and Heritage group under the Translocation Operational Policy.	Mitigate impacts to resident fauna.	Prior to vegetation clearance.	Qualified ecologist and construction contractor.
	Implement mitigation measures to manage weeds during construction and operation to protect adjacent flora	Mitigate impacts to retained	Prior to vegetation	Construction contractor.

Measures	Action	Outcome	Timing	Responsibility
	populations. Follow the guidance in the Cumberland Plain Conservation Plan Weed Control Implementation Strategy.	vegetation and fauna habitat.	clearance/Ongoing.	
	A qualified expert must prepare a pest control strategy to be carried out during construction. This must be done in accordance with best practice for chemical use to reduce the risk of secondary poisoning (from poison such as Pindone or second-generation rodenticides).	Mitigate impacts to retained vegetation and fauna habitat.	Prior to vegetation clearance/Ongoing.	Qualitied expert and construction contractor.
	Contain domestic cats and dogs within certified-urban capable land, consistent with relevant council guidelines.	Mitigate impacts to retained vegetation and fauna habitat.	Prior to vegetation clearance/Ongoing.	Construction contractor.
	Retaining large and dead native trees (>50 cm diameter at breast height) that are not a safety risk and that provide habitat for threatened species.	Mitigate impacts to retained vegetation and fauna habitat.	Prior to vegetation clearance/Ongoing.	Construction contractor.
	Avoiding impacts to soil within the dripline of the retained trees.	Mitigate impacts to retained vegetation and fauna habitat.	Prior to vegetation clearance/Ongoing.	Construction contractor.
	Provide setbacks from development for grey-headed flying fox camps and raptors, if present on or adjacent to the site as below: • Grey-headed Flying-fox camps require a 100 m setback to any development. The setback area should be maintained free of flying fox roosting habitat. • Raptor (birds of prey) nests require a 500 m circular setback from where nests are in undisturbed bushland, or a minimum circular setback distance of 250 m where nests are closer to existing development. Owl nests require a 100 m circular setback from where nests are.	Mitigate impacts to retained vegetation and fauna habitat.	Prior to vegetation clearance/Ongoing.	Construction contractor.
	Undertake pre-construction surveys before removing or disturbing human-made structures and before microbats go into torpor– an inactive state that conserves energy. This is to retain roosting habitat for microbat species. Retain man-made roosting habitat including mine shafts, storm water tunnels, old or derelict buildings, bridges and culverts, where possible, and ensure any individuals are dispersed or	Mitigate impacts to resident fauna.	Prior to built structure demolition.	Qualified ecologist and construction contractor.

Measures	Action	Outcome	Timing	Responsibility
	relocated in accordance with best practice.			
	Apply best-practice site hygiene protocols to manage the potential spread of Phytophthora and myrtle rust from adjacent land to avoided land, in accordance with the Arrive Clean, Leave Clean: Guidelines (Commonwealth of Australia 2015).	Mitigate impacts to retained vegetation and fauna habitat.	Prior to vegetation clearance/Ongoing.	Construction contractor.
	Undertake fire hazard management within Asset Protection Zones in the Greater Macarthur Growth Area to protect and enhance the Spiked Rice Flower Pimelea spicata species in accordance with species mapping in the Cumberland Plain Assessment Report.	Mitigate impacts to threatened flora.	Ongoing/throughout earthworks.	Construction contractor.
	Ensure development adjacent to the southern and western boundaries of Commonwealth land comprising the Orchard Hills Defence Establishment mitigates impacts to surface water flows and the water quality of Blaxland Creek.	Mitigate impacts to waterways.	Ongoing/throughout earthworks.	Construction contractor.
	Retain areas of the Proteaceae shrubs for the Eastern Pygmy Possum Cercartetus nanus along or adjacent to riparian areas to improve and maintain habitat connectivity in accordance with species mapping in the Cumberland Plain Assessment Report.	Mitigate impacts to resident fauna.	Ongoing/throughout earthworks.	Construction contractor.
Adaptive management strategies proposed to monitor and respond to impacts on biodiversity values that are uncertain	Implementation of an appropriate CEMP during works.	Mitigate risk of impact to environmental controls during project construction.	Ongoing/throughout earthworks.	Construction contractor.

8.2.1. Biodiversity management plan

Several Eastern Grey Kangaroo are noted to occur in the study area. There is opportunity for the development of a Kangaroo Management Strategy to assist in managing habitat and connectivity for the species through the precinct. This could be provided as part of a precinct BMP, which would consider potential threatened species such as Koala *Phascolarctos cinereus* and Cumberland Plain Land Snail *Meridolum corneovirens* which is endemic to Western Sydney. This BMP would assist in mitigating impacts and ongoing management of habitat for multiple species.

The BMP would include items such as:

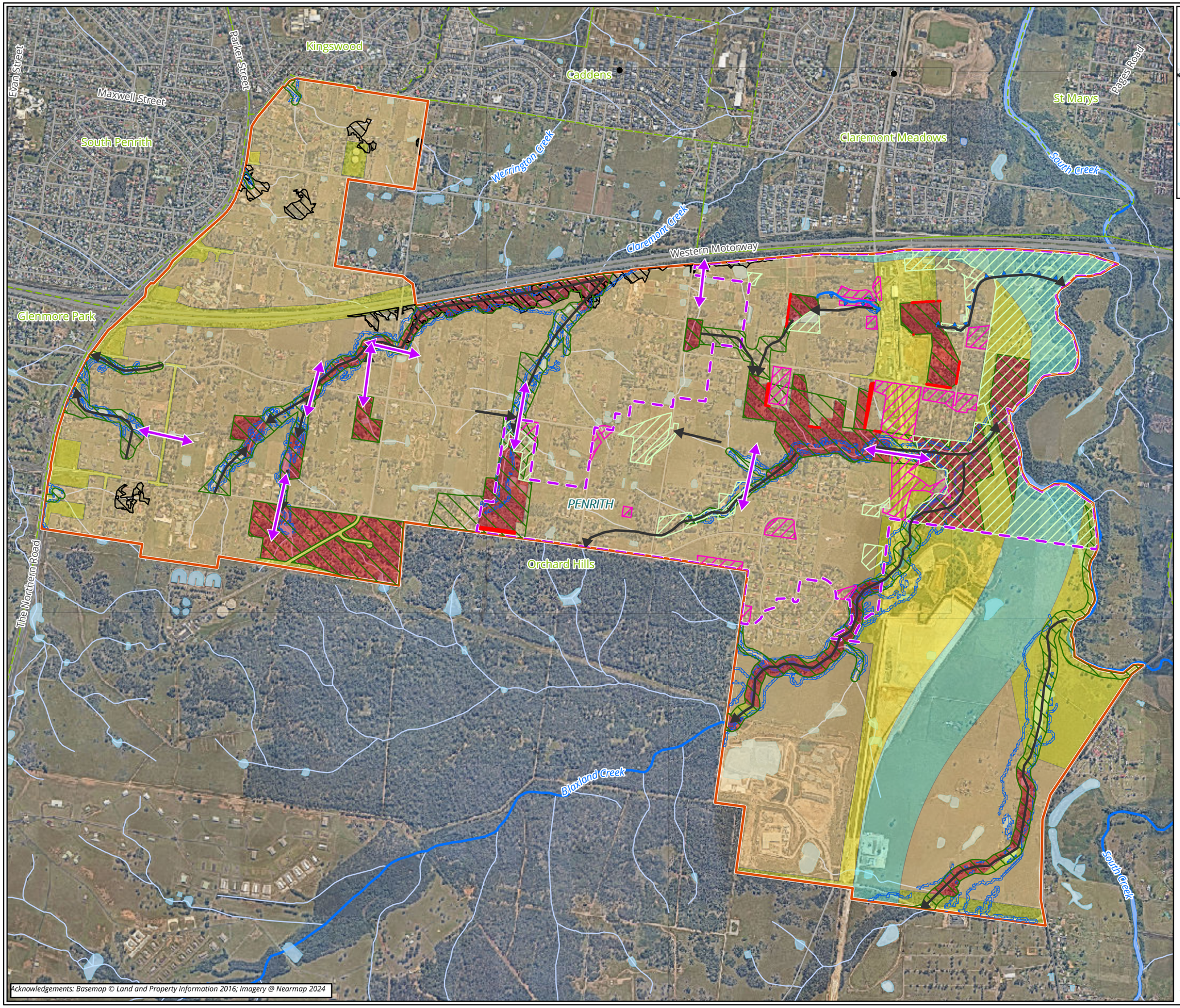
- Low speed traffic zones in areas where a high potential for vehicle strike has been identified.

- Provisions for safe fauna crossing in design of roads, such as underpasses, fauna fencing along large areas of retained native vegetation. Fences surrounding and within avoided land may is to be in line with the CPCP (see Section 3.4 and 7.1).
- Retaining connectivity through riparian corridors, avoided land and any areas of retained native grassland.
- Construction mitigation measures to prevent impacts to fauna during vegetation clearing.
- Include actions for community groups to be involved with monitoring of local fauna, and improvement of habitat.

It is noted that further information of the Eastern Grey Kangaroo occurring in the Orchard Hills Precinct may be required. Detailed information on the population size and movements would require further investigation, with longer-term studies being required following BMP implementation. Although the species is not listed under the BC Act or EPBC Act, precinct planning has the potential to impact on resident individuals which may come into conflict with increased vehicle movement from future development. A BMP would include details for the study of the population to gain understanding of the size and movements in the area and could provide opportunities for community engagement through the monitoring of fauna species occurring within the precinct and actions to improve habitat or protection measures (such as maintaining wildlife crossings) for those species.

8.2.2. Adaptive management strategy

CEMPs would all contain an adaptive management component. Adaptive management strategies would be receptive to any new and relevant data that may arise through ongoing assessment and monitoring and are key to the successful implementation of crucial objectives yet also allow flexibility to changing dynamics and ongoing feedback and results. This includes measures to monitor predicted and uncertain impacts which would trigger adaptive management actions and allow for effective and quick responses. The CEMP would be implemented during works.



Legend

- Study area
- Stage 1 rezoning area
- Retained vegetation

Opportunities

- Opportunities to retain/ improve connectivity
- Opportunities to retain 1% AEP buffer
- Opportunities to retain fauna habitat
- Opportunities to retain/ enhance native vegetation or fauna habitat
- Proposed rezone
- Opportunities to retain/ improve connectivity
- Fauna crossings
- Riparian connectivity opportunities

Land category

- Avoided land
- Certified - major transport corridor
- Certified - urban capable land
- Excluded land

Figure 5 Opportunities

0 200 400 600 800

Metres

Scale: 1:20,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

N

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Matter: 37782, Date: 12 July 2024,
Drawn by: JET, Checked by: SA, Last edited by: hliswoyo
Layout: 37782_F5_Opportunities
Project: P:\37700s\37782\Mapping\
37782_OrchardHills_2024.aprx

Acknowledgements: Basemap © Land and Property Information 2016; Imagery @ Nearmap 2024

9. Conclusion and recommendations

9.1. Conclusion

The study area was found to contain a range of biodiversity values. These include:

- TECs:
  - PCT 724 – *Shale Gravel Transition Forest in the Sydney Basin Bioregion* (Endangered, BC Act) and *Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest* (Critically Endangered, EPBC Act).
  - PCT 725 – *Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion* (Endangered, BC Act) and *Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion* (Critically Endangered, EPBC Act).
  - PCT 835 – *River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (Endangered, BC Act) and *River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria* (Critically Endangered, EPBC Act).
  - PCT 849 and PCT 850 – *Cumberland Plain Woodland in the Sydney Basin Bioregion* (Critically Endangered, BC Act) and *Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest* (Critically Endangered, EPBC Act).
  - PCT 1800 – *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (Endangered, BC Act) and *Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community* (Endangered, EPBC Act).
- Three major waterways and several small tributaries that:
  - Are considered to constitute KFH (in lieu of detailed aquatic survey).
  - Provide potential habitat for a range of threatened fauna threatened species, including microbats.
  - Wildlife corridors within native vegetation.
- Mapped important habitat for the Swift Parrot.

The Stage 1 rezoning area was found to contain a range of biodiversity values. These include:

- TECs:
  - PCT 724 – *Shale Gravel Transition Forest in the Sydney Basin Bioregion* (Endangered, BC Act) and *Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest* (Critically Endangered, EPBC Act).
  - PCT 725 – *Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion* (Endangered, BC Act) and *Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion* (Critically Endangered, EPBC Act).
  - PCT 835 – *River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (Endangered, BC Act) and *River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria* (Critically Endangered, EPBC Act).
  - PCT 849 and PCT 850 – *Cumberland Plain Woodland in the Sydney Basin Bioregion* (Critically Endangered, BC Act) and *Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest* (Critically Endangered, EPBC Act).
  - PCT 1800 – *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (Endangered, BC Act) and *Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community* (Endangered, EPBC Act).
- Three major waterways and several small tributaries that:
  - Are considered to constitute KFH (in lieu of detailed aquatic survey).

  - Provide potential habitat for a range of threatened fauna threatened species, including microbats.
  - Wildlife corridors within native vegetation.
- Mapped important habitat for the Swift Parrot.

9.2. Recommendations

Recommendations for further assessment are provided in Table 17 below.

Table 17 Recommendations

Value	Recommendation
CPCP mapped avoided land	• Where avoided land is required to be rezoned for infrastructure purposes to facilitate precinct planning, requirements under Ministerial Direction 3.6 and the CPCP Guideline for Infrastructure Development (DPE 2022b) will need to be met. Where appropriate, a CPCP modification could also be progressed, which would be subject to approval. • Infrastructure impacts to avoided land require offsetting and additional provisions to be met under the CPCP including avoiding and minimising impacts. • Further biodiversity assessment may be required for areas mapped as avoided land that are proposed as for provision of essential infrastructure (Figure 5).
CPCP mapped excluded land	• Biodiversity assessment to: – Investigate areas identified as suitable for development/clearing that do not contain native vegetation. If land contains native vegetation, further assessment in accordance with the BC Act and EPBC Act. – Confirm low quality vegetation identified as suitable for development. – Identify moderate and high-quality vegetation and threatened species habitat to prioritise for retention. – Identify areas of potential future connectivity for retention.
CPCP mapped Certified - urban capable land	• Application for rezoning/development can proceed without further biodiversity approvals, subject to development meeting the CPCP Mitigation Measures Guideline (DPE 2022c). • Retain vegetation adjacent to waterways where possible (Figure 5). Undertake further assessment in accordance with the FM Act and WM Act or avoid development.
Waterways	• Apply for re-classification of first order waterways. Further assessment to collect information required by NRAR is required. • Conduct on-ground top of bank mapping to determine VRZ widths. • Further technical review of impact of increased flows on receiving environments.
Kangaroo management	• Further studies and survey of the Eastern Grey Kangaroo population occurring within the study area are likely to be required to inform the Kangaroo Management Plan.

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APPENDICES

Appendix A. Flora

Appendix A.1. Threatened flora species

The following table includes a list of the threatened flora species and ecological communities that have potential to occur within the study area. The list of species is sourced from the NSW BioNet Wildlife Atlas and the Protected Matters Search Tool (Cth DCCEEW; accessed on 01/02/2023).

Examples of criteria for determining the likelihood of occurrence for threatened biota as a guide for writing the rationale for likelihood have been listed below.

Notes to table

Likelihood of occurrence	Potential criteria
High	• Species/ecological communities recorded in study area during current or previous assessment/s. • Aquatic species recorded from connected waterbodies near the study area during current or previous assessment/s. • Sufficient good quality habitat is present in study area or in connected waterbodies near the study area (aquatic species). • Study area is within species natural distributional range (if known). • Species has been recorded within 10 kilometres or from the relevant catchment/basin.
Medium	• Records of terrestrial biota within 10 kilometres of the study area or of aquatic species in the relevant basin/neighbouring basin. • Habitat limited in its capacity to support the species due to extent, quality, or isolation.
Low	• No records within 10 kilometres of the study area or for aquatic species, the relevant basin/neighbouring basin. • Marginal habitat present (low quality & extent). • Substantial loss of habitat since any previous record(s).
Negligible	• Habitat not present in study area • Habitat for aquatic species not present in connected waterbodies in close proximity to the study area. • Habitat present but sufficient targeted survey has been conducted at an optimal time of year and species wasn't recorded.

Table A 1 Threatened flora species recorded, or predicted to occur, within 10 kilometres of the study area

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC				
Acacia bynoeana	Bynoe's Wattle	VU	EN	2022#	Low	Habitat not present within the study area, communities within the study area not associated with Bynoe's Wattle	Semi prostrate shrub growing in central eastern NSW spanning from the Hunter District, west to the Blue Mountains and south to the Southern Highlands. Grows in a variety of communities including; Southern Tableland Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands and Sydney Coastal Heaths. Prefers open, slightly disturbed sites on sandy soils.
Acacia pubescens	Downy Wattle	VU	VU	2018#	Moderate	Habitat present within the investigation area.	A spreading shrub primarily confined to the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers at Barden Ridge, Oakdale and Mountain Lagoon. Grows in Cooks/River Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland, usually within roadside and bushland remnants. Grows on shale, sandstone, alluvium and gravely soils, often including ironstone.
Allocasuarina glareicola	-	EN	EN	2021#	Low	Although found in the Cumberland Plain, distribution is restricted, and the associated plant species were not present within the investigation area.	Small, depauperate shrub restricted to a few populations in the Richmond district with an outlier population at Voyager Point in Liverpool. Grows in Castlereagh Woodlands, Cumberland Dry Sclerophyll Forest, Sydney Hinterland Dry Sclerophyll Forest, Sydney Sand Flats Dry Sclerophyll Forests. Grows in lateritic soil.
Cynanchum elegans	White-flowered Wax Plant	EN	EN	#	Low	Habitat not present within the study area.	Climbing vine restricted to eastern NSW from Brunswick Heads to Gerroa in the Illawarra region. Grows in rainforest gully scrub and scree slope on the edge of dry rainforests in a variety of communities including Coastal Floodplain Wetlands, Maritime Grasslands, Coastal Valley Grassy Woodlands and Northern Hinterland Wet Sclerophyll Forests.

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Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC				
Dillwynia tenuifolia	-	-	VU	2022	Moderate	Habitat present within the study area.	Low, spreading shrub restricted to the Cumberland Plain in Western Sydney. Grows in scrubby or heathy areas within a variety of communities including Castlereagh Ironbark Forest, Shale Gravel Transition Forest, Castlereagh Scribbly Gum Woodland and Sydney Hinterland Dry Sclerophyll Forests. Grows on tertiary alluvium, laterised clays and in shale-sandstone transitions.
Eucalyptus benthamii	Camden White Gum	VU	VU	2015	Moderate	Marginal habitat present within the investigation area.	Tall tree confined to the lower Nepean area with two major subpopulations located at Kedumba Valley in Blue Mountains National Park and at Bents Basin State Recreation Park. Grows along valley floors within riparian flood zones at elevations between 30 - 300m in Central Gorge Dry Sclerophyll Forests, Sydney Sand Flats Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Eastern Riverine Forests and Coastal Valley Grassy Woodland Grows in sandy, alluvial soils.
Genoplesium baueri	Bauer's Midge Orchid	EN	EN	#	Low	Habitat not present within the study area.	Terrestrial orchid with 13 populations totalling 200 plants distributed between Ulladulla and Port Stephens. Grows on moss gardens in a variety of communities including Sydney Coastal Dry sclerophyll Forests, Sydney Coastal Heaths, Sydney Montane Heaths, Southern Lowland Wet Sclerophyll Forests and Sydney Hinterland Dry Sclerophyll Forests. Grows on sandstone substrates
Grevillea juniperina* subsp. *juniperina	Juniper-leaved Grevillea	-	VU	2022	High	Thousands of recent records within 10 km of the investigation area, the closest is within the investigation area. Habitat is also present.	Spreading to erect medium sized shrub endemic to Western Sydney with a distribution spanning from Blacktown, Erskine Park, Londonderry and Windsor and outlying populations at Kemps Creek and Pitt Town. Grows at elevations <50 m in Cumberland Plain Woodland, Castlereagh Ironbark Forest, Castlereagh Scribbly Gum Woodland, Shale/Gravel Transition Forest, Sydney Sand Flats Dry Sclerophyll Forests and

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC				
							Coastal Valley Grassy Woodlands. Grows in sandy to clay loam soils and red pseudolateritic gravels derived from Wianamatta Shale and Tertiary Alluvium.
Grevillea parviflora* subsp. *parviflora	Small-flower Grevillea	VU	VU	2018	Low	Habitat not present within the study area.	Low spreading to erect shrub sporadically distributed throughout the Sydney Basin, most notably in the Picton, Appin and Bargo regions, in the Cessnock - Kurri Kurri area and isolated populations from Putty to Wyong and Lake Macquarie. Grows in Shale Sandstone Transition Forest, Kurri Sand Swamp Woodland, *Corymbia maculata - Angophora costata* Open Forest in the Dooralong Area, Sydney Sandstone Ridgetop Woodland at Wedderburn and Cooks River/Castlereagh Ironbark Forest at Kemps Creek. Grows in sandy or light clay soils including tertiary alluviums over thin shales and lateritic ironstone gravels.
Haloragis exalata* subsp. *exalata	Square Raspwort	VU	VU	#	Low	Habitat not present within the study area.	Small to medium sized shrub found growing in four widely scattered locations in eastern NSW including the central coast, south coast and north western slopes. Grows in damp, protected and shaded areas in riparian zones in a variety of communities including South East Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Montane Bogs and Fens and Northern Warm Temperate Rainforests.
Hibbertia fumana	-	-	CR	2021	Low	Habitat not present within the study area.	Low shrub that occurs on aeolian sand deposits and grows in a variety of habitats including open areas, disturbed sites and in association with thick ground cover sedges, rushes and grasses. Also potentially will occur in coastal shale sandstone communities and open forests. Community composition has been recorded to include *Eucalyptus sideroxylon, E. fibrosa, E. parramattensis* and *E. sclerophylla*, with *Melaleuca decora*. Shrub layer with *Hakea sericea, Callistemon*

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC				
							linearis, Bursaria spinosa, Grevillea parviflora, Acacia brownii, Acacia bynoeana, Pultenaea retusa, P. villosa, a diverse groundcover of *Goodenia, Dianella, Poa, Stylidium, Themeda* and *Gonocarpus.*
Hibbertia puberula	-	-	EN	2021	Low	Habitat not present within the study area.	Shrublet with a distribution extending from Wollemi National Park south to Morton National Park and the south coast near Nowra. Grows in a variety of communities including Southern Tableland Dry Sclerophyll Forests, Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Coastal Heath Swamps, Coastal Valley Grassy Woodlands and Sydney Coastal Heaths. Grows on sandy soils, occasionally on clay soils.
Hibbertia* sp. *Bankstown	-	CR	CR	2022	Low	Restricted distribution and minimal habitat not present within the study area.	Prostrate shrub with one population restricted to Bankstown Airport. Grows in a highly modified habitat with surrounding native vegetation composition reminiscent of Castlereagh Ironbark Forest or Castlereagh Scribbly Gum Woodland and associated with Cumberland Dry Sclerophyll Forests, Sydney Sand Flats Dry Sclerophyll Forests, and Coastal Floodplain Wetlands. Grows in sandy tertiary alluvial soils with a high silt content.
Isotoma fluviatilis* subsp. *fluviatilis	-	EX	-	2002	Low	Species believed to be extinct.	Known to grow in damp places, on the Cumberland Plain, including freshwater wetland, grassland/alluvial woodland and an alluvial woodland/shale plains woodland (Cumberland Plain Woodland) ecotone. May be an early successional species that benefits from some disturbance. Possibly out competed when overgrown by some species such as *Cynodon dactylon*.
Leucopogon fletcheri* subsp. *fletcheri	-	-	EN	2010	Moderate	Marginal habitat present.	Erect, densely branched shrub restricted to north-west Sydney between St Albans in the north to Annangrove in the south. Grows along ridges and spurs on flat to

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC				
							gently sloping terrain in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands and Sydney Coastal Heaths. Grows on lateritic soils.
Macadamia integrifolia	Macadamia Nut	VU	-	2018	Low	Habitat not present within the study area.	Medium sized tree found growing from Mount Bauple, near Gympie to Currumbin Valley in the Gold Coast hinterland in south-east Queensland. Occurs in the Northern Rivers region of NSW in remnant rainforest, mixed notophyll forest and rainforest margins.
Marsdenia viridiflora* subsp. *viridiflora	Native Pear	-	EN	2021	Moderate	Some habitat present within the study area.	Slender climber with twining stems with a scattered distribution within the Prospect, Bankstown, Smithfield, Cabramatta Creek, St Mary's and north from Razorback Range. Grows in vine thickets and open shale woodland in a variety of communities including Cumberland Dry Sclerophyll Forests, Coastal Floodplains Wetlands, Coastal Valley Grassy Woodlands and Dry Rainforests.
Melaleuca deanei	Deane's Paperbark	VU	VU	2012#	Low	Habitat not present within the study area.	Medium sized shrub found growing in two distinct populations in the Ku-ring-gai/Berowra and Holsworthy/Wedderburn areas along with a few outliers at Springwood and in the Wollemi National Park, Yalwal and the Central Coast regions. Grows in ridgetop woodland in a variety of communities including Sydney Coastal Dry Sclerophyll Forests, South East Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands, Sydney Coastal Heaths. Grows on sandstone substrates in alluvial soils.
Micromyrtus minutiflora	-	VU	EN	2022	Moderate	Habitat present within the study area.	Slender, spreading shrub restricted to the western edge of the Cumberland Plain between Richmond and Penrith. Grows in Cumberland Dry Sclerophyll Forests and Sydney Sand Flats Dry Sclerophyll Forests

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC				
							including Castlereagh Scribbly Gum Woodlands, Castlereagh Ironbark Forests, and Shale/Gravel Transition Forests. Grows in tertiary alluvium and consolidated river sediments.
Persicaria elatior	Tall Knotweed	VU	VU	#	Low	Habitat not present within the study area.	Erect herb found growing in south-eastern NSW at Mount Dromedary, Moruya State Forest near Turlinjah, Upper Avon River catchment north of Robertson, Bermagui and Picton Lakes. Also grows in northern NSW around Raymond Terrace near Newcastle and Cherry Tree and Gibberagee State Forests in the Grafton area. Grows in damp places usually on the margins of waterbodies and in swamp forests in a variety of communities including Coastal Floodplain Wetlands, Coastal Swamp Forests, Eastern Riverine Forests, Coastal Freshwater Lagoons and Coastal Heath Swamps.
Persoonia hirsuta	Hairy Geebung	EN	EN	1998#	Low	The most recent record of this species is from over 20 years ago. Landscape features important for this species are not present within the study area.	Spreading, hairy shrub with a scattered distribution throughout Sydney from Singleton to the north, the east coast of Bargo to the south and the Blue Mountains to the west. Grows at elevations between 350 - 600 metres in a variety of communities including Southern Tableland Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Western Slopes Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands, Sydney Coastal Heaths and Southern Escarpment Wet Sclerophyll Forests. Grows in sandy soils on sandstone substrates.
Persoonia nutans	Nodding Geebung	EN	EN	2022#	Moderate	Several recent records within close proximity of the investigation area, and habitat present within the investigation area.	Erect or spreading shrub with a disjunct distribution restricted to the Cumberland Plain between Richmond in the north and Macquarie Fields in the south with core distribution occurring in the Penrith and to a lesser extent, Hawkesbury regions. Grows in Cumberland Dry Sclerophyll Forests including Agnes

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC				
							Banks Woodland, Castlereagh Scribbly Gum Woodland, Cooks River/Castlereagh Ironbark Forest and Shale-Sandstone Transition Forest as well as Sydney Sand Flats Dry Sclerophyll Forests and Coastal Valley Grassy Woodlands. Grows in sandy soils derived from aeolian or alluvial sediments as well as in tertiary alluviums to the south of its range.
Pilularia novae-hollandiae	Austral Pillwort	-	EN	1966	Low	Most recent record is from over 50 years ago, and habitat is not present within the investigation area.	Semi-aquatic fern with the only extant populations located at Lake Cowal and Oolambeyan National Park. Historical distribution ranged from Sydney, Khancoban, The Riverina near Albury and Urana. Grows in seasonally dry depressions, drainage lines, margins of marshes, shallow swamps and waterways in a variety of communities including Inland Riverine Forests, Inland Floodplain Swamps, Southern Tableland Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Coastal Swamp Forests, Coastal Freshwater Lagoons. Grows in mud amongst grasses and sedges.
Pimelea curviflora* var. *curviflora	-	VU	VU	2018#	Low	Habitat not present within the investigation area.	Small to medium sized shrub restricted to the coastal areas of Sydney between northern Sydney and Maroota with an outlying population at Croom Reserve near Albion Park in the Illawarra region. Grows on ridgetops and upper slopes amongst grasses and sedges in a variety of communities including Cumberland Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands, Sydney Coastal Heaths and Northern Hinterland Wet Sclerophyll Forests. Can be inconspicuous amongst grasses and sedges although easier to find in October to May when flowering. Grows on sandstone substrates in shale/lateritic soils and shale/sandstone transition soils.

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Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC				
Pimelea spicata	Spiked Rice-flower	EN	EN	2021#	Moderate	Habitat present within the investigation area.	Small erect or spreading shrub with populations occurring in two disjunct areas, one occurring on the Cumberland Plain from Marayong and Prospect Reservoir south to Narellan and Douglas Park, and the other occurring in the Illawarra from Landsdowne to Shellharbour and north Kiama. Grows in Maritime Grasslands and Coastal Valley Grassy Woodlands including Cumberland Plain Woodlands and Moist Shale Woodlands within the Cumberland Basin and in Coast Banksia Open Woodland Coastal Grasslands in the Illawarra region. Grows on well-structured clay soils.
Pomaderris brunnea	Brown Pomaderris	VU	EN	#	Low	No records within 10 km of the study area, and habitat not present within the investigation area.	Medium sized shrub with a distribution limited to the area around the Colo, Nepean and Hawkesbury Rivers including the Bargo area and near Camden. Grows on floodplains and creeklines in a variety of communities including Sydney Hinterland Dry Sclerophyll Forests, Central Gorge Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Coastal Valley Grasslands and North Coast Wet Sclerophyll Forests. Grows in clay and alluvial soils.
Pterostylis chaetophora	-	-	VU	1989	Low	Habitat not present within the investigation area. No recent records.	A terrestrial orchid known from 18 scattered locations in a relatively small area between Taree and Kurri Kurri, extending to the south-east towards Tea Gardens and west into the Upper Hunter, with additional records near Denman and Wingen and isolated records from the Sydney region. Grows in seasonally moist, dry sclerophyll forest with a grass and shrub understorey.
Pterostylis saxicola	Sydney Plains Greenhood	EN	EN	1900#	Low	Habitat not present within the investigation area.	Deciduous terrestrial orchid restricted to a few small populations located in Western Sydney between Freemans Reach in the north and Picton in the south including Georges River National Park. Found growing

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC				
							near streams in depression on sandstone rock shelves above cliff lines faces, moist, sheltered ridges and creek banks on mossy rocks in Temperate Montane Grasslands, Northern Warm Temperate Rainforests, Southern Warm Temperate Rainforests and Southern Tableland Wet Sclerophyll Forests. Grows in small pockets of shallow shale or shale/sandstone transition soils over sandstone substrates.
Pultenaea parviflora	-	VU	EN	2022#	Moderate	Several recent records near the study area, habitat present within the study area.	Small erect, branching shrub endemic to the Cumberland Plain from Windsor to Penrith east to Dean Park with outlying populations at Kemps Creek and Wilberforce. Found growing in Cumberland Dry Sclerophyll Forests including Castlereagh Ironbark Forest, Shale Gravel Transition Forest and Castlereagh Scribbly Gum Woodland, Sydney Coastal Dry Sclerophyll Forests, Sydney Sand Flats Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands and Southern Lowland Wet Sclerophyll Forests. Grows in soils derived from Wianamatta shale, laterite or alluvium.
Rhizanthella slateri	Eastern Australian Underground Orchid	EN	VU	#	Low	Habitat not present within the study area.	Terrestrial orchid with a distribution spanning from south-east NSW to south-east Queensland. Recorded in ten populations in NSW including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wisemans Ferry Area, Agnes Banks and near Nowra. A cryptic species which grows beneath the soil surface with flowers being the only part of the plant to occur aboveground in Sydney Sand Flats Dry Sclerophyll Forests, Eastern Riverine Forests, Northern Warm Temperate Rainforests, North Coast Wet Sclerophyll Forests, Northern Hinterland Wet Sclerophyll Forests and Southern Lowland Wet Sclerophyll Forests. Grows in deep loam soils.

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Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC				
Rhodamnia rubescens	Scrub Turpentine	-	CR	2018#	Low	Habitat not present within the study area.	Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.
Senna acclinis	Rainforest Cassia	-	EN	2015	Low	Habitat not present within the study area.	Tall shrub with populations occurring in the coastal districts and adjacent tablelands from the Illawarra to Queensland. Found growing on rainforest margins, often fulfilling the role of a gap phase shrub in a variety of communities including Sydney Coastal Dry Sclerophyll Forests, Dry Rainforests, Subtropical Rainforests, Western Vine Thickets, North Coast Wet Sclerophyll Forests and Northern Escarpment Wet Sclerophyll Forests.
Syzygium paniculatum	Magenta Lilly Pilly	VU	EN	2017#	Low	Habitat not present within the study area.	Small to medium sized rainforest tree restricted to a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest. Found growing on stabilized dunes near the sea in South Coast Sands Dry Sclerophyll Forests, Coastal Swamp Forests, Coastal Headland Heaths, Littoral Rainforests, Northern Hinterland Wet Sclerophyll Forests and Southern Lowland Wet Sclerophyll Forests. Grows on grey sandy, gravelly, silty or clay soils over sandstone substrates.
Tetratheca glandulosa	-	-	VU	2006	Low	Habitat not present within the study area.	Small, spreading shrub with 150 populations confined to the Baulkham Hills, Gosford, Hawkesbury, Ku-ring-gai, Pittwater, Ryde and Wyong Local Government Areas. Found growing in a variety of communities including Sydney Sandstone Ridgetop Woodland, Sydney Coastal Dry Sclerophyll Forests, Eastern Riverine Forests, Coastal Valley Grassy Woodlands, Sydney Montane Heaths and North Coast Wet Sclerophyll Forests. Grows in the shallow, yellow clay/sandy loams that are typical of shale/sandstone transition soils where shale caps occur over sandstone

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Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC				
							substrates such as the Lucas Heights, Gymea, Lambert and Faulconbridge soil landscapes.
Thelymitra kangaloonica	Kangaloon Sun Orchid	CR	CR	#	Low	Habitat not present within the study area.	Terrestrial orchid confined to the southern tablelands in the Moss Vale, Kangaloon, Fitzroy Falls area with the majority growing on land managed by the Sydney Catchment Authority. Found growing in swamps and sedgelands at elevations between 550 and 700 metres in Temperate Highland Peat Swamps on Sandstone, Coastal Heath Swamps and Montane Bogs and Fens. A cryptic species which is most visible when flowering between late October and early November. Grows in grey silty or grey loam soils.
Thesium australe	Austral Toadflax	VU	VU	#	Low	Habitat not present within the study area.	Small, straggling herb with a distribution comprising of small populations scattered along the coast of eastern NSW including the Northern and Southern Tablelands, Tasmania, Queensland and eastern Asia. A root parasite found growing on damp sites in grassland, grassy woodlands and coastal headlands often in association with Kangaroo Grass *Themeda triandra* in a variety of communities including New England Dry Sclerophyll Forests, Western Slopes Grasslands, Northern Tableland Wet Sclerophyll Forests, Brigalow Clay Plain Woodlands, Subalpine Woodlands and Maritime Grasslands.

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Appendix A.2. Priority weeds

Table A 2 Priority weed species recorded, or predicted to occur, within the Penrith City Council Local Government Area

Scientific name	Common name	Relevant Duty
Alternanthera philoxeroides	Alligator Weed	*General Biosecurity Duty* ***Biosecurity Zone*** *The Alligator Weed Biosecurity Zone is established for all land within the state except land in the following regions: Greater Sydney; Hunter (but only in the local government areas of City of Lake Macquarie, City of Maitland, City of Newcastle or Port Stephens). Within the Biosecurity Zone this weed must be eradicated where practicable, or as much of the weed destroyed as practicable, and any remaining weed suppressed. The local control authority must be notified of any new infestations of this weed within the Biosecurity Zone.* ***Regional Recommended Measure*** *Exclusion zone: Blue Mountains City Council area. Core infestation area: the remainder of the region. Whole region: Land managers prevent spread from their land where feasible. Exclusion zone: The plant is eradicated from the land and the land kept free of the plant. Core infestation area: Land managers mitigate the risk of new weeds being introduced to their land. Land managers reduce the impact on priority assets.*
Andropogon gayanus	Gamba Grass	*General Biosecurity Duty* ***Prohibited Matter***
Annona glabra	Pond Apple	*General Biosecurity Duty* ***Prohibited Matter***
Anredera cordifolia	Madeira Vine	*General Biosecurity Duty*
Arundo donax	Giant Reed	*General Biosecurity Duty* ***Regional Recommended Measure*** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should not be bought, sold, grown, carried or released into the environment.*
Asparagus aethiopicus	Ground Asparagus	*General Biosecurity Duty*
Asparagus africanus	Climbing Asparagus	*General Biosecurity Duty* ***Regional Recommended Measure*** *The plant should be eradicated from the land and the land kept free of the plant. Notify local control authority if found.*
Asparagus asparagoides	Bridal Creeper	*General Biosecurity Duty* *This requirement also applies to the Western Cape form of bridal creeper.*
Asparagus declinatus	Bridal Veil Creeper	*General Biosecurity Duty* ***Prohibited Matter***
Asparagus densiflorus	Foxtail Fern	*General Biosecurity Duty*

Scientific name	Common name	Relevant Duty
Asparagus falcatus	Sicklethorn	*General Biosecurity Duty* ***Regional Recommended Measure*** *The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*
Asparagus macowanii	Ming Asparagus Fern	*General Biosecurity Duty* ***Regional Recommended Measure*** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*
Asparagus plumosus	Climbing Asparagus Fern	*General Biosecurity Duty*
Asparagus scandens	Snakefeather	*General Biosecurity Duty*
Asparagus virgatus	Asparagus Fern	***Regional Recommended Measure*** *Exclusion zone: all lands in the region, except the core infestation area of: Central Coast local government area.* *Whole region: Land managers should mitigate the risk of new weeds being introduced to their land. The plant or parts of the plant should not be traded, carried, grown or released into the environment. Notify the Local Control Authority if found. Exclusion zone: The plant should be eradicated from the land and the land kept free of the plant. Core infestation: Land managers should mitigate spread from their land. Land managers should reduce impacts from the plant on priority assets.*
Asystasia gangetica* subsp. *micrantha	Chinese Violet	*General Biosecurity Duty* ***Control Order*** *Owners and occupiers of land on which there is Chinese Violet must notify the local control authority for the area if the Chinese Violet is part of a new infestation on the land, destroy all Chinese Violet on the land ensuring that subsequent generations of Chinese Violet are destroyed; and keep the land free of Chinese Violet. A person who deals with a carrier of Chinese Violet must ensure the plant (and any seed and propagules) is not moved from the land; and immediately notify the local control authority of the presence of the plant on the land, or on or in a carrier.*
Austrocylindropuntia cylindrica	Cane Cactus	*General Biosecurity Duty*
***Austrocylindropuntia* spp.**	Prickly Pear	*General Biosecurity Duty*
Austrocylindropuntia subulata	Eve's Needle Cactus	*General Biosecurity Duty*
Baccharis halimifolia	Groundsel Bush	*General Biosecurity Duty* ***Regional Recommended Measure*** *The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold,*

Scientific name	Common name	Relevant Duty
		grown, carried or released into the environment. Notify local control authority if found.
Barleria repens	Coral Creeper	*General Biosecurity Duty* ***Regional Recommended Measure*** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*
Bassia scoparia	Kochia	*General Biosecurity Duty* ***Prohibited Matter****, excluding the subspecies trichophylla.*
Cabomba caroliniana	Cabomba	*General Biosecurity Duty* ***Regional Recommended Measure*** *Land managers should mitigate the risk of new weeds being introduced to their land. Plants should not be bought, sold, grown, carried or released into the environment.*
Caesalpinia decapetala	Mysore Thorn	*General Biosecurity Duty* ***Regional Recommended Measure*** *The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment.*
Carduus nutans* subsp. *nutans	Nodding Thistle	*General Biosecurity Duty* ***Regional Recommended Measure*** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*
Centaurea stoebe* subsp. *micranthos	Spotted Knapweed	*General Biosecurity Duty* ***Prohibited Matter***
Centaurea X moncktonii	Black Knapweed	*General Biosecurity Duty* ***Prohibited Matter***
Cestrum parqui	Green Cestrum	*General Biosecurity Duty* ***Regional Recommended Measure*** *Land managers should mitigate the risk of new weeds being introduced to land used for grazing livestock. Land managers should mitigate spread from their land. Plant should not be bought, sold, grown, carried or released into the environment.*
Chromolaena odorata	Siam Weed	*General Biosecurity Duty* ***Prohibited Matter***
Chrysanthemoides monilifera* subsp. *monilifera	Boneseed	*General Biosecurity Duty* ***Control Order*** *Boneseed Control Zone: Whole of NSW.*

Scientific name	Common name	Relevant Duty
		Boneseed Control Zone (Whole of NSW): Owners and occupiers of land on which there is Boneseed must notify the local control authority of new infestations; immediately destroy the plants; ensure subsequent generations are destroyed; and ensure the land is kept free of the plant. A person who deals with a carrier of boneseed must ensure the plant (and any seed and propagules) is not moved from the land; and immediately notify the local control authority of the presence of the plant.
Chrysanthemoides monilifera* subsp. *rotundata	Bitou Bush	*General Biosecurity Duty* ***Biosecurity Zone*** *The Bitou Bush Biosecurity Zone is established for all land within the State except land within 10 kilometres of the mean high water mark of the Pacific Ocean between Cape Byron in the north and Point Perpendicular in the south. Within the Biosecurity Zone this weed must be eradicated where practicable, or as much of the weed destroyed as practicable, and any remaining weed suppressed. The local control authority must be notified of any new infestations of this weed within the Biosecurity Zone*
Clidemia hirta	Koster's Curse	*General Biosecurity Duty* ***Prohibited Matter***
***Cortaderia* spp.**	Pampas Grass	*General Biosecurity Duty* ***Regional Recommended Measure*** *Land managers mitigate the risk of the plant being introduced to their land. Land managers prevent spread from their land where feasible. Land managers reduce the impact on priority assets. The plant should not be bought, sold, grown, carried or released into the environment.*
Cryptostegia grandiflora	Rubber Vine	*General Biosecurity Duty* ***Prohibited Matter***
Cylindropuntia fulgida* var. *mamillata	Boxing Glove Cactus	*General Biosecurity Duty*
Cylindropuntia imbricata	Rope Pear	*General Biosecurity Duty*
Cylindropuntia pallida	Hudson Pear	*General Biosecurity Duty*
***Cylindropuntia* spp.**	Prickly Pear	*General Biosecurity Duty*
Cytisus scoparius* subsp. *scoparius	Scotch Broom	*General Biosecurity Duty* ***Regional Recommended Measure*** *Land managers mitigate the risk of the plant being introduced to their land. Land managers reduce the impact on priority assets.*
Dolichandra unguis-cati	Cat's Claw Creeper	*General Biosecurity Duty* ***Regional Recommended Measure*** *Land managers prevent spread from their land where feasible. Land managers mitigate the risk of the plant being introduced to their land. Land managers reduce the impact*

Scientific name	Common name	Relevant Duty
		on priority assets. The plant should not be bought, sold, grown, carried or released into the environment.
Dovyalis caffra	Kei Apple	*General Biosecurity Duty* ***Regional Recommended Measure*** *The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*
Eichhornia azurea	Anchored Water Hyacinth	*General Biosecurity Duty* ***Prohibited Matter***
Eichhornia crassipes	Water Hyacinth	*General Biosecurity Duty* ***Biosecurity Zone*** *The Water Hyacinth Biosecurity Zone applies to all land within the State, except for the following regions: Greater Sydney or North Coast, North West (but only the local government area of Moree Plains), Hunter (but only in the local government areas of City of Cessnock, City of Lake Macquarie, MidCoast, City of Maitland, City of Newcastle or Port Stephens), South East (but only in the local government areas of Eurobodalla, Kiama, City of Shellharbour, City of Shoalhaven or City of Wollongong).* *Within the Biosecurity Zone this weed must be eradicated where practicable, or as much of the weed destroyed as practicable, and any remaining weed suppressed. The local control authority must be notified of any new infestations of this weed within the Biosecurity Zone* ***Regional Recommended Measure*** *Land managers should mitigate spread from their land. Plant should not be bought, sold, grown, carried or released into the environment.*
***Equisetum* spp.**	Horsetails	*General Biosecurity Duty* ***Regional Recommended Measure*** *The plant should be eradicated from the land and the land kept free of the plant. Notify local control authority if found. Plant should not be bought, sold, grown, carried or released into the environment.*
Euphorbia paralias	Sea Spurge	*General Biosecurity Duty* ***Regional Recommended Measure*** *Exclusion zone: whole region except the core infestation area of Sutherland Shire.* *Whole region: Land managers should mitigate spread from their land. The plant should not be bought, sold, grown, carried or released into the environment.* *Exclusion zone: The plant should be eradicated from the land and the land kept free of the plant. Notify local control authority if found. Core area: Land managers should mitigate the risk of new weeds being introduced to their land.*
Genista linifolia	Flax-leaf Broom	*General Biosecurity Duty*

Scientific name	Common name	Relevant Duty
Genista monspessulana	Cape Broom	*General Biosecurity Duty*
Gloriosa superba	Glory Lily	*General Biosecurity Duty* ***Regional Recommended Measure*** *The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*
Gymnocoronis spilanthoides	Senegal Tea Plant	*General Biosecurity Duty* ***Regional Recommended Measure*** *Exclusion zone: whole region except the core infestation area of the Central Coast Council, Royal National Park and the Hawkesbury-Nepean River and its tributaries.* *Whole region: Land managers mitigate the risk of the plant being introduced to their land. The plant or parts of the plant are not traded, carried, grown or released into the environment. The Local Control Authority should be notified if the plant is found.* *Exclusion zone: The plant is eradicated and the land kept free of the plant. Core infestation area: Land managers prevent spread from their land where feasible.*
Heteranthera reniformis	Kidney-leaf Mud Plantain	*General Biosecurity Duty* ***Regional Recommended Measure*** *The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*
Heteranthera zosterifolia	Water Star Grass	*General Biosecurity Duty* ***Regional Recommended Measure*** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*
Hydrocleys nymphoides	Water Poppy	*General Biosecurity Duty* ***Regional Recommended Measure*** *Exclusion zone: All lands and waters in the region except for the core infestation area of the Hacking River catchment.* *Exclusion zone: The plant should be eradicated from the land and the land kept free of the plant. Notify Local Control Authority if found.* *Core infestation: Land managers should mitigate the risk of new weeds being introduced to their land. Land managers should mitigate spread from their land. Plant should not be bought, sold, grown, carried or released into the environment.*
Hydrocotyle ranunculoides	Hydrocotyl	*General Biosecurity Duty* ***Prohibited Matter***
Hygrophila costata	Hygrophila	*General Biosecurity Duty*

Scientific name	Common name	Relevant Duty
		Regional Recommended Measure *The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*
Hygrophila polysperma	East Indian Hygrophila	*General Biosecurity Duty* ***Regional Recommended Measure*** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*
Hymenachne amplexicaulis **(and hybrids)**	Hymenachne	*General Biosecurity Duty* ***Regional Recommended Measure*** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*
Jatropha gossypiifolia	Bellyache Bush	*General Biosecurity Duty*
Lagarosiphon major	Lagarosiphon	*General Biosecurity Duty* ***Prohibited Matter***
Lantana camara	Lantana	*General Biosecurity Duty*
Limnobium laevigatum	Frogbit	*General Biosecurity Duty* ***Prohibited Matter***
Limnobium spongia	Spongeplant	*General Biosecurity Duty* ***Prohibited Matter***
Limnocharis flava	Yellow Burrhead	*General Biosecurity Duty* ***Prohibited Matter***
Limonium hyblaeum	Sicilian Sea Lavender	*General Biosecurity Duty* ***Regional Recommended Measure*** *The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*
Ludwigia peruviana	Ludwigia	*General Biosecurity Duty* ***Regional Recommended Measure*** *Land managers mitigate the risk of the plant being introduced to their land. Land managers prevent spread from their land where feasible. Land managers reduce the impact on priority assets. The plant should not be bought, sold, grown, carried or released into the environment. Local Control Authority is notified if the plant is found on the land.*
Lycium ferocissimum	African Boxthorn	*General Biosecurity Duty*

Scientific name	Common name	Relevant Duty
***Miconia* spp.**	Miconia	*General Biosecurity Duty* ***Prohibited Matter***
Mikania micrantha	Mikania Vine	*General Biosecurity Duty* ***Prohibited Matter***
Mimosa pigra	Mimosa	*General Biosecurity Duty* ***Prohibited Matter***
Myriophyllum spicatum	Eurasian Water Milfoil	*General Biosecurity Duty* ***Prohibited Matter***
Nassella neesiana	Chilean Needle Grass	*General Biosecurity Duty*
Nassella tenuissima	Mexican Feather Grass	*General Biosecurity Duty* ***Prohibited Matter***
Nassella trichotoma	Serrated Tussock	*General Biosecurity Duty* ***Regional Recommended Measure*** *Exclusion zone: whole region excluding the core infestation area of Wollondilly and Camden.* *Whole region: Land managers should mitigate the risk of new weeds being introduced to their land. The plant or parts of the plant should not be traded, carried, grown or released into the environment. Notify the Local Control Authority if found.* *Exclusion zone: The plant should be eradicated from the land and the land kept free of the plant. Core infestation: Land managers should mitigate spread from their land.*
Olea europaea* subsp. *cuspidata	African Olive	***Regional Recommended Measure*** *An exclusion zone is established for all lands in Blue Mountains City Council and Central Coast local government areas. The remainder of the region is classified as the core infestation area.* *Whole region: The plant or parts of the plant are not traded, carried, grown or released into the environment. Exclusion zone: The plant is eradicated from the land and the land kept free of the plant.* *Core infestation area: Land managers prevent spread from their land where feasible. Land managers reduce impacts from the plant on priority assets.*
Opuntia aurantiaca	Tiger Pear	*General Biosecurity Duty* ***Regional Recommended Measure*** *Exclusion zone: all lands in the region except the core infestation area of: Blacktown and Wollondilly local government areas.* *Whole region: Land managers mitigate the risk of the plant spreading from their land. Notify Local Control Authority if found.* *Exclusion zone: The plant should be eradicated from the land and the land kept free of the plant. Core infestation: Land managers should mitigate the risk of new weeds being*

Scientific name	Common name	Relevant Duty
		introduced to their land. Land managers reduce impacts from the plant on priority assets.
Opuntia leucotricha	Aaron's Beard Prickly Pear	*General Biosecurity Duty*
Opuntia microdasys	Bunny Ears Cactus	*General Biosecurity Duty*
Opuntia monacantha	Smooth Tree Pear	*General Biosecurity Duty*
Opuntia robusta	Wheel Cactus	*General Biosecurity Duty*
Opuntia rufida	Blind Cactus	*General Biosecurity Duty*
Opuntia schickendantzii	Chicken Dance Cactus	*General Biosecurity Duty*
***Opuntia* spp.**	Prickly Pear	*General Biosecurity Duty, except for Opuntia ficus-indica (Indian Fig).*
Opuntia stricta	Common Pear	*General Biosecurity Duty*
Opuntia tomentosa	Velvety Tree Pear	*General Biosecurity Duty*
***Orobanche* spp.**	Broomrapes	***Prohibited Matter**, except Clover Broomrape Orobanche minor and Australian Broomrape Orobanche cernua var. australiana.*
Paederia foetida	Skunk Vine	*General Biosecurity Duty* ***Regional Recommended Measure*** *The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*
Parkinsonia aculeata	Parkinsonia	*General Biosecurity Duty* ***Control Order*** *Parkinsonia Control Zone: Whole of NSW.* *Parkinsonia Control Zone (Whole of NSW): Owners and occupiers of land on which there is Parkinsonia must notify the local control authority of new infestations; immediately destroy the plants; ensure subsequent generations are destroyed; and ensure the land is kept free of the plant. A person who deals with a carrier of Parkinsonia must ensure the plant (and any seed and propagules) is not moved from the land; and immediately notify the local control authority of the presence of the plant.*
Parthenium hysterophorus	Parthenium Weed	*General Biosecurity Duty* ***Prohibited Matter*** *The following equipment must not be imported into NSW from Queensland: grain harvesters (including the comb or front), comb trailers (including the comb or front), bins used for holding grain during harvest operations, augers or similar for moving grain, vehicles used to transport grain harvesters, support vehicles driven in paddocks during harvest operations, mineral exploration drilling rigs and vehicles used to transport those rigs, unless set out as an exception in*

Scientific name	Common name	Relevant Duty
		Division 5, Part 2 of the Biosecurity Order (Permitted Activities) 2017.
Pereskia aculeata	Leaf Cactus	*General Biosecurity Duty* ***Regional Recommended Measure*** *The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*
Persicaria chinensis	Chinese Knotweed	*General Biosecurity Duty* ***Regional Recommended Measure*** *The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*
***Pilosella* spp.**	Hawkweeds	*All species in the genera Pilosella and Hieracium are* ***Prohibited Matter*** *except for Hieracium murorum.*
Pistia stratiotes	Water Lettuce	*General Biosecurity Duty* ***Regional Recommended Measure*** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*
***Prosopis* spp.**	Mesquite	*General Biosecurity Duty*
Pueraria lobata	Kudzu	*General Biosecurity Duty* ***Regional Recommended Measure*** *The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*
***Rubus fruticosus* spp. aggregate**	Blackberry	*All species in the Rubus fruiticosus species aggregate have a General Biosecurity Duty requirement, except for the varietals Black Satin, Chehalem, Chester Thornless, Dirksen Thornless, Loch Ness, Murrindindi, Silvan, Smooth Stem, and Thornfree.*
Rubus niveus	White Blackberry	*General Biosecurity Duty* ***Regional Recommended Measure*** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*
Sagittaria platyphylla	Sagittaria	*General Biosecurity Duty*
Salix cinerea	Grey Sallow	*General Biosecurity Duty* ***Regional Recommended Measure*** *The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold,*

Scientific name	Common name	Relevant Duty
		grown, carried or released into the environment. Notify local control authority if found.
Salix nigra	Black Willow	*General Biosecurity Duty* ***Regional Recommended Measure*** *The plant is eradicated from the land and the land is kept free of the plant. Local Control Authority is notified if the plant is found on the land.*
***Salix* spp.**	Willows	*All species in the Salix genus have this a General Biosecurity Duty requirement, except Weeping Willows Salix babylonica, Pussy Willow Salix x calodendron and Sterile Pussy Willow Salix x reichardtii.*
Salvinia molesta	Salvinia	*General Biosecurity Duty* ***Regional Recommended Measure*** *Exclusion zone: whole region except for the core infestation area of the Georges and Hawkesbury-Nepean Rivers and their tributaries.* *Whole region: Land managers mitigate the risk of the plant being introduced to their land.* *Exclusion zone: The plant is eradicated and the land kept free of the plant. The Local Control Authority should be notified if the plant is found.* *Core infestation area: Land managers should prevent spread from their land where feasible.*
Senecio glastifolius	Holly Leaved Senecio	*General Biosecurity Duty* ***Regional Recommended Measure*** *Exclusion zone: whole region except for the core infestation area of the Royal National Park.* *Whole region: Land managers mitigate the risk of the plant being introduced to their land. The plant or parts of the plant are not traded, carried, grown or released into the environment. The Local Control Authority should be notified if the plant is found. Exclusion zone: The plant is eradicated and the land kept free of the plant.* *Core infestation area: Land managers prevent spread from their land where feasible. Land managers reduce impacts from the plant on priority assets.*
Senecio madagascariensis	Fireweed	*General Biosecurity Duty*
Solanum chrysotrichum	Giant Devil's Fig	*General Biosecurity Duty* ***Regional Recommended Measure*** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*
Solanum elaeagnifolium	Silverleaf Nightshade	*General Biosecurity Duty*
Solanum viarum	Tropical Soda Apple	*General Biosecurity Duty* ***Control Order***

Scientific name	Common name	Relevant Duty
		Tropical Soda Apple Control Zone: Whole of NSW. *Tropical Soda Apple Control Zone (Whole of NSW): Owners and occupiers of land on which there is tropical soda apple must notify the local control authority of new infestations; destroy the plants including the fruit; ensure subsequent generations are destroyed; and ensure the land is kept free of the plant. A person who deals with a carrier of tropical soda apple must ensure the plant (and any seed and propagules) is not moved from the land; and immediately notify the local control authority of the presence of the plant on the land, or on or in a carrier.*
Spartium junceum	Spanish Broom	*General Biosecurity Duty* ***Regional Recommended Measure*** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*
Sphagneticola trilobata	Singapore Daisy	*General Biosecurity Duty* ***Regional Recommended Measure*** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should not be bought, sold, grown, carried or released into the environment. Land managers reduce the impact on priority assets.*
Sporobolus pyramidalis	Giant Rat's Tail Grass	*General Biosecurity Duty* ***Regional Recommended Measure*** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should be eradicated from the land and the land kept free of the plant. The plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.*
Stratiotes aloides	Water Soldier	*General Biosecurity Duty* ***Prohibited Matter***
***Striga* spp.**	Witchweeds	***Prohibited Matter**, except the native Striga parviflora.*
Tamarix aphylla	Athel Pine	*General Biosecurity Duty*
***Trapa* spp.**	Water Caltrop	*General Biosecurity Duty* ***Prohibited Matter***
Ulex europaeus	Gorse	*General Biosecurity Duty* ***Regional Recommended Measure*** *Exclusion zone: Blue Mountains City Council area. Core infestation area: rest of region.* *Whole region: Land managers should mitigate the risk of new weeds being introduced to their land. The plant or parts of the plant should not be traded, carried, grown or released into the environment.* *Exclusion zone: The plant should be eradicated from the land and the land kept free of the plant. Core infestation area: Land managers should mitigate spread from their land.*

Scientific name	Common name	Relevant Duty
Vachellia karroo	Karroo Acacia	*General Biosecurity Duty* ***Prohibited Matter***
Vachellia nilotica	Prickly Acacia	*General Biosecurity Duty* ***Prohibited Matter***

Appendix B. Fauna

Appendix B.1. Threatened fauna species

The following table includes a list of the significant fauna species that have potential to occur within the study area. The list of species is sourced from the NSW BioNet Wildlife Atlas, BirdLife Australia data search and the Protected Matters Search Tool (Cth DCCEEW; accessed on 12/07/2024).

Notes to table

#	species predicted to occur by the Cth DCCEEW database (not recorded on other databases)
##	species predicted to occur based on natural distributional range and suitable habitat despite lack of records in the databases searched
Year	recorded on databases listed above
2023	recorded during current survey

Likelihood of occurrence	Potential criteria
High	• Species recorded in study area during current or previous assessment/s. • Aquatic species recorded from connected waterbodies in close proximity to the study area during current or previous assessment/s. • Sufficient good quality habitat is present in study area or in connected waterbodies in close proximity to the study area (aquatic species). • Study area is within species natural distributional range (if known). • Species has been recorded within 10 km or from the relevant catchment/basin.
Medium	• Records of terrestrial species within 10 km of the study area or of aquatic species in the relevant basin/neighbouring basin. • Habitat limited in its capacity to support the species due to extent, quality, or isolation.
Low	• No records within 10 km of the study area or for aquatic species, the relevant basin/neighbouring basin. • Marginal habitat present (low quality and extent). • Substantial loss of habitat since any previous record(s).
Negligible	• Habitat not present in study area • Habitat for aquatic species not present in connected waterbodies in close proximity to the study area. • Habitat present but sufficient targeted survey has been conducted at an optimal time of year and species wasn't recorded.
Transient	• Species which may occur only on occasion as part of larger nomadic, semi-nomadic or foraging movements.

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Table A 3 Threatened fauna species recorded, or predicted to occur, within 10 kilometres of the study area

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
Mammals								
Cercartetus nanus	Eastern Pygmy-possum	-	VU	-	2019	Moderate	Recent records of the species occur within the locality. Potential habitat occurs within the study area where moderate and high-quality native vegetation occur.	Patchily distributed from the coast to the Great Dividing Range, and as far as Pillaga, Dubbo, Parkes and Wagga Wagga on the western slopes. Inhabits rainforest through to sclerophyll forest and tree heath. Banksias and myrtaceous shrubs and trees are a favoured food source. Soft fruits are eaten when flowers are unavailable, and it also feeds on insects. Will often nest in tree hollows but can also construct its own nest. Because of its small size it is able to utilise a range of hollow sizes including very small hollows. Individuals will use a number of different hollows and an individual has been recorded using up to 9 nest sites within a 0.5 ha area over a 5-month period.
Chalinolobus dwyeri	Large-eared Pied Bat	VU	VU	-	2019#	Moderate	Recent records of the species occur within the locality. Potential habitat occurs within the study area where moderate and high quality native vegetation occur.	Occurs from the Queensland border to Ulladulla, with largest numbers from the sandstone escarpment country in the Sydney Basin and Hunter Valley. Primarily found in dry sclerophyll forests and woodlands, but also found in rainforest fringes and subalpine woodlands. Forages on small, flying insects below the forest canopy. Roosts in colonies of between three and 80 in caves, Fairy Martin nests and mines, and beneath rock overhangs, but usually less than 10 individuals. Likely that it hibernates during the cooler months. The only known existing maternity roost is in a sandstone cave near Coonabarabran.
Dasyurus maculatus	Spotted-tailed Quoll	EN	VU	-	2019#	Moderate	Recent records of the species occur within the locality. Potential habitat occurs within the study area where moderate and	Occurs along the east coast of Australia and the Great Dividing Range. Uses a range of habitats including sclerophyll forests and woodlands, coastal heathlands and rainforests. Occasional sightings have been made in open country, grazing lands, rocky outcrops and other treeless areas. Habitat requirements include suitable den sites, including hollow logs, rock crevices and caves, an abundance of food and an area of intact vegetation in which

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
							high quality native vegetation occur.	to forage. Seventy per cent of the diet is medium-sized mammals, and also feeds on invertebrates, reptiles and birds. Individuals require large areas of relatively intact vegetation through which to forage. The home range of a female is between 180 and 1000 ha, while males have larger home ranges of between 2000 and 5000 ha. Breeding occurs from May to August.
Falsistrellus tasmaniensis	Eastern False Pipistrelle	--	VU	-	2021	Moderate	Recent records of the species occur within the locality. Potential habitat occurs within the study area where moderate and high quality native vegetation occur and along riparian corridors.	Distribution extending east of the Great Dividing Range throughout the coastal regions of NSW, from the Queensland border to the Victorian border. Prefers wet high-altitude sclerophyll and coastal mallee habitat, preferring wet forests with a dense understorey but being found in open forests at lower altitudes. Apparently hibernates in winter. Roosts in tree hollows and sometimes in buildings in colonies of between 3 and 80 individuals. Often change roosts every night. Forages for beetles, bugs and moths below or near the canopy in forests with an open structure, or along trails. Has a large foraging range, up to 136 ha. Records show movements of up to 12 km between roosting and foraging sites.
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	--	VU	-	2022	Moderate	Recent records of the species occur within the locality. Potential habitat occurs within the study area where moderate and high quality native vegetation occur and along riparian corridors.	Distribution extends east of the Great Dividing Range from southern Queensland to south of Sydney. Most records are from dry eucalypt forests and woodland. Individuals tend to forage in natural and artificial openings in forests, although it has also been caught foraging low over a rocky river within rainforest and wet sclerophyll forest habitats. The species generally roosts in hollow spouts of large mature eucalypts (including paddock trees), although individuals have been recorded roosting in the roof of a hut, in wall cavities, and under metal caps of telegraph poles. Foraging generally occurs within a few kilometres of roosting sites.

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
Miniopterus australis	Little Bent-winged Bat	--	VU	-	2019	Moderate	Recent records of the species occur within the locality. Potential foraging habitat occurs within the study area where moderate and high quality native vegetation occur and along riparian corridors.	Occurs from Northern Queensland to the Hawkesbury River near Sydney. Roost sites encompass a range of structures including caves, tunnels and stormwater drains. Young are raised by the females in large maternity colonies in caves in summer. Shows a preference for well-timbered areas including rainforest, wet and dry sclerophyll forests, Melaleuca swamps and coastal forests. The Little Bentwing bat forages for small insects (such as moths, wasps and ants) beneath the canopy of densely vegetated habitats.
Miniopterus orianae oceanensis	Large Bent-winged Bat	--	VU	-	2021	Moderate	Recent records of the species occur within the locality. Potential foraging habitat occurs within the study area where moderate and high quality native vegetation occur and along riparian corridors.	Occurs from Victoria to Queensland, on both sides of the Great Dividing Range. Forms large maternity roosts (up to 100,000 individuals) in caves and mines in spring and summer. Individuals may fly several hundred kilometres to their wintering sites, where they roost in caves, culverts, buildings, and bridges. They occur in a broad range of habitats including rainforest, wet and dry sclerophyll forest, paperbark forest and open grasslands. Has a fast, direct flight and forages for flying insects (particularly moths) above the tree canopy and along waterways.
Myotis macropus	Southern Myotis	--	VU	-	2022	Moderate	Recent records of the species occur within the locality. Potential foraging habitat occurs within the study area along riparian corridors and suitable roosting structures such as culverts and hollow bearing trees have a high likelihood of occurrence in the study area.	Scattered, mainly coastal distribution extending to South Australia along the Murray River. Roosts in caves, mines or tunnels, under bridges, in buildings, tree hollows, and even in dense foliage. Colonies occur close to water bodies, ranging from rainforest streams to large lakes and reservoirs. They catch aquatic insects and small fish with their large hind claws, and also catch flying insects.

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
Petauroides volans	Greater Glider	VU	--	-	2019#	Moderate	Recent records occur within the locality and potential habitat exists within moderate and high quality vegetation. The species requires large hollows for shelter, further assessment of the study area will determine whether suitable habitat occurs.	The distribution of the Greater Glider includes the ranges and coastal plain of eastern Australia, where it inhabits a variety of eucalypt forests and woodlands. Presence and density of Greater Gliders is related to soil fertility, eucalypt tree species, disturbance history and density of suitable tree hollows. Feeds exclusively on eucalypt leaves, buds, flowers and mistletoe.
Petaurus australis	Yellow-bellied Glider	VU	VU	-	2019#	Moderate	Recent records occur within the locality and potential habitat exists within moderate and high quality vegetation. The species requires hollows for shelter, further assessment of the study area will determine whether suitable habitat occurs.	Restricted to tall native forests in regions of high rainfall along the coast of NSW. Preferred habitats are productive, tall open sclerophyll forests where mature trees provide shelter and nesting hollows. Critical elements of habitat include sap-site trees, winter flowering eucalypts, mature trees suitable for den sites and a mosaic of different forest types.
Petaurus norfolcensis	Squirrel Glider	--	VU	-	2019	Moderate	Recent records occur within the locality and potential habitat exists within moderate and high quality vegetation. The species requires hollows for shelter, further assessment of the study area will determine	Generally, occurs in dry sclerophyll forests and woodlands but is absent from dense coastal ranges in the southern part of its range. Requires abundant hollow-bearing trees and a mix of eucalypts, banksias and acacias. Within a suitable vegetation community at least one species should flower heavily in winter and one species of eucalypt should be smooth barked.

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
							whether suitable habitat occurs.	
Petrogale penicillata	Brush-tailed Rock-wallaby	VU	EN	-	#	Negligible	No suitable habitat occurs within the study area due to the lack of steep cliff areas and rock outcropping.	Occurs along the Great Dividing Range south to the Shoalhaven, and also occurs in the Warrumbungles and Mt Kaputar. Habitats range from rainforest to open woodland. It is found in areas with numerous ledges, caves and crevices particularly with northern aspects. The species forages on grasses and forbs.
Phascolarctos cinereus	Koala	EN	VU	-	2020#	Moderate	Records occur within 10 km of the study area, suitable foraging resources occur within the study area.	In NSW the Koala mainly occurs on the central and north coasts with some populations in the western region. Koalas feed almost exclusively on eucalypt foliage, and their preferences vary regionally. Primary feed trees include *Eucalyptus robusta, E. tereticornis, E. punctata, E. haemostoma* and *E. signata*. They are solitary with varying home ranges.
Pseudomys novaehollandiae	New Holland Mouse	VU	-	-	#	Negligible	No suitable habitat or known extant populations occur within the study area.	The New Holland Mouse currently has a disjunct, fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Across the species' range the New Holland Mouse is known to inhabit open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes. The home range of the New Holland Mouse can range from 0.44 ha to 1.4 ha. The New Holland Mouse is a social animal, living predominantly in burrows shared with other individuals. The species is nocturnal and omnivorous, feeding on seeds, insects, leaves, flowers and fungi, and is therefore likely to play an important role in seed dispersal and fungal spore dispersal. It is likely that the species spends considerable time foraging above-ground for food, predisposing it to predation by native predators and introduced species. Breeding typically occurs between August and January but can extend into autumn.
Pteropus poliocephalus	Grey-headed Flying-fox	VU	VU	-	2022#	Transient	Suitable foraging habitat occurs in the study area.	Occurs along the NSW coast, extending further inland in the north. This species is a canopy-feeding frugivore and nectarivore

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
							No recorded roosting camps occur within the study area, the closest camp is approximately 3.5km north west along Ropes Creek	of rainforests, open forests, woodlands, melaleuca swamps and banksia woodlands. Roosts in large colonies, commonly in dense riparian vegetation.
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	-	VU	-	2019	Moderate	Recent records of the species occur within the locality. Potential foraging habitat occurs within the study area where moderate and high quality native vegetation occur and along riparian corridors.	Found throughout NSW in habitats including wet and dry sclerophyll forest, open woodland, acacia shrubland, mallee, grasslands and desert. They roost in tree hollows in colonies and have also been observed roosting in animal burrows, abandoned Sugar Glider nests, cracks in dry clay, hanging from buildings and under slabs of rock. Forages for insects above the canopy in forests.
Scoteanax rueppellii	Greater Broad-nosed Bat	-	VU	-	2022	Moderate	Recent records of the species occur within the locality. Potential foraging habitat occurs within the study area where moderate and high quality native vegetation occur and along riparian corridors.	Occurs along the Great Dividing Range and in coastal areas. Occurs in woodland and rainforest, preferring open habitats or openings in wetter forests. Often hunts along creeks or river corridors. Preys upon beetles and other large, flying insects, other bats and spiders. Roosts in hollow tree trunks and branches.
Birds								
Anthochaera phrygia	Regent Honeyeater	CR	CR	-	2010#	Transient	No mapped important areas occur within the study area (DPE 2023c), however, the species may occur on occasion during	Regent Honeyeaters are semi-nomadic, occurring in temperate eucalypt woodlands and open forests. Most records are from box-ironbark eucalypt forest associations and wet lowland coastal forests. Nectar and fruit from mistletoes are also eaten. This species usually nest in tall mature eucalypts and sheoaks.

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
							nomadic, migratory movements	
Artamus cyanopterus cyanopterus	Dusky Woodswallow	-	VU	-	2019	Moderate	Recent records exist within the locality and potential habitat occurs within the study area.	Primarily inhabits dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. It has also been recorded in shrublands, heathlands and very occasionally in moist forest or rainforest. Also found in farmland, usually at the edges of forest or woodland.
Botaurus poiciloptilus	Australasian Bittern	EN	EN	-	2013#	Moderate	Recent records exist within the locality and potential habitat occurs within riparian corridors within the study area.	The Australasian Bittern is distributed across south-eastern Australia. Often found in terrestrial and estuarine wetlands, generally where there is permanent water with tall, dense vegetation including *Typha spp*. and *Eleoacharis spp*.. Typically this bird forages at night on frogs, fish and invertebrates, and remains inconspicuous during the day. The breeding season extends from October to January with nests being built amongst dense vegetation on a flattened platform of reeds.
Burhinus grallarius	Bush Stone-curlew	-	EN	-	1996	Low	The species is unlikely to occur in the study area or locality with no records occurring from the past 20 years, potential habitat occurring in a degraded state due to clearing, introduction of exotic species and high likelihood of threats such as predation from foxes, domestic cats and dogs occurring.	The Bush Stone-curlew is found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Only in northern Australia is it still common however and in the south-east it is either rare or extinct throughout its former range. Occurs in lightly timbered open forest and woodland, or partly cleared farmland with remnants of woodland, with a ground cover of short sparse grass and few or no shrubs where fallen branches and leaf litter are present.

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
Calidris ferruginea	Curlew Sandpiper	CR	EN	-	2010#	Negligible	Migratory wading bird, unlikely to occur in the study area. Waterways and farm dams do not provide suitable habitat for the species.	Inhabits sheltered intertidal mudflats. Also non-tidal swamps, lagoons and lakes near the coast. Infrequently recorded inland.
Callocephalon fimbriatum	Gang-gang Cockatoo	EN	VU	-	2018#	Moderate	Potential foraging habitat occurs in the study area and recent records exist within the locality.	In summer, occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. Also occur in subalpine Snow Gum woodland and occasionally in temperate or regenerating forest. In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas. It requires tree hollows in which to breed.
Calyptorhynchus lathami	Glossy Black-Cockatoo	-	VU	-	2022	Moderate	Potential foraging habitat occurs in the study area and recent records exist within the locality.	Inhabits forest with low nutrients, characteristically with key Allocasuarina species. Tends to prefer drier forest types. Often confined to remnant patches in hills and gullies. Breed in hollows stumps or limbs, either living or dead.
Chthonicola sagittata	Speckled Warbler	-	VU	-	2017	Moderate	Potential foraging habitat occurs in the study area and recent records exist within the locality.	Speckled Warbler occurs on the hills and tablelands of the Great Dividing Range. Found in eucalypt and cypress woodlands with a grassy understorey, often on ridges or gullies. The species nests on the ground in grass tussocks, dense litter and fallen branches. They forage on the ground for arthropods and seeds.
Circus assimilis	Spotted Harrier	-	VU	-	2013	Moderate	Potential foraging habitat occurs in the study area and recent records exist within the locality. The species may occur on occasion, although more	The Spotted Harrier is found throughout Australia but rarely in densely forested and wooded habitat of the escarpment and coast. Preferred habitat consists of open and wooded country with grassland nearby for hunting. Habitat types include open grasslands, acacia and mallee remnants, spinifex, open shrublands, saltbush, very open woodlands, crops and similar low vegetation. The Spotted Harrier is more common in drier

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Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
							common in drier inland areas.	inland areas, nomadic part migratory and dispersive, with movements linked to the abundance of prey species. Nesting occurs in open or remnant woodland and unlike other harriers, the Spotted Harrier nests in trees.
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	-	VU	-	2019	Moderate	Potential foraging habitat occurs in the study area and recent records exist within the locality.	Lives in eucalypt woodlands, especially areas of relatively flat open woodland typically lacking a dense shrub layer, with short grass or bare ground and with fallen logs or dead trees present.
Daphoenositta chrysoptera	Varied Sittella	-	VU	-	2022	Moderate	Potential foraging habitat occurs in the study area and recent records exist within the locality.	The Varied Sittella is a sedentary species which inhabits a wide variety of dry eucalypt forests and woodlands, usually with either shrubby understorey or grassy ground cover or both, in all climatic zones of Australia. Usually inhabit areas with rough-barked trees, such as stringybarks or ironbarks, but also in mallee and acacia woodlands, paperbarks or mature Eucalypts. The Varied Sittella feeds on arthropods gleaned from bark, small branches and twigs. It builds a cup-shaped nest of plant fibres and cobweb in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years.
Ephippiorhynchus asiaticus	Black-necked Stork	-	EN	-	2020	Low	Suitable habitat is not likely to occur within the study area as farm dams provide limited features of	Found in swamps, mangroves and mudflats. Can also occur in dry floodplains and irrigated lands and occasionally forages in open grassy woodland. Nests in live or dead trees usually near water.
Epthianura albifrons	White-fronted Chat	-	VU	-	2001	Low	The study area is not within the geographic extent of the known Sydney Metro CMA population. The study area does not provide suitable habitat for the species.	Sydney Metropolitan CMA: The White-fronted Chat occupies foothills and lowlands below 1000 m above sea level. In NSW it occurs mostly in the southern half of the state, occurring in damp open habitats along the coast, and near waterways in the western part of the state. The White-fronted Chat is found in damp open habitats, particularly wetlands containing saltmarsh areas that are bordered by open grasslands or lightly timbered

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
								lands. Along the coastline, they are found in estuarine and marshy grounds with vegetation less than 1 m tall. The species is also observed in open grasslands and sometimes in low shrubs bordering wetland areas. Inland, the species is often observed in open grassy plains, salt lakes and saltpans that are along the margins of rivers and waterways. In Victoria White-fronted Chats have been observed breeding from late July through to early March. Nests are built in low vegetation and in the Sydney region nests have also been observed in low isolated mangroves. An Endangered Population occurs in the Sydney Metropolitan CMA area, at Newington Nature Reserve near Homebush and at Towra Point Nature Reserve.
Falco hypoleucos	Grey Falcon	VU	EN	-	#	Low	Occurs mostly west of the Great Dividing Range, habitat in the study area is not typical of the species and no records occur in the locality.	Found over open country and wooded lands of tropical and temperate Australia. Mainly found on sandy and stony plains of inland drainage systems with lightly timbered acacia scrub.
Falco subniger	Black Falcon	-	VU	-	2013	Low	Occurs mostly west of the Great Dividing Range, habitat in the study area is not typical of the species and no records occur in the locality.	Mainly occur in woodlands and open country where can hunt. Often associated with swamps, rivers and wetlands. Nest in tall trees along watercourses.
Glossopsitta pusilla	Little Lorikeet	-	VU	-	2022	Moderate	The species has been recorded recently in the locality and suitable habitat occurs within the study area.	Distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range in NSW, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri. Mostly occur in dry, open eucalypt forests and woodlands. They feed primarily on nectar and pollen in the tree canopy. Nest hollows are located at heights of between 2 m and 15 m, mostly

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Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
								in living, smooth-barked eucalypts. Most breeding records come from the western slopes.
Grantiella picta	Painted Honeyeater	VU	VU	-	#	Low	The species is strongly associated with mistletoe and rarely recorded east of the Great Dividing Range. The species is unlikely to occur except on occasion.	Found mainly in dry open woodlands and forests, where it is strongly associated with mistletoe. Often found on plains with scattered eucalypts and remnant trees on farmlands.
Haliaeetus leucogaster	White-bellied Sea-Eagle	-	VU	-	2022#	Transient	The species has been recorded recently from the locality, the study area is unlikely to support suitable foraging and breeding habitat due to the small size of farm dams and waterways, however the species may occur due to the proximity of the study area in the landscape to larger features.	A migratory species that is generally sedentary in Australia, although immature individuals and some adults are dispersive. Found in terrestrial and coastal wetlands; favouring deep freshwater swamps, lakes and reservoirs; shallow coastal lagoons and saltmarshes. It hunts over open terrestrial habitats. Feeds on birds, reptiles, fish, mammals, crustaceans and carrion. Roosts and makes nest in trees.
Hieraaetus morphnoides	Little Eagle	-	VU	-	2019	Moderate	Suitable habitat occurs in the study area and the species has been recorded recently from the locality.	The Little Eagle is most abundant in lightly timbered areas with open areas nearby providing an abundance of prey species. It has often been recorded foraging in grasslands, crops, treeless dune fields, and recently logged areas. The Little Eagle nests in tall living trees within farmland, woodland and forests.
Hirundapus caudacutus	White-throated Needletail	VU	-	-	2016#	Transient	Recent records occur within the locality and the study area provides suitable habitat.	An aerial species found in feeding concentrations over cities, hilltops and timbered ranges. Breeds in Asia.

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
Ixobrychus flavicollis	Black Bittern	-	VU	-	2016	Moderate	Recently recorded in close proximity to the study area in South Creek. May occur in the riparian corridors within the study area.	The Black Bittern is found along the coastal plains within NSW, although individuals have rarely being recorded south of Sydney or inland. It inhabits terrestrial and estuarine wetlands such as flooded grasslands, forests, woodlands, rainforests and mangroves with permanent water and dense waterside vegetation. The Black Bittern typically roosts on the ground or in trees during the day and forages at night on frogs, reptiles, fish and invertebrates. The breeding season extends from December to March. Nests are constructed of reeds and sticks in branches overhanging the water.
Lathamus discolor	Swift Parrot	CR	EN	-	2021#	Moderate	The species has been recorded recently in the locality and suitable habitat occurs within the study area. Mapped important habitat occurs within the study area, it is recommended important habitat is avoided.	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects. The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW. Favoured feed trees include winter flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*. Commonly used lerp infested trees include Grey Box *E. microcarpa*, Grey Box *E. moluccana* and Blackbutt *E. pilularis*. This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability.
Limosa limosa	Black-tailed Godwit	-	VU	-	1982	Negligible	Migratory wading bird, unlikely to occur in the study area. Waterways and farm dams do not provide suitable habitat for the species.	The Black-tailed Godwit is a migratory wading bird that breeds in Mongolia and Eastern Siberia and flies to Australia for the southern summer, arriving in August and leaving in March. In NSW, it is most frequently recorded at Kooragang Island (Hunter River estuary), with occasional records elsewhere along the coast, and inland. Records in western NSW indicate that a regular inland passage is used by the species, as it may occur around any of the large lakes in the western areas during summer, when the muddy shores are exposed. The species has

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
								been recorded within the Murray-Darling Basin, on the western slopes of the Northern Tablelands and in the far north-western corner of the state.
Lophoictinia isura	Square-tailed Kite	-	VU	-	2020	Moderate	Recent records occur within the locality and native vegetation provides potentially suitable habitat in the study area.	Typically inhabits coastal forested and wooded lands of tropical and temperate Australia. In NSW it is often associated with ridge and gully forests dominated by *Eucalyptus longifolia, Corymbia maculata, E. elata,* or *E. smithii*. Individuals appear to occupy large hunting ranges of more than 100 km2. They require large living trees for breeding, particularly near water with surrounding woodland /forest close by for foraging habitat. Nest sites are generally located along or near watercourses, in a tree fork or on large horizontal limbs.
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	-	VU	-	2004	Moderate	Recent records occur within the locality and native vegetation provides potentially suitable habitat in the study area.	This species lives in a wide range of temperate woodland habitats, and a range of woodlands and shrublands in semi-arid areas.
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	-	VU	-	2007	Moderate	Recent records occur within the locality and native vegetation provides potentially suitable habitat in the study area.	Found mostly in open forests and woodlands dominated by box and ironbark eucalypts. It is rarely recorded east of the Great Dividing Range.
Neophema pulchella	Turquoise Parrot	-	VU	-	2012	Transient	Recent records occur within the locality and native vegetation provides potentially suitable habitat in the study area.	Occurs in open woodlands and eucalypt forests with a ground cover of grasses and understorey of low shrubs. Generally found in the foothills of the Great Divide, including steep rocky ridges and gullies. Nest in hollow-bearing trees, either dead or alive; also in hollows in tree stumps. Prefer to breed in open grassy forests and woodlands, and gullies that are moist.
Ninox connivens	Barking Owl	-	VU	-	2019	Moderate	Recent records occur within the locality and	Generally found in open forests, woodlands, swamp woodlands, farmlands and dense scrub. Can also be found in the foothills

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
							native vegetation provides potentially suitable habitat in the study area.	and timber along watercourses in otherwise open country. Territories are typically 2000 ha in NSW habitats. Hunts small arboreal mammals or birds and terrestrial mammals when tree hollows are absent.
Ninox strenua	Powerful Owl	-	VU	-	2022	Moderate	Recent records occur within the locality and native vegetation provides potentially suitable habitat in the study area.	The Powerful Owl occupies wet and dry eucalypt forests and rainforests. It may inhabit both un-logged and lightly logged forests as well as undisturbed forests where it usually roosts on the limbs of dense trees in gully areas. Large mature trees with hollows at least 0.5 m deep are required for nesting. Tree hollows are particularly important for the Powerful Owl because a large proportion of the diet is made up of hollow-dependent arboreal marsupials. Nest trees for this species are usually emergent with a diameter at breast height of at least 100 cm. It has a large home range of between 450 and 1450 ha.
Numenius madagascariensis	Eastern Curlew	CR	-	-	#	Negligible	Migratory wading bird, unlikely to occur in the study area. Waterways and farm dams do not provide suitable habitat for the species.	Occurs in sheltered coasts, especially estuaries, embayments, harbours, inlets and coastal lagoons with large intertidal mudflats or sandflats often with beds of seagrass.
Pandion cristatus	Eastern Osprey	-	VU	-	2014#	Moderate	Recent records occur within the locality and native vegetation provides potentially suitable habitat in the study area.	Found in coastal waters, inlets, estuaries and offshore islands. Occasionally found 100 km inland along larger rivers. It is water-dependent, hunting for fish in clear, open water. The Osprey occurs in terrestrial wetlands, coastal lands and offshore islands. It is a predominantly coastal species, generally using marine cliffs as nesting and roosting sites. Nests can also be made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.
Petroica boodang	Scarlet Robin	-	VU	-	2015	Moderate	Recent records occur within the locality and	The Scarlet Robin inhabits dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
							native vegetation provides potentially suitable habitat in the study area.	shrubs. During autumn and winter it moves to more open and cleared areas. The Scarlet Robin forages amongst logs and woody debris for insects. The nest is an open cup of plant fibres and cobwebs, sited in the fork of a tree.
Petroica phoenicea	Flame Robin	-	VU	-	2014	Moderate	Recent records occur within the locality and native vegetation provides potentially suitable habitat in the study area.	Flame Robins are found in a broad coastal band from southern Queensland to just west of the South Australian border. The preferred habitat in summer includes moist eucalyptus forests and open woodlands, in winter prefers open woodlands and farmlands. It is considered migratory. Diet consists mainly of invertebrates.
Petroica rodinogaster	Pink Robin	-	VU	-	2013	Moderate	Recent records occur within the locality and native vegetation provides potentially suitable habitat in the study area.	The Pink Robin is found in dense, dank forests and treefern gullies. During the winter months the Pink Robin disperses north (as far up as the central coast of NSW) and west (as far as the ACT area) into more open forests, woodlands and scrublands. The diet consists mainly of spiders and insects.
Ptilinopus superbus	Superb Fruit-Dove	-	VU	-	2002	Moderate	Recent records occur within the locality and native vegetation provides potentially suitable habitat in the study area.	The Superb Fruit Dove ranges from northern NSW to as far south as Moruya. It is found in rainforests, closed forests (including mesophyll vine forests) and sometimes in eucalypt and acacia woodlands with fruit-bearing trees. It forages in the canopy of fruiting trees such as figs and palms.
Pycnoptilus floccosus	Pilotbird	VU	-	-	#	Low	There are no local records of this species and it is unlikely to occur in the vegetation types within the study area.	The pilotbird is found from the Wollemi National Park and Blue Mountains National Park in New South Wales through to the Dandenong Ranges, near Melbourne in Victoria. Its natural habitat is temperate wet sclerophyll forests and occasionally temperate rainforest, where there is dense undergrowth with abundant debris. [ALA 2022]
Rostratula australis	Australian Painted Snipe	EN	EN	-	2015#	Low	Records occur within the locality however larger areas of wetlands and shallow wading habitat	Usually found in shallow inland wetlands including farm dams, lakes, rice crops, swamps and waterlogged grassland. They prefer freshwater wetlands but have been recorded in brackish

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
							utilised by this species are not present and it is unlikely to occur except on occasion as part of dispersal movements.	waters. Forages on mudflats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter.
Stagonopleura guttata	Diamond Firetail	-	VU	-	2014	Moderate	Recent records occur within the locality and native vegetation provides potentially suitable habitat in the study area.	The Diamond Firetail is widely distributed, found in a range of habitat types including open eucalypt forest, mallee and acacia scrubs. Often occur in vegetation along watercourses. Feeds exclusively on the ground on ripe grass and herb seeds, green leaves and insects.
Stictonetta naevosa	Freckled Duck	-	VU	-	2018	Low	Although recorded recently in the locality, waterways and farm dams do not provide suitable habitat for the species. Farm dams are not heavily vegetated and do not provide large open spans of water.	The Freckled Duck breeds in permanent fresh swamps that are heavily vegetated. Found in fresh or salty permanent open lakes, especially during drought. Often seen in groups on fallen trees and sand spits.
Tyto novaehollandiae	Masked Owl	-	VU	-	2019	Moderate	Recent records occur within the locality and native vegetation provides potentially suitable habitat in the study area.	The Masked Owl is found in range of wooded habitats that provide tall or dense mature trees with hollows suitable for nesting and roosting. It is mostly seen in open forests and woodlands adjacent to cleared lands. Prey includes hollow-dependent arboreal marsupials and terrestrial mammals.
Tyto tenebricosa	Sooty Owl	-	VU	-	2019	Moderate	Recent records occur within the locality and native vegetation provides potentially suitable habitat in the study area. Habitat within the study area is likely marginal due to the	The Sooty Owl is often found in tall old-growth forests, including temperate and subtropical rainforests. It is mostly found on escarpments with a mean altitude <500 m. This species nests and roosts in hollows of emergent trees, mainly eucalypts often located in gullies.

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
							topography and disturbed nature of the study area.	
Frogs								
Heleioporus australiacus	Giant Burrowing Frog	VU	VU	-	2004#	Moderate	Records occur within the locality and suitable microhabitat may occur in the study area.	Prefers hanging swamps on sandstone shelves adjacent to perennial non-flooding creeks. Can also occur within shale outcrops within sandstone formations. Known from wet and dry forests and montane woodland in the southern part range. Individuals can be found around sandy creek banks or foraging along ridge-tops during or directly after heavy rain. Males often call from burrows located in sandy banks next to water. Spends the majority of its time in non-breeding habitat 20-250m from breeding sites.
Litoria aurea	Green and Golden Bell Frog	VU	EN	-	2019#	Moderate	Records occur within the locality and suitable microhabitat may occur in the study area.	Most existing locations for the species occur as small, coastal, or near coastal populations, with records occurring between south of Grafton and northern VIC. The species is found in marshes, dams and stream sides, particularly those containing bullrushes or spikerushes. Preferred habitat contains water bodies that are unshaded, are free of predatory fish, have a grassy area nearby and have diurnal sheltering sites nearby such as vegetation or rocks, although the species has also been recorded from highly disturbed areas including disused industrial sites, brick pits, landfill areas and cleared land. Breeding usually occurs in summer. Tadpoles, which take approximately 10-12 weeks to develop, feed on algae and other vegetative matter. Adults eat insects as well as other frogs, including juveniles of their own species.
Pseudophryne australis	Red-crowned Toadlet	-	VU	-	2021	Moderate	Records occur within the locality and suitable microhabitat may occur in	Occurs on wetter ridge tops and upper slopes of sandstone formations on which the predominant vegetation is dry open forests and heaths. This species typically breeds within small

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
							the study area along waterways.	ephemeral creeks characterised by a series of shallow pools that feed into larger semi-perennial streams.
Fish								
Macquaria australasica	Macquarie Perch	EN	-	EN	#	Low	Not recorded from the locality.	Macquarie Perch are found in the Murray-Darling Basin (particularly upstream reaches) of the Lachlan, Murrumbidgee and Murray rivers, and parts of south-eastern coastal NSW, including the Hawkesbury and Shoalhaven catchments. Macquarie perch are found in both river and lake habitats, especially the upper reaches of rivers and their tributaries
Prototroctes maraena	Australian Grayling	VU	-	EN	#	Low	Not recorded from the locality.	The Australian Grayling occurs in streams and rivers on the eastern and southern flanks of the Great Dividing Range from Sydney southwards to the Otway Ranges in Victoria, and Tasmania. Australian grayling does not occur in the inland Murray–Darling Basin system. Grayling is a diadromous species, migrating between freshwater streams and the ocean. This species has been found in clear, gravel-bottomed streams with alternating pools and riffles, and granite outcrops, and in muddy-bottomed, heavily silted habitats.
Reptiles								
Eulamprus leuraensis	Blue Mountains Water Skink	EN	EN	-	2014	Low	No suitable swampy heaths occur in the study area, the species is not known from the locality.	Swampy heaths over sandstone at Wentworth falls, Leura and Newnes Plateau in the Blue Mountains. Basks on dense grass tussocks, sheltering beneath them or in burrows, including those of crustaceans, when disturbed.
Hoplocephalus bungaroides	Broad-headed Snake	VU	EN	-	2016	Low	Suitable habitat is not likely to occur in the study area due to topography, remnant native vegetation and lack of rock outcropping.	Mainly occurs in association with communities occurring on Triassic sandstone within the Sydney Basin. Typically found among exposed sandstone outcrops with vegetation types ranging from woodland to heath. Within these habitats they generally use rock crevices and exfoliating rock during the cooler months and tree hollows during summer.

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
Gastropods								
Meridolum corneovirens	Cumberland Plain Land Snail	-	EN	-	2022	Moderate	Potential suitable habitat occurs in the study area including suitable remnants of Cumberland Plain Woodland.	Most likely restricted to Cumberland Plain, Castlereagh Woodlands and boundaries between River-flat Forest and Cumberland Plain Woodland. It is normally found beneath logs, debris and amongst accumulated leaf and bark particularly at the base of trees. May also use soil cracks for refuge.
Pommerhelix duralensis	Dural Land Snail	EN	EN	-	2019	Moderate	Potential suitable habitat occurs in the study area and the species is known from the wider locality.	The species is a shale-influenced-habitat specialist, which occurs in low densities along the western and northwest fringes of the Cumberland IBRA subregion on shale-sandstone transitional landscapes. The species has a strong affinity for communities in the interface region between shale-derived and sandstone-derived soils, with forested habitats that have good native cover and woody debris. It favours sheltering under rocks or inside curled-up bark. It does not burrow nor climb. The species has also been observed resting in exposed areas, such as on exposed rock or leaf litter, however it will also shelter beneath leaves, rocks and light woody debris.

* - habitat descriptions have been adapted by qualified ecologists from the Cth DCCEEW Species Profile and Threats (SPRAT) Database, NSW DCCEEW Threatened Species online profiles and the NSW Scientific Committee final determinations for listed species, references within the above table are provided within the report reference list.

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Appendix B.2. Migratory species (EPBC Act listed)

Includes records from the following sources:

- NSW BioNet Wildlife Atlas (refer to Section 2.1)
- Cth DCCEEW database (accessed on 21/05/2024)
- BirdLife Australia data search
- Current survey

Bold denotes species recorded in the study area during the current assessment.

Table A 4 Migratory fauna species recorded or predicted to occur within 10 kilometres of the study area

Scientific name	Common name	Most recent record
Actitis hypoleucos	Common Sandpiper	2003#
Apus pacificus	Fork-tailed Swift	2015#
Calidris acuminata	Sharp-tailed Sandpiper	2018#
Calidris ferruginea	Curlew Sandpiper	2010#
Calidris melanotos	Pectoral Sandpiper	#
Calidris ruficollis	Red-necked Stint	2010
Charadrius veredus	Oriental Plover	2014
Gallinago hardwickii	Latham's Snipe	2020#
Gelochelidon nilotica	Gull-billed Tern	2012
Hirundapus caudacutus	White-throated Needletail	2016#
Hirundo rustica	Barn Swallow	2021
Hydroprogne caspia	Caspian Tern	2001
Limosa limosa	Black-tailed Godwit	1982
Motacilla flava	Yellow Wagtail	#
Numenius madagascariensis	Eastern Curlew	#
Numenius minutus	Little Curlew	2012
Pandion cristatus	Eastern Osprey	2014#
Plegadis falcinellus	Glossy Ibis	2013
Pluvialis fulva	Pacific Golden Plover	2010
Pluvialis squatarola	Grey Plover	2012
Tringa glareola	Wood Sandpiper	2010
Tringa nebularia	Common Greenshank	1998#
Tringa stagnatilis	Marsh Sandpiper	2010

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