South Creek West (South West) Precinct Biodiversity Assessment

BHL Group

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Template 2.8.1

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Abbreviations

Abbreviation	Description
AHCVV	Additional High Conservation Value Vegetation – vegetation meeting the requirements for ENV that was not mapped in the Growth Centres Conservation Plan
BC Act	*Biodiversity Conservation Act 2016*
CEEC	Critically Endangered Ecological Community
DAWE	Department of Agriculture, Water and the Environment (previously DotEE)
DCP	Development Control Plan
DotEE	Department of the Environment and Energy (now DAWE)
DPIE	Department of Planning, Industry and Environment
ELA	Eco Logical Australia Pty Ltd
ENV	Existing Native Vegetation, as defined in the Growth Centres Conservation Plan
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
IPC & AES	Ian Perkins Consultancy Services and Aquila Ecological Surveys
ILP	Indicative Layout Plan
MNES	Matters of National Environmental Significance
NPWS	NSW National Parks and Wildlife Service
OEH	NSW Office of Environment and Heritage (known now as DPIE)
SCW	South Creek West
SCWLA	South Creek West Land Release area
SWGA	South West Growth Area
TSC Act	*Threatened Species Conservation Act 1995*
TSSC	Threatened Species Scientific Committee

Executive Summary

Eco Logical Australia Pty Ltd (ELA) was engaged by BHL Group to undertake a Biodiversity Assessment for Precinct Planning of the South Creek West (South West) precinct, 'Precinct 5'. The aim of this report is to identify key ecological constraints to assist design of an Indicative Layout Plan (ILP).

Biodiversity Certification of the Growth Centres Conservation Plan identifies a regional offsets package, effectively facilitating the strategic loss of ecological values on 'certified lands' without triggering further assessment under the former *Threatened Species Conservation Act 1995* (TSC Act – now the *Biodiversity Conservation Act 2016* (BC Act)). This strategic loss is offset through the retention and management of areas of higher ecological value across the Growth Centres and through a levy that will be used to protect and manage areas of high ecological value outside of the Growth Centres. A Strategic Assessment under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) was approved by the Commonwealth (the then Department of Sustainability, Environment, Water, Population and Communities). Therefore, provided development proceeds in accordance with the Growth Centres Biodiversity Certification Order, the assessment and approval of threatened species and endangered ecological communities under Commonwealth legislation is not required.

The site was found to contain a number of significant environmental features, including Cumberland Plain Woodland (a critically endangered ecological community under both the BC Act and EPBC Act), River-Flat Eucalypt Forest (an endangered ecological community under the BC Act) and habitat features associated with potential habitat for a number of threatened flora and fauna species.

Approximately 1.59 ha of vegetation in the precinct was identified in the Draft Growth Centres Conservation Plan 2007. Desktop assessment and field survey identified 23.01 ha of Additional High Conservation Value Vegetation (AHCVV) within the subject site.

Sub-Precinct 5 is wholly biodiversity certified. Under the Draft Growth Centres Conservation Plan, no Existing Native Vegetation (ENV) within the study area was counted towards achieving the 2000-hectare conservation outcome.

The vegetation on site does however have biodiversity value and Precinct Planning should consider opportunities to protect vegetation where possible, particularly where synergies with riparian protection and improved amenity can be achieved.

The ILP will protect 1.06 ha of validated ENV and 9.41 ha of validated AHCVV, through the protection of native vegetation within the proposed riparian corridor and Ridgeline Park.

1. Introduction

1.1 Overview

Eco Logical Australia Pty Ltd (ELA) was engaged by BHL Group to undertake a Biodiversity Assessment for Precinct Planning of the South Creek West (South West) Precinct within the South-West Growth Centre.

The South Creek West Land Release Area forms part of the South West Growth Area (SWGA). Given the scale of the release area, the Department of Planning, Industry and Environment (DPIE) divided it into five distinct precincts numbered 1 – 5. The land to which this Planning Proposal relates to is referred to as Cobbitty Sub-Precinct 5, also known as Precinct 5. It totals approximately 303 hectares and has been characterised by rural residential and agricultural land uses and activities.

The precinct was released by the Minister for Planning on 24 November 2017 for urban development. The release formally commenced the rezoning process for land within the precinct, including the subject site.

Precinct 5 is located within the south-west portion of the South Creek West Land Release (SCWLA) area within the suburb of Cobbitty in the Camden LGA. The Precinct adjoins the Lowes Creek Maryland Precinct, which has recently been rezoned to the north, the Pondicherry precinct to the east which is in the process of being rezoned and the growing town centre and suburbs of Oran Park to the south.

Figure 1 illustrates the site boundaries of the Cobbitty Precinct and SCWLA.

1.2 Proposal

BHL, as the major landholder in the precinct, seeks to initiate the preparation of a planning proposal for the rezoning of Precinct 5, consistent with the Draft Indicative Layout Plan (ILP). This is to facilitate the orderly redevelopment of Precinct 5 into a residential community.

The intended outcome of this Planning Proposal is to amend the current *State Environmental Planning Policy (Sydney Region Growth Centres) 2006* to facilitate the urban development of Precinct 5 as part of the South West Growth Centre as envisaged in the Greater Sydney Commission's Regional Plan and District Plan.

The Draft ILP has been prepared to support the planning proposal and precinct rezoning and has been informed by extensive specialist consultant studies. The site will comprise approximately 3,800 dwellings and a population of approximately 12,000 people within a thriving community supported by:

- Easy access to jobs in the Western Sydney Aerotropolis
- Local shops, community uses and services, and proximity to the Oran Park Town Centre
- Over 78ha of open space, including 32 ha of sporting fields and local parks
    - Open space typologies also include creeks, grasslands, playgrounds, and other nature-based recreations areas
- Pedestrian and cycling connections including a central green corridor
- Prominent creeks and riparian areas that retain water in the local environment

- A future local school
- Integrated stormwater and services infrastructure that improve local amenity

The proposed new planning controls comprise amendments to *State Environmental Planning Policy (Sydney Region Growth Centres) 2006* and associated environmental planning instruments including the rezoning of the precinct to reflect land uses shown in the Draft ILP.

This Planning Proposal also seeks to introduce a site-specific Schedule to the *Camden Growth Centre Precincts Development Control Plan* to support the Precincts development in accordance with the Draft ILP and supporting technical investigations.

The key parameters of the proposal are outlined in Table 1.

Table 1: Key parameters of the proposal

Key Parameter	Indicative Layout Plan
Precinct name	Cobbitty Sub Precinct 5 / (Precinct 5)
Proponent reference	BHL Group
Total site size	303.15 ha (approx. 303)
Total public open space	31.79 ha (approx. 32)
Total passive open space	16.8 ha (approx. 17)
Total active open space	14.99 ha (approx. 15)
Riparian corridor area	40.93 ha (approx. 41)
Detention Basins	14.8 ha (approx. 15)
Grassland areas (Easement)	5.67 ha (approx. 6)
Projected Dwelling Yield	3,800 (approx. 3,800)
Average Household Size	3.1
Projected total population	11,903 (approx. 12,000)

It is noted that the findings/recommendations/conclusions of this [technical report] were based on a previous Indicative Layout which considered the entirety of Sub-Precinct 5. The current ILP only incorporates Lots 2 & 4 in DP 1216380, Lot 2 in DP 1241819 and Lot 500 in DP 1231858 as shown in Figure 2.

The findings/recommendations/conclusions of this report remain relevant, providing a holistic assessment of the precinct to inform future development on the subject site. It is intended this report will be updated to reflect the refined ILP and any comments received following public notification.

1.3 Methodology overview

An overview of the methodology is provided below. For full details see Appendix B.

- database search for threatened species, populations and ecological communities under the Biodiversity Conservation Act and Matters of National Environmental Significance (NES) under the EPBC Act;

- assessment of State and Federal statutory requirements;
- validation of vegetation threatened species and habitat condition mapping. Assessments include the identification of AHCVV;
- assessment of biodiversity values and mapping including analysis and identification of ecological constraints (rated low, moderate and high);
- desktop assessment of subject site outside of the survey area
- recommendations for the development.

Figure 3 illustrates the location of the precinct ('subject site'). The 'survey area' refers to the portion of the subject site that was field validated.

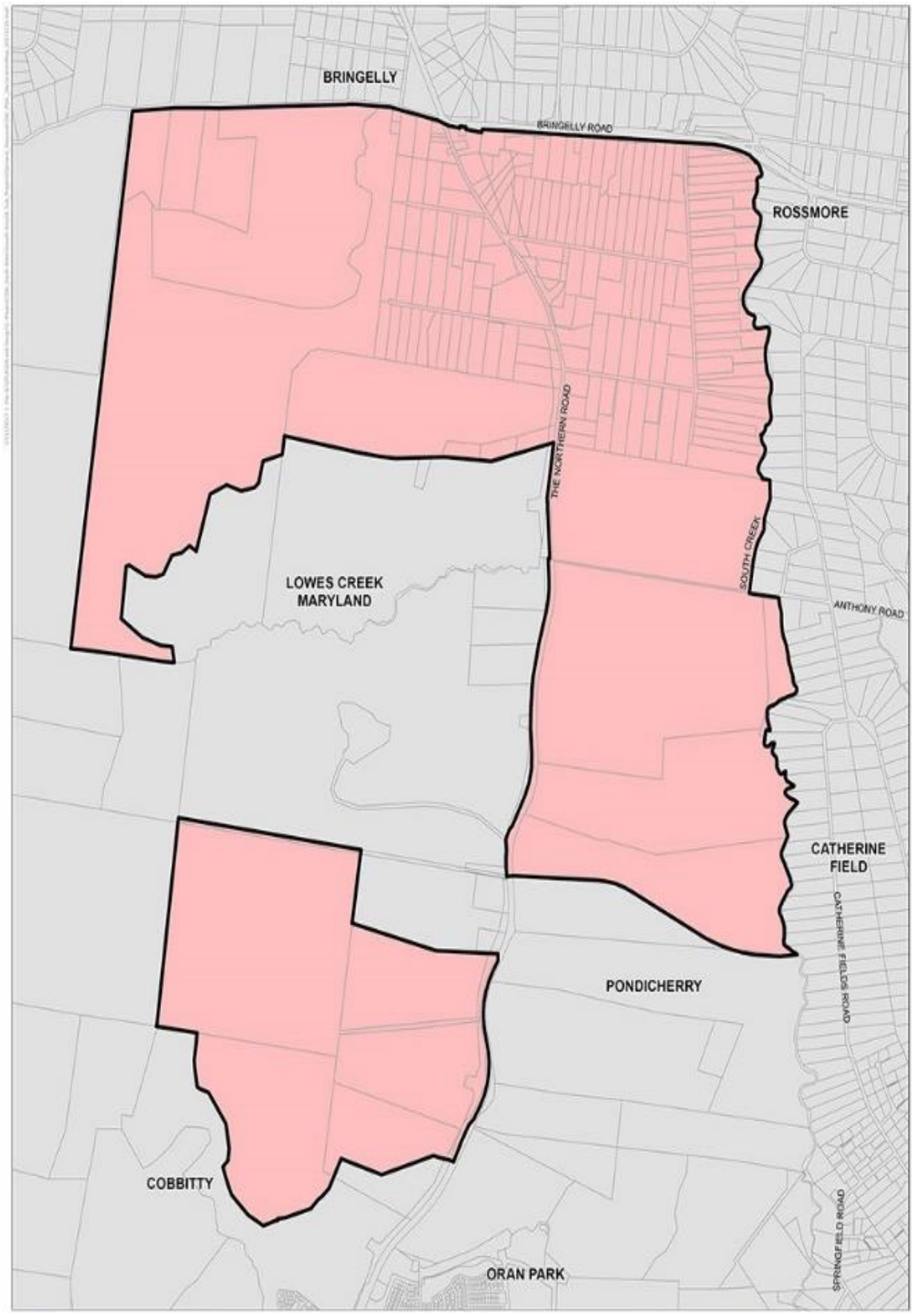

Figure 1: South Creek West release area. Image provided by BHL Group

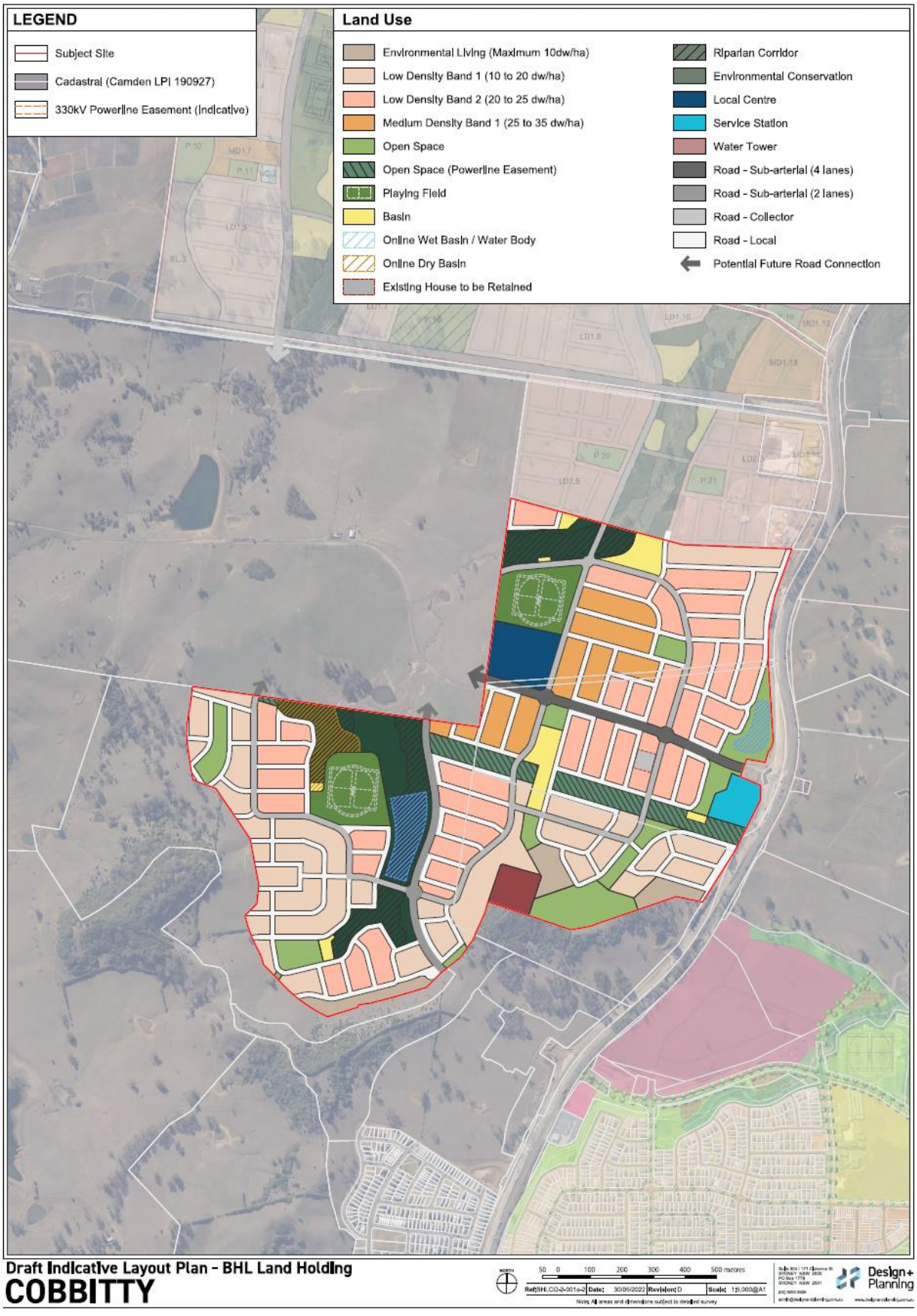

Figure 2: Draft Indicative Layout Plan

Figure 3: Subject site

2. Statutory Framework

A substantial array of legislation, policies and guidelines apply to the assessment, planning and management of ecological issues within the subject site. This information was reviewed and used to identify priority issues and approaches for the subject site (refer to Appendix A for detailed review).

2.1 International

- Japan – Australia Migratory Bird Agreement (JAMBA)
- China – Australia Migratory Bird Agreement (CAMBA)
- Republic of Korea – Australia Migratory Bird Agreement (ROKAMBA).

2.2 Commonwealth

- *Environment Protection & Biodiversity Conservation Act 1999* (EPBC Act).

2.3 State

- *Environmental Planning and Assessment Act 1979* (EP&A Act)
- *Biodiversity Conservation Act 2016* (BC Act)
- *Fisheries Management Act 1994* (FM Act)
- *Biosecurity Act 2015*
- State Environmental Planning Policy (Sydney Region Growth Centres) 2006
- Growth Centres Development Code 2006
- (Draft) Growth Centres Conservation Plan 2007.

2.3.1 Biodiversity Certification

Key to the assessment and protection of biodiversity values in the Sydney Region Growth Centres is the Biodiversity Certification (under the BC Act) of the Sydney Region Growth Centres State Environmental Planning Policy (SEPP) (referred to as the 'Growth Centres SEPP').

The Biodiversity Certification has three main functions. It requires the protection of 2000 hectares of existing native vegetation with the Growth Centres; it allows for development to proceed without further biodiversity assessment at the DA stage on land that is 'biodiversity certified', and it establishes a funding mechanism for conservation outcomes outside of the Growth Centres.

To achieve the 2000-hectare protection target, each precinct should protect the 'existing native vegetation' on non-biodiversity certified land, or where the vegetation is no longer extant, an equivalent area of existing native vegetation should be protected on land that is currently certified if possible.

The (Draft) Growth Centres Conservation Plan (2007) assessed native vegetation across the entire Growth Centres area (Figure 5) and identified Existing Native Vegetation (ENV), defined as areas of indigenous trees (including mature and saplings) that:

- had 10 % or greater over-storey canopy cover present,
- were ≥ 0.5 ha in area, and

- were identified as "vegetation" on maps 4 and 5 of the (Draft) Growth Centres Conservation Plan, at the time the biodiversity certification order took effect, subject to condition 13.

The entire subject site is biodiversity certified as shown in Figure 4.

Figure 5 and Figure 6 show that there was no 'existing native vegetation on non-certified land' within the precinct and therefore no vegetation within the precinct contributes to the 2000 hectare target.

Clause 13 of the biodiversity-certification details the ground-truthing requirements for ENV; namely, if new information becomes available after the biodiversity certification order took effect that demonstrates that the vegetation within an area does not otherwise meet the definition of existing native vegetation, then for the purposes of conditions 7-8 and 11-12 only the area of validated existing native vegetation shall be considered.

2.3.2 EPBC Strategic Assessment

On 28 February 2012, the Commonwealth Minister for the Environment announced the program of development related activities within the Growth Centres that had been approved under the Growth Centres Strategic Assessment. (This was the second stage of the approval of the Strategic Assessment of the Growth Centres under the Commonwealth EPBC Act). Specifically,

> *"All actions associated with the development of the Western Sydney Growth Centres as described in the Sydney Region Growth Centres Strategic Assessment Program Report (Nov 2010) have been assessed at the strategic level and approved in regard to their impact on the following matters of national environmental significance (MNES):*
>
> - *World Heritage Properties*
> - *National Heritage Places,*
> - *Wetlands of International Importance,*
> - *Listed threatened species, populations and communities, and*
> - *Listed migratory species."*

This approval essentially means that the Commonwealth is satisfied that the conservation and development outcomes that will be achieved through development of the Growth Centres Precincts will satisfy their requirements for environmental protection under the EPBC Act. Therefore, provided development activity proceeds in accordance with the Growth Centres requirements (such as the Biodiversity Certification Order, the Growth Centres SEPP and Development Control Plans (DCPs), Growth Centres Development Code etc), then there is no requirement to assess the impact of development activities on MNES and hence no requirement for referral of activities to the Commonwealth. The requirement for assessment and approval of threatened species and endangered ecological communities and the other MNES issues listed above under the EPBC Act has now been "turned off" by the approval of the Strategic Assessment.

2.3.3 Growth Centres Development Code 2006

The Growth Centres Development Code was produced by the Growth Centres Commission in 2006. The Development Code was produced to guide the planning and urban design in the North West and South West Growth Areas.

The Development Code includes objectives and provisions that support the retention of as much native vegetation, habitat and riparian areas within the precinct through incorporation into land use planning outcomes such as lower density development in these areas, subdivision patterns, road design, local parks, and other areas required to be set aside for community uses without adversely affecting the development yield of areas.

As a requirement under the Development Code, Precinct 5 will need to demonstrate how the biodiversity and other values of areas identified by the SEPP will be protected, maintained and enhanced.

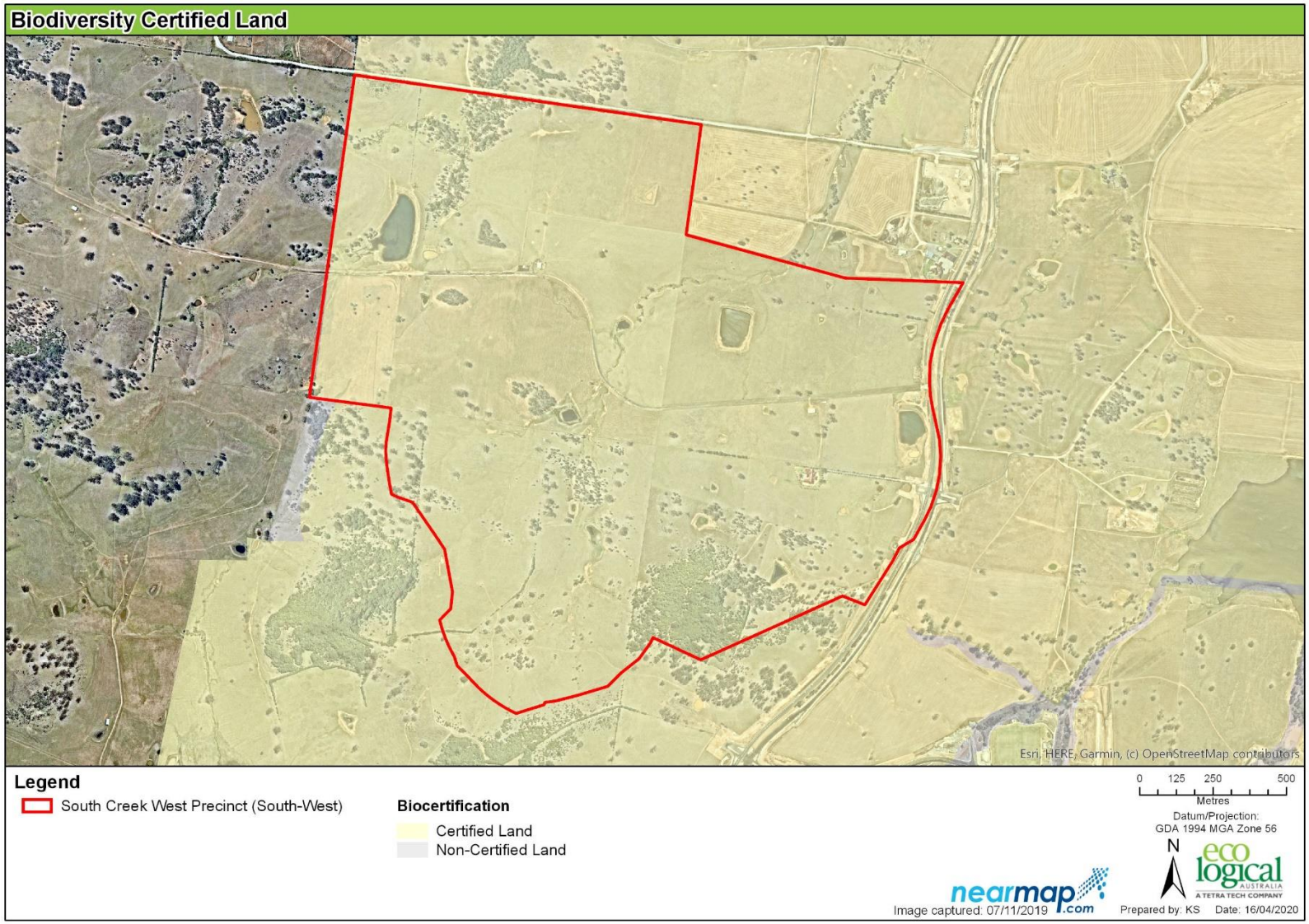

Figure 4: Biodiversity Certification

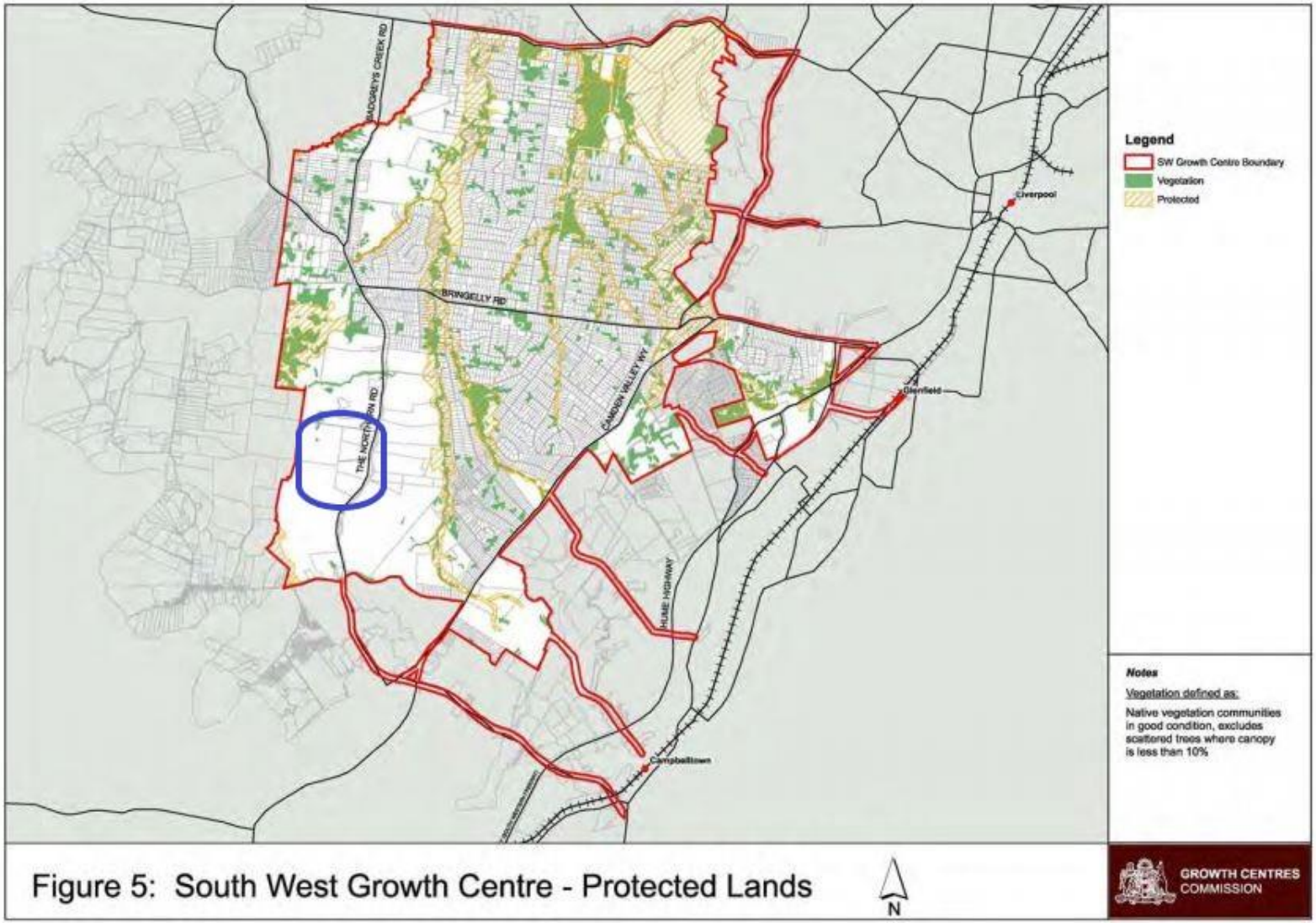

Figure 5: South West Growth Area Protected Lands from Draft Growth Centres Conservation Plan (Growth Centres Commission 2007)

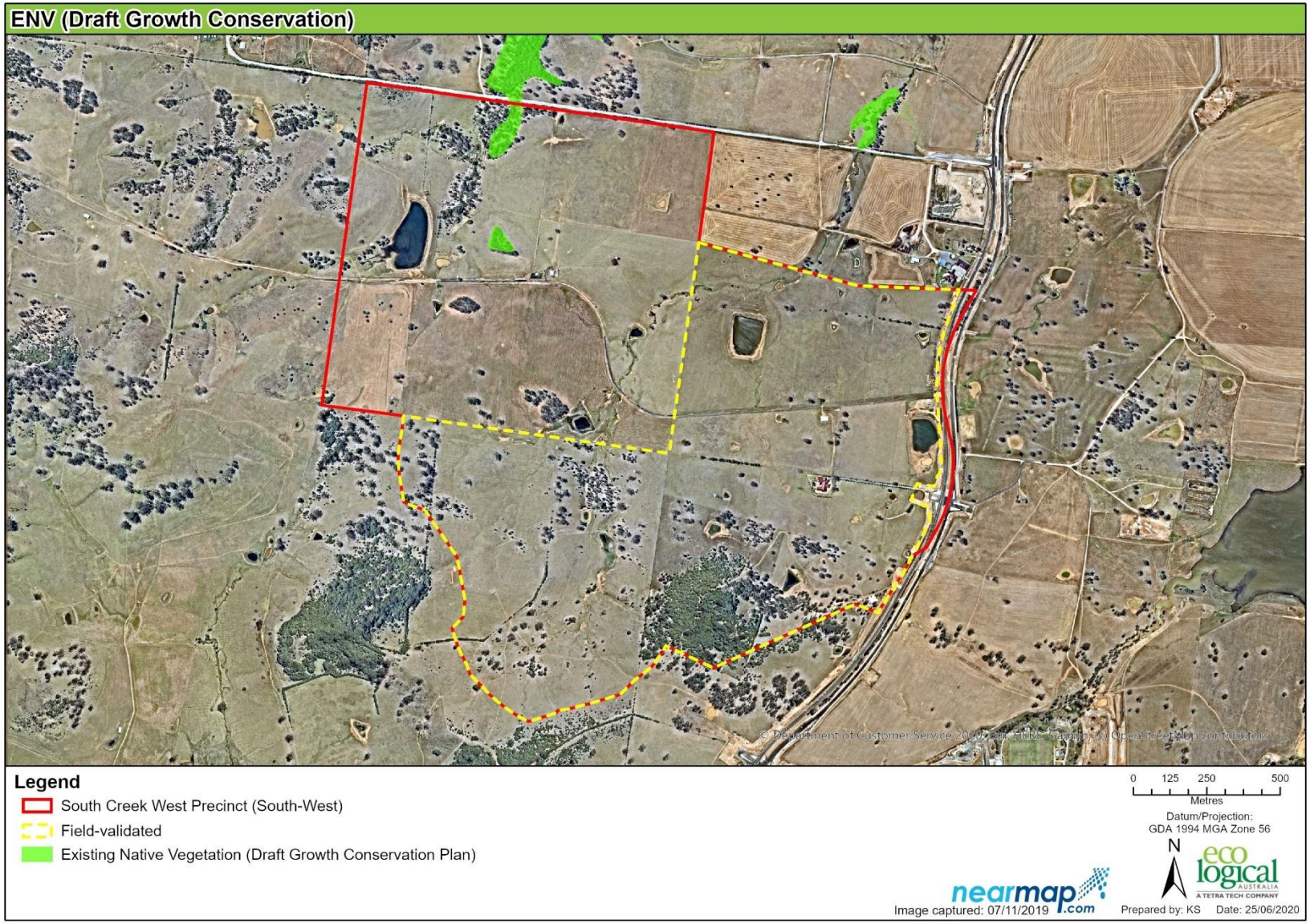

Figure 6: ENV as per Figure 5 of the Growth Centres Conservation Plan within the subject site

3. Methods

3.1 Literature review

A desktop literature review was undertaken by ELA to determine the location and extent of previous surveys, identify the constraints within the subject site and evaluate the presence of any threatened species, populations and ecological communities listed under the BC Act and the Commonwealth EPBC Act that could potentially occur within the subject site. The following documentation and mapping were reviewed:

- Aerial photography of the subject site
- NSW Atlas of Wildlife Database (5 km radius)
- EPBC Act online Protected Matters Search Tool (5 km radius)
- Native Vegetation Maps of the Cumberland Plain – Interpretation Guidelines (DECC, 2000b)
- Draft Growth Centres Conservation Plan' prepared by Eco Logical Australia (2007) for NSW Growth Centres Commission
- Office of Environment and Heritage (OEH) 2013 vegetation mapping
- NSW Government South Creek West Release Area – Precinct 5: Biodiversity and Riparian Corridors Proposal Request.

3.2 Desktop assessment

The north-west portion of the subject site was not field validated as site access was not available. Where land access was not available, the OEH 2013 Vegetation map was updated based on aerial photo interpretation. Vegetation mapping was edited to removed portions mapped over buildings.

A desktop assessment was conducted to determine the following:

- Potential vegetation communities
- Potential for patches of vegetation to meet the definition of AHCVV or ENV
- Potential threatened species habitat
- Potential constraints and recovery potential

3.3 Field survey

Where accessible, vegetation was ground-truthed over two days by two ecologists in March 2020. The survey area is shown in Figure 3 as 'Field validated'. A basic floristic survey of the precinct was undertaken to confirm the vegetation communities present, including their condition and extent. This survey included classification of native vegetation communities in accordance with DPIE (2020b) profiles and the Commonwealth listing and conservation advice (where relevant). A threatened species habitat assessment was also conducted across the entire subject site.

A detailed methodology is presented in Appendix B.

4. Results

4.1 Vegetation communities

The following two native vegetation communities were identified within the subject site in varied condition and structure:

- Cumberland Plain Woodland in the Sydney Basin Bioregion / Cumberland Plain Shale Woodlands and Shale Gravel Transition Forest
- River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions.

The subject site also contained areas dominated by exotic vegetation. The location of each vegetation community is presented in Figure 7. Each vegetation community, and their varied conditions, are described below.

4.1.1 Cumberland Plain Woodland

Cumberland Plain Woodland in the Sydney Basin Bioregion is listed as a critically endangered ecological community under the BC Act and forms part of the critically endangered ecological community Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest, listed under the EPBC Act.

Cumberland Plain Woodland is an open eucalypt woodland with an open shrub layer and grassy ground cover and is commonly found on clay-loam soils derived from the Wianamatta shale (DPIE 2020b). This community is restricted to the Cumberland Plain in the Sydney region and typically contains *Eucalyptus moluccana* (Grey Box), *E. tereticornis* (Forest Red Gum), with *E. crebra* (Narrow-leaved Ironbark), *E. eugenioides* (Thin-leaved Stringybark) and *Corymbia maculata* (Spotted Gum) occurring less frequently. The midstorey is comprised of *Bursaria spinosa* (Blackthorn). Typical groundcover species include *Dichondra repens* (Kidney Weed), *Aristida vagans* (Threeawn Speargrass), *Microlaena stipoides* var. *stipoides* (Weeping Grass), *Themeda triandra* (Kangaroo Grass), *Brunoniella australis* (Blue Trumpet), *Desmodium varians* (Slender Tick-trefoil), *Opercularia diphylla, Wahlenbergia gracilis* (Sprawling Bluebell) and *Dichelachne micrantha* (Shorthair Plumegrass).

Desktop assessment identified Cumberland Plain Woodland in the northwest portion of the subject site.

Cumberland Plain Woodland within the survey area was observed in five conditions, each detailed in Table 2 below.

Table 2: Different conditions of Cumberland Plain Woodland identified within survey area.

Condition	Description	BC Act	EPBC Act and Justification#
Good (BC Act and EPBC Act)	Cumberland Plain Woodland in this condition was present throughout the southern half of the subject site (Figure 8). These areas were characterised by a canopy dominated by *Eucalyptus tereticornis* (Forest Red Gum) and *Eucalyptus moluccana* (Grey Box). The open midstorey was dominated by exotic species *Lycium ferocissimum* (African Boxthorn) and *Olea europaea* subsp. *cuspidata* (African Olive), with occasional intrusions of *Lantana camara* (Lantana) and *Gomphocarpus fruticosus* (Narrow-leaved Cotton Bush) in some areas. The groundcover was dominated by a large number of native grasses and forbs, including *Microlaena stipoides* (Weeping Grass), *Bothriochloa macra* (Red Grass), *Einadia hastata* (Berry Saltbush) and more. Exotic groundcover species were also present, though to a significantly lesser extent, and included *Eragrostis curvula* (African Lovegrass), *Setaria parviflora* and *Sida acuta* (Spinyhead Sida).	CEEC	CEEC – Cumberland Plain Woodland in this condition met the key diagnostic characteristics for listing under the EPBC Act and met the following condition thresholds: • minimum patch* size is > 0.5 ha • > 50% of the perennial understorey vegetation cover** is made up of native species.
Moderate (BC Act and EPBC Act)	One patch of Cumberland Plain Woodland in moderate condition was present near the southern boundary of the subject site (Figure 8). Cumberland Plain Woodland in this condition contained an assemblage of native species similar to that of the ecological community in good (BC Act and EPBC Act) condition. However, Cumberland Plain Woodland in moderate (BC Act and EPBC Act) condition was characterised by the following: • The midstorey entirely comprised a dense layer of *Olea europaea* subsp. *cuspidata* (African Olive). • The groundcover in this patch was sparser in comparison to patches in Good (BC Act and EPBC Act) condition.	CEEC	CEEC – Cumberland Plain Woodland in this condition met the key diagnostic characteristics for listing under the EPBC Act and met the following condition thresholds: • minimum patch* size is > 0.5 ha • > 30% of the perennial understorey vegetation cover** is made up of native species • contained large trees above large tree benchmark (50 DBH) or trees with hollows.
Good (BC Act)	Three patches of Cumberland Plain Woodland in this condition were identified within the southern half of the subject site (Figure 8). These patches were characterised by a canopy dominated by *Eucalyptus tereticornis* (Forest Red Gum) and *Eucalyptus moluccana* (Grey Box). The midstorey was sparse and included *Bursaria spinosa* (Blackthorn), *Lycium ferocissimum* (African Boxthorn) and *Olea europaea* subsp. *cuspidata* (African Olive), or absent. The groundcover was dominated by native species including *Paspalidium distans*, *Sporobolus creber* (Western Rat-tail Grass), *Glycine tabacina* and *Einadia nutans* (Climbing Saltbush).	CEEC	No – Cumberland Plain Woodland in this condition did not meet condition thresholds because the patch size was <0.5 ha.
Poor (BC Act)	Cumberland Plain Woodland in poor (BC Act) condition was scattered throughout the subject site (Figure 8). Cumberland Plain Woodland in this condition contained an assemblage of canopy and midstorey species like that of the ecological community in good (BC Act) condition. However, Cumberland Plain	CEEC	No – Cumberland Plain Woodland in poor condition did not meet condition thresholds because < 30% of the perennial

Condition	Description	BC Act	EPBC Act and Justification#
	Woodland in poor (BC Act) condition was characterised by the dominance of exotic groundcover species including *Cenchrus clandestinus* (Kikuyu Grass), *Chenopodium album* (Fat Hen) and *Chloris gayana* (Rhodes Grass). Native species were also present in the groundcover, including *Einadia polygonoides*, *Portulaca oleracea* (Pigweed) and *Glycine tabacina*.		understorey vegetation cover** is made up of native species.
Derived Native Grassland (BC Act)	Derived native grasslands which result from the removal of woody strata are included in the BC Act listing of the ecological community (DPIE 2020b). Vegetation in this condition was dominant throughout the southern half of the subject site (Figure 9). These areas were dominated by a diverse range of native grasses and forbs, including *Bothriochloa macra* (Red Grass), *Cymbopogon refractus* (Barbed Wire Grass), *Themeda triandra* (Kangaroo Grass), *Cheilanthes sieberi*, *Desmodium varians* (Slender Tick-trefoil) and *Tricoryne elatior* (Yellow Autumn-lily).	CEEC -	No – Derived grassland and shrublands are not included as part of the nationally listed ecological community.

CEEC = critically endangered ecological community.
 # Based on key diagnostic features and condition thresholds (TSCC 2009).
** A patch is defined as a discrete and continuous area that comprises the ecological community.*
*** Perennial understorey vegetation cover includes vascular plant species of the ground and shrub layers with a lifecycle of more than two growing seasons. Cover excludes annuals, cryptogams, leaf litter or exposed soil.*

4.1.2 River-Flat Eucalypt Forest

River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions is listed as an endangered ecological community under the BC Act. In 2016, River-Flat Eucalypt Forest was nominated for listing as a threatened ecological community under the EPBC Act as Coastal floodplain eucalypt forest of eastern Australia. Conservation Advice for this species has been drafted, public consultation closed in August 2019, and the nomination is currently being assessed.

The canopy of this ecological community is typically comprised of *Eucalyptus tereticornis* (Forest Red Gum), *E. amplifolia* (Cabbage Gum) and *Angophora floribunda* (Rough-barked Apple) (DPIE 2020b). The mid-storey contains *Acacia parramattensis* subsp. *parramattensis* (Parramatta Wattle), *Casuarina glauca* (Swamp Oak) and *Melaleuca linariifolia* (Flax-leaved Paperbark). Common groundcover species include *Microlaena stipoides* (Weeping Grass)*, Oplismenus aemulus* (Basket Grass)*, Dichondra spp., Entolasia marginata* (Bordered Panic)*, Solanum prinophyllum* (Forest Nightshade)*, Pratia purpurascens* (Whiteroot)*, Echinopogon ovatus* (Forest Hedgehog Grass)*, Desmodium gunnii* (Slender Tick Trefoil)*, Commelina cyanea, Veronica plebeia* (Creeping Speedwell)*.*

Desktop assessment identified River-Flat Eucalypt Forest in the north-west portion of the subject site.

Field survey confirmed the presence of three small patches of River-Flat Eucalypt Forest in poor condition along watercourses in the northeast of the survey area (Figure 10). The canopy consisted of scattered *Angophora floribunda* (Rough-barked Apple). The midstorey was absent with the exception of one *Melaleuca decora*. The groundcover was limited to exotic pasture grasses and forbs such as *Cenchrus clandestinus* (Kikuyu Grass) and *Plantago lanceolata* (Lamb's Tongues). This occurrence of the community conforms to the endangered ecological community listed under the BC Act.

4.1.3 Exotic Cover

Vegetation mapped as Exotic Cover was prevalent throughout the survey area (Figure 11). The majority of this vegetation was characterised by groundcover dominated by exotic pasture grasses. Infestations of *Olea europaea* subsp. *cuspidata* (African Olive) were prominent throughout this vegetation, especially near the southern boundary of the survey area. Canopy surrounding the residential dwelling near the eastern boundary of the survey area consisted almost entirely of planted *Phoenix canariensis* (Canary Island Date Palm).

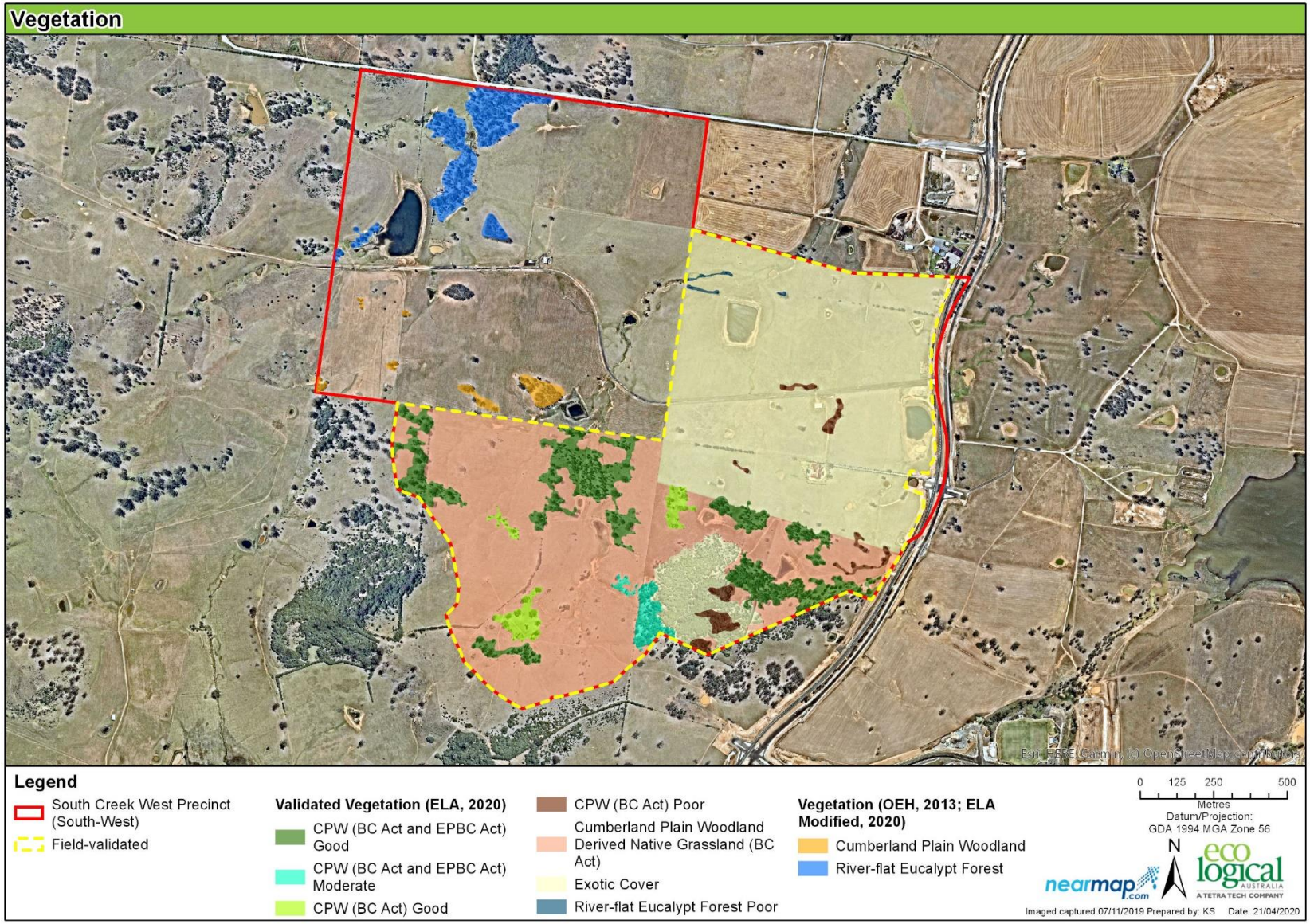

Figure 7: Vegetation communities and conditions identified during field survey.

Figure 8: Cumberland Plain Woodland identified in varying conditions. Top left: Good (BC Act and EPBC Act). Top right: Moderate (BC Act and EPBC Act). Bottom left: Good (BC Act). Bottom right: Poor (BC Act).

Figure 9: Derived Native Grassland (a sub-community of Cumberland Plain Woodland).

Figure 10: Poor condition River-Flat Eucalypt Forest.

Figure 11: Areas of exotic cover.

4.1.4 Vegetation Community and Condition Assessment Area Calculations

Area calculations of each vegetation community within the subject site are provided Table 3.

Table 3: Summary of area (ha) occupied by vegetation communities and their condition.

Vegetation community	Condition		Area (ha)
Cumberland Plain Woodland	Good (BC Act and EPBC Act)		15.73
Cumberland Plain Woodland	Moderate (BC Act and EPBC Act)		1.93
Cumberland Plain Woodland	Good		2.64
Cumberland Plain Woodland	Poor		2.35
Cumberland Plain Woodland	Derived Native Grasslands		66.72
Cumberland Plain Woodland	Desktop Assessment		1.76
		Total	**91.13**
River-Flat Eucalypt Forest	Poor		0.29
River-Flat Eucalypt Forest	Desktop Assessment		7.3
		Total	**7.59**
		Total	**98.72**

4.2 Validated ENV Area Calculations and Identification of any Further AHCVV

Desktop aerial photo analysis and field survey was undertaken to validate the extent of the mapped 'Existing Native Vegetation' to confirm whether it still existed. This process resulted in the following classifications:

- Validated Existing Native Vegetation.
- Additional High Conservation Value Vegetation: Vegetation which meets criteria a) and b) of the definition of ENV (i.e. a 10% of greater canopy cover and a patch size of greater than 0.5 ha) but was not mapped in the original conservation plan. This is a combination of mapping inaccuracies in the original mapping or changes to the condition and size of the vegetation on site since the Conservation Plan map production.

As the entire site is currently biodiversity certified, the 'existing native vegetation on the site was not counted as a contribution to the 2000 ha target for the Growth Centres. Areas of ENV and AHVCC within the subject site are presented in Table 4 and Figure 12.

Table 4: Amount of ENV and AHCVV in subject site (ha)

	Certified Land	Non-Certified Land	Total
Mapped ENV in Draft Conservation Plan	1.59	0	**1.59**
Additional Native Vegetation (AHCVV)	23.01	0	**23.01**

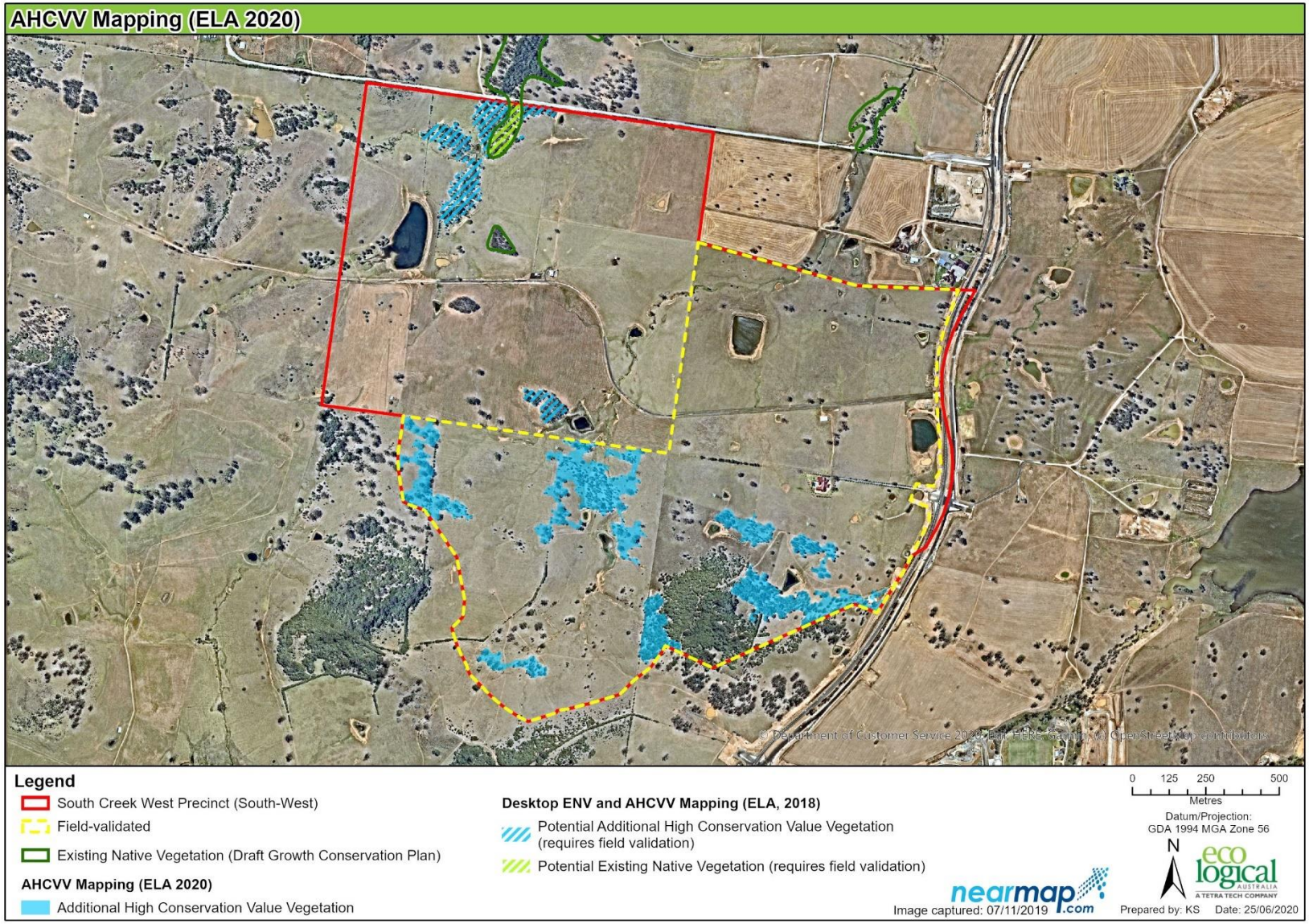

Figure 12: ENV and AHCVV within the subject site.

4.3 Recovery Potential

Recovery potential relates to the ability of the land to be managed for an improvement in the condition of the remnant vegetation and to increase linkages (wildlife corridor) between extant stands of vegetation. Identifying areas of recovery potential is consistent with the aims of the BC Act; to protect and encourage the recovery of threatened species, populations and communities listed under the Act.

With appropriate management actions, areas identified as having a moderate recovery potential would improve the condition of threatened species habitat and ecosystem connectivity within the precinct. Management actions would need to be on-going and facilitate the natural regeneration of the over-storey and/or regeneration of native species (grasses, herbs and forbs) in the seed bank.

Four classes of recovery potential have been identified within the precinct which has been informed by the assessments (desktop and field) conducted in this report. Where land access was not available, the OEH 2013 Vegetation map was used to inform classification. The four classes are shown in Figure 13 and are described below:

- High Recovery Potential – native vegetation mapped as areas that meet the definition of AHCVV which generally have native canopy cover of greater than 10% and contained native species in each structural layer
- Moderate Recovery Potential – other areas of native vegetation with some canopy, less structural complexity and a higher level of weed infestation or ongoing disturbance
- Low Recovery Potential –areas which show some potential for natural regeneration. Some native species present in some structural layers, very high level of weed infestations, not all structural layers present
- Very Low Recovery Potential – all other areas including cleared and heavily cultivated and/or pasture improved areas.

Area calculations of each recovery potential class within the subject site are presented in Table 5.

Table 5: Area of different recovery potential classes identified within the subject site.

Recovery potential class	Area (ha)
High	29.83
Moderate	198.27
Low	1.37
Very Low	81.50

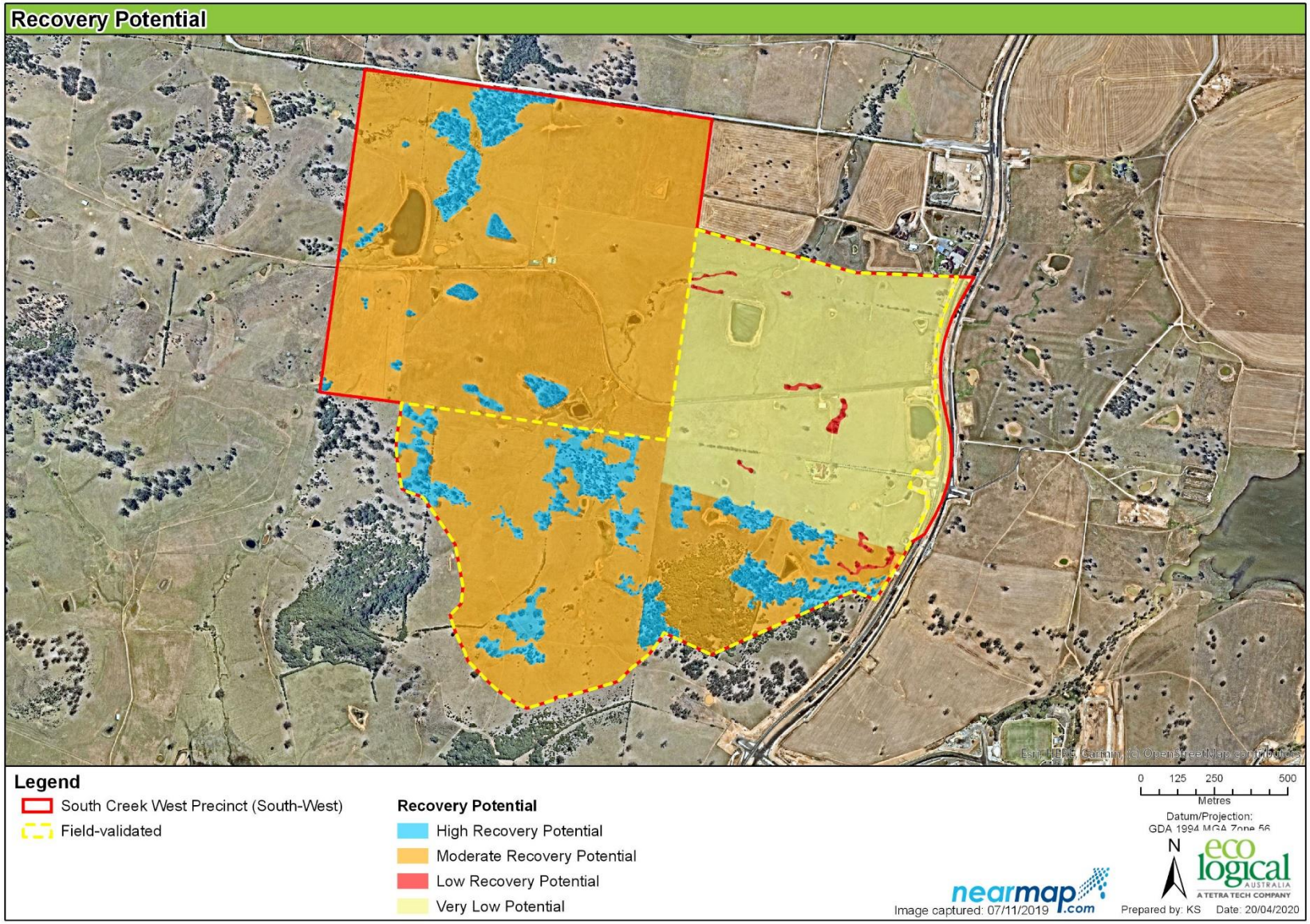

Figure 13: Recovery potential

4.4 Ecological constraints assessment

An ecological constraint ranking was derived by assessing size, condition and recovery potential of an area (see Appendix B). Note that this assessment doesn't take into account the fact that the land is currently biodiversity certified.

Broadly, the rankings are as follows:

- High constraint = high ecological value, relatively large areas of good quality, well connected vegetation;
- Moderate constraint = moderate ecological value, smaller areas of good quality vegetation or large areas of poorer quality vegetation;
- Low constraint = low ecological value, areas infested with weeds and exotics, with a low recovery potential or completely cleared or developed.

The results of this analysis are presented in Table 6 and Figure 14.

Table 6: Area of different ecological constraints rankings identified within the subject site.

Ecological constraints ranking	Area (ha)
High	29.83
Moderate	190.36
Low	90.78

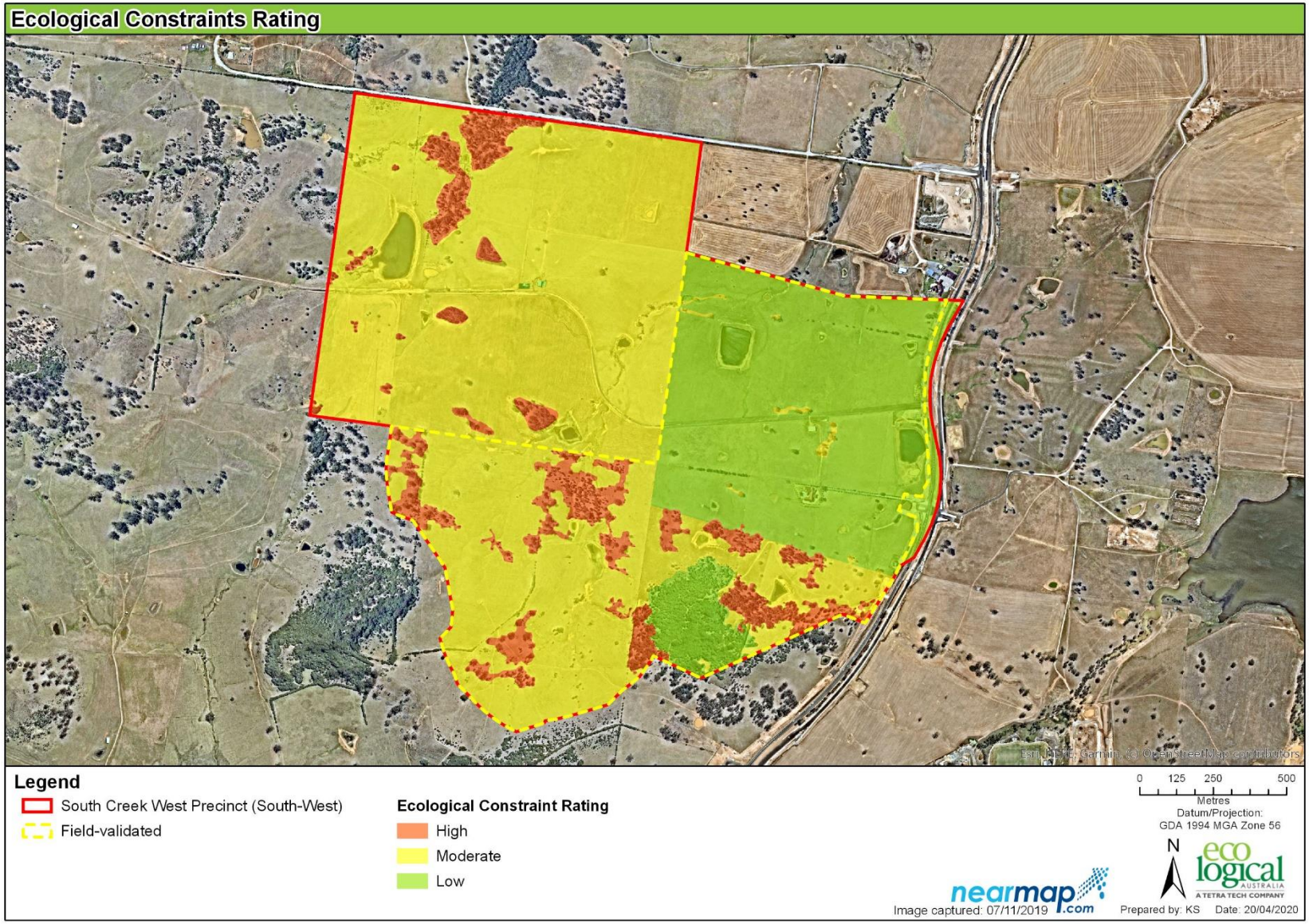

Figure 14: Ecological constraints analysis

4.5 Threatened Species Habitat

The following threatened flora species are associated with Cumberland Plain Woodland and were therefore identified as having the potential to occur within the subject site (Figure 15):

- *Cynanchum elegans*, listed as endangered under the BC Act and EPBC Act
- *Grevillea juniperina* subsp. *juniperina* (Juniper-leaved Grevillea), listed as vulnerable under the BC Act
- *Marsdenia viridiflora* subsp. *viridiflora* (Native Pear), listed as an endangered population under the BC Act
- *Pimelea spicata* (Spiked Rice-flower), listed as endangered under the BC Act and EPBC Act.

Habitat features for several threatened fauna species were identified within the survey area during field survey. These species have also been recorded within 5 km of the survey area (DPIE 2020a). The species and the habitat features relevant to them are presented in Table 7 and Figure 15.

Table 7: Threatened fauna species likely or with the potential to occur in the survey area.

Scientific name	Common name	BC Act Status	EPBC Act Status	Habitat features
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	-	The survey area contained open eucalypt woodland and farmland adjoining woodland.
Daphoenositta chrysoptera	Varied Sittella	V	-	The survey area contained open eucalypt woodland.
Glossopsitta pusilla	Little Lorikeet	V	-	The survey area contained open eucalypt woodland and riparian areas.
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	-	The survey area contained open eucalypt woodland and riparian areas.
Hieraaetus morphnoides	Little Eagle	V	-	The survey area contained open eucalypt woodland and riparian areas.
Lathamus discolor	Swift Parrot	E	CE	Native canopy in the survey area was dominated by Eucalyptus tereticornis, a favoured feed tree of this species. .
Meridolum corneovirens	Cumberland Plain Land Snail	E	-	Leaf litter was present at the base of trees within Cumberland Plain Woodland in Good (BC Act and EPBC Act) and Moderate (BC Act and EPBC Act).
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V	-	The survey area contained hollow bearing trees and intact sections of native vegetation.
Miniopterus orianae oceanensis	Large Bent-winged Bat	V	-	The survey area contained intact sections of native vegetation.
Myotis macropus	Southern Myotis	V	-	The survey area contained hollow bearing trees and intact sections of native vegetation.
Ninox strenua	Powerful Owl	V	-	The survey area contained intact sections of native vegetation.

Scientific name	Common name	BC Act Status	EPBC Act Status	Habitat features
Phascolarctos cinereus	Koala	V	V	The survey area contained favoured feed tree species *Eucalyptus tereticornis* and *Angophora floribunda*.
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	The survey area contained intact sections of native vegetation.
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-	The survey area contained hollow bearing trees and intact sections of native vegetation.
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	The survey area contained hollow bearing trees and intact sections of native vegetation.

V = vulnerable, E = endangered, CE = critically endangered, - = Not Listed.

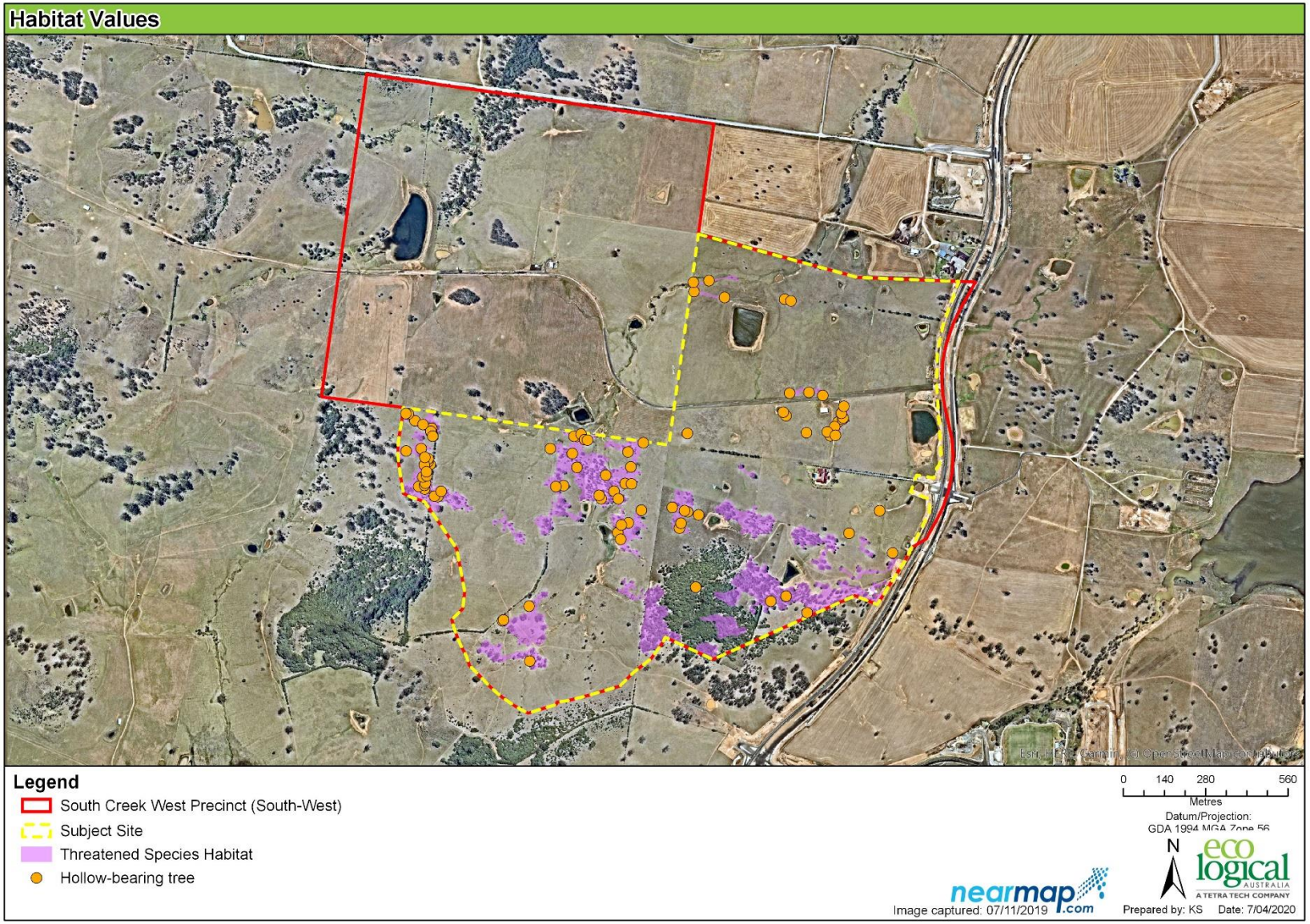

Figure 15: Areas of potential habitat for threatened species.

5. Recommendations for Indicative Layout Plan

5.1 Recommendations for consistency with the Biodiversity Certification Order

No vegetation in this precinct counted towards the 2,000-ha target for the Growth Centres. However, the precinct does contain Cumberland Plain Woodland and River-Flat Eucalypt Forest in varying conditions, the protection of which would enhance biodiversity outcomes within the precinct and the broader growth centres. The precinct contains a total of 23.01 ha of native vegetation that meets the definition of AHCVV and 1.59 ha of previously mapped ENV therefore, providing containing 24.6 ha of native vegetation.

Riparian habitat throughout the site varied in quality but did include areas of Cumberland Plain Woodland and hollow bearing trees, therefore it is recommended that riparian zones be rehabilitated and form the core of the biodiversity outcome for the precinct. Riparian habitat and proposed management strategies is further discussed within the South Creek (South West) Precinct Riparian Assessment (ELA, 2021).

Infestations of *Olea europaea* subsp. *cuspidata* (African Olive), especially prominent near the southern boundary of the survey area, should be cleared. Retaining native canopy in this area of the study area is recommended where possible.

Table 8 outlines the amount of validated ENV and AHCVV that will be protected through the previous ILP, as depicted in Figure 16.

Table 8: Amount of native vegetation proposed to be protected in ILP

	Within Precinct (ha)	Protected within Riparian Corridor (ha)	Protected within Ridgeline Park (ha)	Percentage Retained
Validated ENV	1.59	1.06	0.00	66.67%
Validated AHCVV	23.01	7.82	1.59	40.90%
TOTAL	**24.6**	**8.88**	**1.59**	**42.56%**

5.2 Zoning, ownership and management

Areas of vegetation that are to be protected or rehabilitated should have adequate protection via the Precinct Plans. The E2 Environment Conservation zone has been typically used in precinct plans for this purpose, although RE1 Recreation may also be used provided there is a clear objective to provide for maintenance or rehabilitation of biodiversity values. Where possible, putting the riparian area in a single public ownership and having it managed for conservation and low-impact recreation is a preferred outcome rather than having the land in multiple ownerships without public access.

The permissible uses within the E2 zone are shown below.

Table 9: Potential Environmental Zones

Zone	Permitted without consent	Permitted with consent	Prohibited
E2 Environmental Conservation	Nil	Drainage; Earthworks; Environmental facilities; Environmental protection works; Flood mitigation works; Information and education facilities; Kiosks; Recreation areas; Roads; Signage; Waterbodies (artificial)	Business premises; Hotel or motel accommodation; Industries; Multi dwelling housing; Recreation facilities (major); Residential flat buildings; Restricted premises; Retail premises; Seniors housing; Service stations; Warehouse or distribution centres; Any development not specified in item 2 or 3

Some precinct plans under the Sydney Region Growth Centres SEPP 2006 (e.g., Blacktown Growth Centres Precinct Plan) require a Vegetation Management Plan to be prepared and implemented when residential land adjoining E2 zoned land is developed. If such a clause were to be included in the South Creek West Precinct Plan, its cost implications should be determined. It is therefore prudent to understand the government's expectations for these lands and developing a preferred outcome.

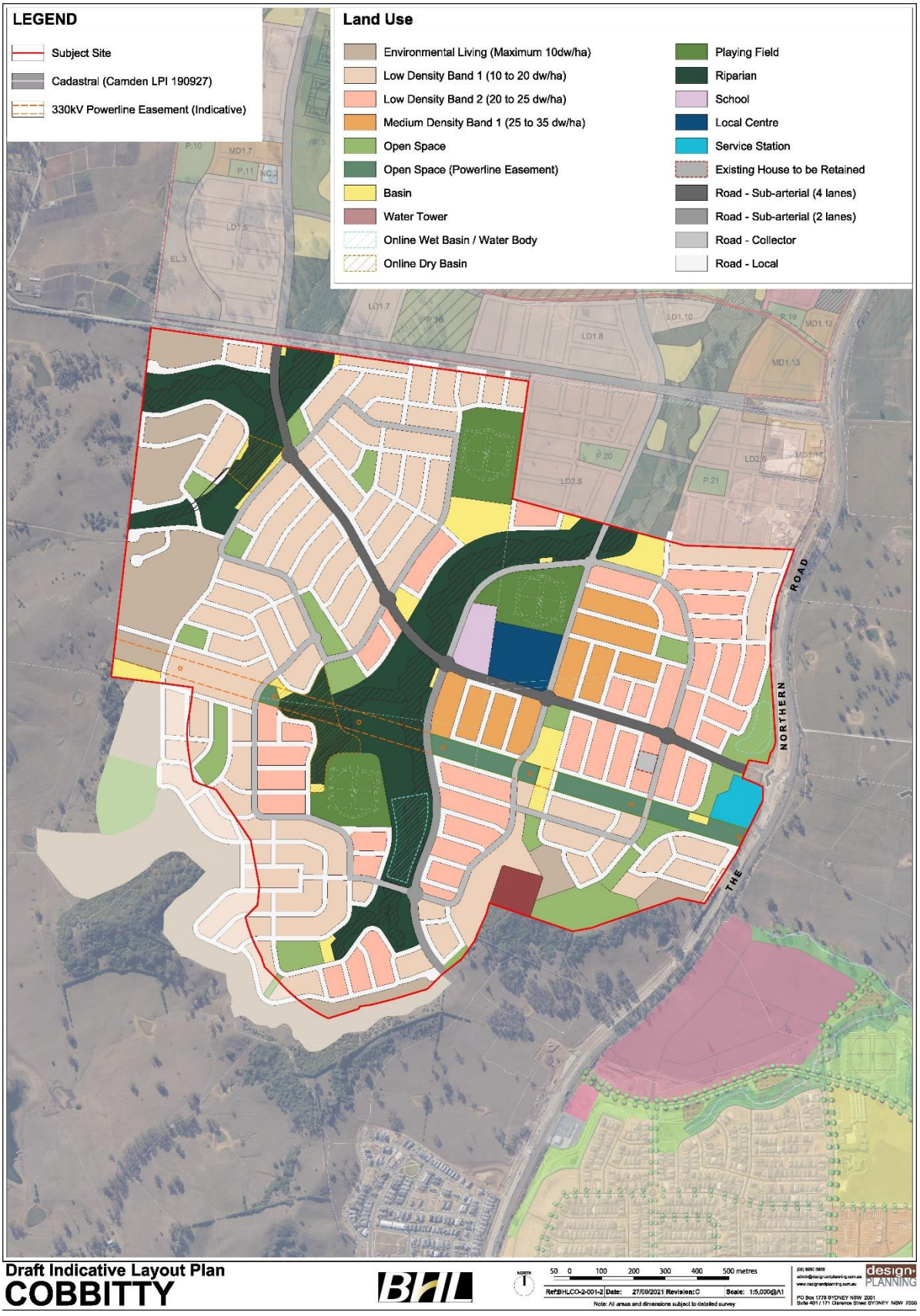

Figure 16: Draft Indicative Layout Plan

6. Conclusion

The aim of this report is to identify key ecological constraints to assist design of an ILP. The site was found to contain a number of significant environmental features, including Cumberland Plain Woodland (a critically endangered ecological community under both the BC Act and EPBC Act), River-Flat Eucalypt Forest (an endangered ecological community under the BC Act) and habitat features associated with potential habitat for a number of threatened flora and fauna species.

Approximately 1.59 ha of vegetation in the precinct was identified for protection in the Draft Growth Centres Conservation Plan 2007. Desktop assessment and field survey validated 1.59 ha of previously identified ENV and identified 23.01 ha of AHCVV.

The whole of Sub-Precinct 5 is biodiversity certified. Therefore, Sub-Precinct 5 is not obligated to retain any areas of ENV. The precinct, however, contains a total of 23.01 ha of native vegetation that meets the definition of AHCVV and 1.59 ha of previously mapped ENV therefore, providing opportunity to provide biodiversity outcomes beyond what was anticipated by the biodiversity certification by protecting native vegetation in riparian areas and their adjoining lands where possible.

The previous ILP will protect 1.06 ha of validated ENV and 9.41 ha of validated AHCVV, through the protection of native vegetation within the proposed riparian corridor and Ridgeline Park.

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Appendix A Detailed Statutory Framework

A1 Commonwealth legislation

Environment Protection & Biodiversity Conservation Act 1999 (EPBC Act)

The Commonwealth *Environment Protection & Biodiversity Conservation Act 1999* (EPBC Act) establishes a process for assessing the environmental impact of activities and developments where 'matters of national environmental significance' (MNES) may be affected. The EPBC Act lists endangered ecological communities, threatened and migratory species that have the potential to occur, or are known to occur on a site.

The approval of both stages of the strategic assessment occurred on the 28th February 2012. This approval essentially means that the Commonwealth is satisfied that the conservation and development outcomes that will be achieved through development of the Growth Centres Precincts will satisfy their requirements for environmental protection under the EPBC Act. So that, provided development activity proceeds in accordance with the Growth Centres requirements (such as the Biodiversity Certification Order, the Growth Centres SEPP and DCPs, Growth Centres Development Code etc) then there is ***no requirement*** to assess the impact of development activities on MNES and hence ***no requirement*** for referral of activities to the Commonwealth Department of Agriculture, Water and the Environment (DAWE). The requirement for assessment and approval of threatened species and endangered ecological communities under the EPBC Act has now been "turned off" by the approval of the Strategic Assessment.

A2 State legislation

Environmental Planning and Assessment Act 1979 (EP&A Act)

The NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) is the principal planning legislation for the state, providing a framework for the overall environmental planning and assessment of development proposals. Various legislative instruments are integrated with EP&A Act and have been reviewed separately.

In determining a development application, the consent authority is required to take into consideration the matters listed under Section 79C of the EP&A Act that are relevant to the application. Key considerations include:

- Any environmental planning instrument, including drafts
- The likely impacts of the development
- The suitability of the site for the development
- Any submissions made in accordance with the EP&A Act or regulations
- The public interest

Biodiversity Conservation Act 2016 (BC Act)

In November 2016 the NSW parliament passed the *Biodiversity Conservation Act 2016* (BC Act). This new legislation repealed the *Threatened Species Conservation Act* 1995 (TSC Act) and took effect 25 August 2017. Among other things, the BC Act introduces new requirements for biodiversity assessment

and requires proponents to offset significant biodiversity impacts through the purchase and retirement of biodiversity credits. The government has recently exhibited regulations that provide further detail on the changes as well as establish the transitional arrangements.

Similar to the TSC Act, the BC Act aims to protect and encourage the recovery of threatened species, populations and communities listed under the Act. The BC Act is integrated with the EP&A Act and requires consideration of whether a development (Part 4 of the EP&A Act 1974) or an activity (Part 5 of the EP&A Act) is likely to significantly affect threatened species, populations and ecological communities or their habitat.

The schedules of the Act list species, populations and communities as endangered or vulnerable. New species, populations and communities are continually being added to the schedules of the BC Act. All developments, land use changes or activities need to be assessed to determine if they will have the potential to significantly impact on species, populations or communities listed under the Act.

Bio-certification was introduced under the TSC Act (s.126G) to confer certification on an environmental planning instrument if the Minister is satisfied that it will lead to the overall improvement or maintenance of biodiversity values – typically at a landscape scale. Under the new BC Act, existing biodiversity certified areas remain valid following the repealed TSC Act.

The effect of granting certification is that any development or activity requiring consent (Under Part 4 and 5 of the EP&A Act) is automatically 'development that is not likely to significantly affect threatened species'. This certification removes the need to address threatened species considerations and the test of significance (s.7.3 of the BC Act), including the preparation of species impact statements (SIS) for Part 5 activities or triggering the Biodiversity Offset Scheme for Part 4 developments.

State Environmental Planning Policy (Sydney Region Growth Centres) 2006 (Growth Centres SEPP)

The Growth Centres State Environmental Planning Policy (SEPP) (referred to as the 'Growth Centres SEPP') has been 'bio-certified' by order of the Minister for the Environment under s.126G of the *TSC Act*. Under the new BC Act, existing biodiversity certified areas remain valid following the repealed TSC Act. The mechanism for achieving this is outlined in the *Growth Centres Conservation Plan* (Eco Logical Australia, 2007) and the conditions for bio-certification are documented in the Ministers order for consent. Bio-certification negates the requirement for impact assessment under s.5A of the *Environmental Planning and Assessment Act, 1979* thus turning off the requirements for the test of significance.

The subject site contains two threatened ecological communities, Cumberland Plain Woodland and River-Flat Eucalypt Forest.

Each precinct needs to be assessed against the conditions of the Biodiversity Conservation Order to ensure that the planned rezoning and subsequent development of the precinct complies. This is undertaken through the completion of a Biodiversity Certification Consistency Report.

Fisheries Management Act 1994 (FM Act)

The *Fisheries Management Act 1994* (FM Act) aims to conserve, develop and share the fishery resources of NSW for the benefit of present and future generations. The FM Act defines 'fish' as any marine, estuarine or freshwater fish or other aquatic animal life at any stage of their life history. This includes

insects, molluscs (e.g. oysters), crustaceans, echinoderms, and aquatic polychaetes (e.g. beachworms), but does not include whales, mammals, reptiles, birds, amphibians or species specifically excluded (e.g. some dragonflies are protected under the TSC Act instead of the FM Act). Under this act, if any activity occurs that will block fish passage, then a permit under this Act will be required.

Matters relating to this act are discussed in a separate, Riparian Assessment Report.

Water Management Act 2000 (WM Act)

The NSW *Water Management Act 2000* has replaced the provisions of the *Rivers and Foreshores Improvement Act 1948*. The *Water Management Act 2000* and *Water Act 1912* control the extraction of water, the use of water, the construction of works such as dams and weirs and the carrying out of activities in or near water sources in New South Wales. 'Water sources' are defined very broadly and include any river, lake, estuary, place where water occurs naturally on or below the surface of the ground and coastal waters.

If a 'controlled activity' is proposed on 'waterfront land', an approval is required under the Water Management Act (s91). 'Controlled activities' include:

- the construction of buildings or carrying out of works;
- the removal of material or vegetation from land by excavation or any other means;
- the deposition of material on land by landfill or otherwise; or
- any activity that affects the quantity or flow of water in a water source.

'Waterfront land' is defined as the bed of any river or lake, and any land lying between the river or lake and a line drawn parallel to and forty metres (40m) inland from either the highest bank or shore (in relation to non-tidal waters) or the mean high-water mark (in relation to tidal waters). It is an offence to carry out a controlled activity on waterfront land except in accordance with an approval.

Matters relating to this act are discussed in a separate, Riparian Assessment Report.

Biosecurity Act 2015 (Bios Act)

Under the Biosecurity Act 2015 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.

Specific legal requirements apply to State determined priorities under the Greater Sydney Regional Strategic Weed Management Plan 2017-2022. Weeds listed as 'other weeds of regional concern' warrant resources for local control or management programs and are a priority to keep out of the region. Inclusion in this list may assist Local Control Authorities and/or land managers to prioritise action in certain circumstances where it can be demonstrated the weed poses a threat to the environment, human health, agriculture etc.

Rural Fires Act 1997

The objectives of the NSW *Rural Fires Act 1997* (RF Act) are to provide for:

- The prevention, mitigation and suppression of fires

- Coordination of bushfire fighting and prevention
- Protection of people and property from fires
- Protection of the environment.

Section 100B of the RF Act provides for the Commissioner to issue a bushfire safety authority for subdivision of bushfire prone land that could lawfully be used for residential or rural residential purposes or for development of bushfire prone land for a special fire protection purpose.

A Bushfire Safety Authority permits development to the extent that it complies with bushfire protection standards. Application for a Bushfire Safety Authority must be lodged as part of the development application process and must demonstrate compliance with the Planning for Bushfire Protection Guidelines (RFS 2006).

The RF Act also outlines the responsibilities of land owners to manage their land for bushfire protection and provides a mechanism for the approval of hazard reduction works, through the issue of a bushfire hazard reduction certificate.

Rural Fires and Environmental Assessment Legislation Amendment Act 2002

The NSW *Rural Fires and Environmental Assessment Legislation Amendment Act 2002* amends the RF Act and the EP&A Act with respect to bushfire prone lands, bushfire hazards and bushfire emergencies.

A3 Planning Instruments

Planning for Bushfire Protection 2006

This guide (*Planning for Bushfire Protection: a Guide for Councils, Planners, Fire Authorities, Developers and Home Owners, NSW Rural Fire Service 2006*) is the key bushfire planning document for the state. The document identifies requirements and strategies for new developments to help protect from bushfire hazards. It details the location and depth of asset protection zones, fire trails and perimeter roads, water supply and building standards in bushfire risk areas. This document is given legal force through the *Rural Fires and Environmental Assessment Legislation Amendment Act 2002*.

State Environmental Planning Policy No.19 – Bushland in Urban Areas

This NSW State Environmental Planning Policy (SEPP) aims to protect and preserve bushland within selected local government areas. The policy recognises the recreational, educational and scientific significance of such bushland and aims to protect the flora, fauna, significant geological features, landforms and archaeological relics in such areas. It encourages management to protect and enhance the quality of the bushland and facilitate public enjoyment, compatible with its conservation. The policy states that a person shall not disturb bushland zoned or reserved for public open space purposes without the consent of the council.

Growth Centres Development Code 2006

The Growth Centres Development Code was produced by the Growth Centres Commission in 2006. The Development Code was produced to guide the planning and urban design in the North West and South West Growth Areas.

The Development Code includes objectives and provisions that support the retention of as much native vegetation, habitat and riparian areas within the precinct through incorporation into land use planning

outcomes such as lower density development in these areas, subdivision patterns, road design, local parks, and other areas required to be set aside for community uses without adversely affecting the development yield of areas.

As a requirement under the Development Code, the South Creek West Release Area (South West) Precinct 5 will need to demonstrate how the biodiversity and other values of areas identified by the SEPP will be protected, maintained and enhanced. Key issues will include boundary management (e.g. buffers to surrounding development), bush fire and water sensitive urban design (WSUD) (GCC 2006).

Draft Growth Centres Conservation Plan 2007

Under the Draft Growth Centres Conservation Plan, the vegetation within South Creek West Release Area (South-West) Precinct 5 have been identified as 'Lower Long-Term Management Viability (LMV)' and approximately 103.68 ha of ENV was originally mapped.

State Environmental Planning Policy (Koala Habitat Protection) 2019

The aim of this SEPP is 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 South-West Precinct is not located on land to which this policy applies.

Appendix B Methodology

B1 Field Survey

Field survey was conducted by ELA ecologists Alex Gorey and Carolina Mora. The survey area was traversed using the random meander method (Cropper 2003) and focused on the following:

- classification of vegetation not previously mapped as ENV
- identification of additional high conservation value vegetation (AHCVV),
- identification of condition of native vegetation
- an assessment of habitat significance for threatened flora and fauna species
- hollow bearing tree (HBT) identification
- incidental sightings of flora and fauna.

When vegetation community boundaries differed to those previously mapped or were not previously mapped, they were documented using digital maps. Floristic summaries were composed for areas of vegetation not previously mapped to determine the type of native vegetation community (where applicable) and to assess the condition of the vegetation. Occurrences of Cumberland Plain Woodland were assessed against the EPBC Act listing advice.

The presence of threatened fauna species identified as having potential to occur in the survey area was determined through a habitat assessment. Where important habitat features, such as hollow bearing trees, rocky outcrops, deep leaf litter, waterways or abandoned buildings were observed, their location was noted. Hollow bearing trees, where present were marked spatially using AvenzaMaps on a mobile device. .

Survey limitations

This assessment was not intended to provide an inventory of all species present across the survey area but instead an overall assessment of its ecological values. The survey was conducted with an emphasis on threatened species, threatened ecological communities and key fauna habitat features. It is important to note that some species may not have been detected within the survey area during the inspection as they may be cryptic or seasonal and only detectable during flowering or during breeding. In this case the likelihood of their occurrence has been assessed based on the presence of potential habitat.

The field survey was undertaken using hand-held GPS units. It should be noted that these units can have errors in accuracy of up to 20 m (subject to availability of satellites on the day).

B2 Recovery potential

Using information collected in the field 'recovery potential' is determined for each area of vegetation. This is defined as "the anticipated capacity of (an) area to recover to a state representative of its condition prior to the most recent disturbance event" (IPC & AES 2002).

Table 10 outlines the decision rules used in this step, resulting in a ranking of High, Moderate, Low or Very Low recovery potential for each vegetation remnant.

Table 10: Recovery potential matrix (ELA 2003)

Current condition and land use	Past land use and disturbance	Soil Condition	Vegetation	Recovery Potential
Cleared (no woodland canopy). Includes *Bursaria* thickets in grassland	Recently cleared (<2 years)	Unmodified or largely natural. Uncultivated.	Native dominated	High
			Exotic dominated	Moderate
		Modified. Heavily cultivated and/or pasture improved. Imported material.	Either	Low
	Historically cleared (>2 years) and consistently managed as cleared.	Unmodified or largely natural. Uncultivated.	Native dominated	Moderate
			Exotic dominated	Low
		Modified. Heavily cultivated and/or pasture improved. Imported material.	Either	Very Low
Wooded/Native Canopy present or regenerating	No recent clearing of understorey	Unmodified or largely natural. Uncultivated.	Native understorey relatively intact or in advanced state of regeneration. Native dominated.	High
			Native understorey significantly structurally modified, absent or largely absent. Includes areas dominated by African Olive.	Moderate
		Moderately modified by long term grazing or mowing.	Exotic dominated	Low
			Native dominated	Low
		Modified. Heavily cultivated and/or pasture improved. Imported material.	Native understorey significantly structurally modified, absent or largely absent. Includes areas dominated by African Olive.	Very Low
			Native understorey present. Heavily weed invaded.	Low
	Understorey patchily intact	Disturbed	Native dominated	Moderate
			Exotic dominated	Low

Current condition and land use	Past land use and disturbance	Soil Condition	Vegetation	Recovery Potential
	Recent clearing of understorey and or native understorey significantly structurally modified due to existing land use (e.g. Mowing, grazing).	Unmodified or largely natural. Uncultivated.	Native dominated. If no vegetation present, assume native dominated.	High
			Exotic dominated	Moderate
		Modified. Heavily cultivated and/or pasture improved. Imported material.	Native dominated	Low
			Exotic dominated	Very Low

B3 Ecological constraints

An ecological constraints analysis based on a methodology previously used by ELA elsewhere in Western Sydney was applied across the subject site. An ecological constraints analysis is a stepped analysis of the environmental values of an area. It provides a combined measure of ecological values and is increasingly used as a basis for negotiations over locations, types and densities of land development. It includes measurement of:

- The legislative status of vegetation communities;
- the structural condition of vegetation remnants;
- type and severity of disturbance and associated recovery potential;
- connectivity between remnants on and off site;
- the size of the vegetation remnant; and
- the value of the remnant as threatened species habitat.

The steps involved in this type of ecological constraints analysis are illustrated in Figure 17. Vegetation mapping is combined with field survey work, threatened species assessment, recovery potential and the NPWS (2002) conservation significance assessment methodology to determine the relative level of ecological value or constraint across a site.

Information derived from the recovery potential, conservation significance and threatened species calculations are combined to determine ecological constraint. The process for combining this information is detailed on Table 11, Table 12 and Table 13.

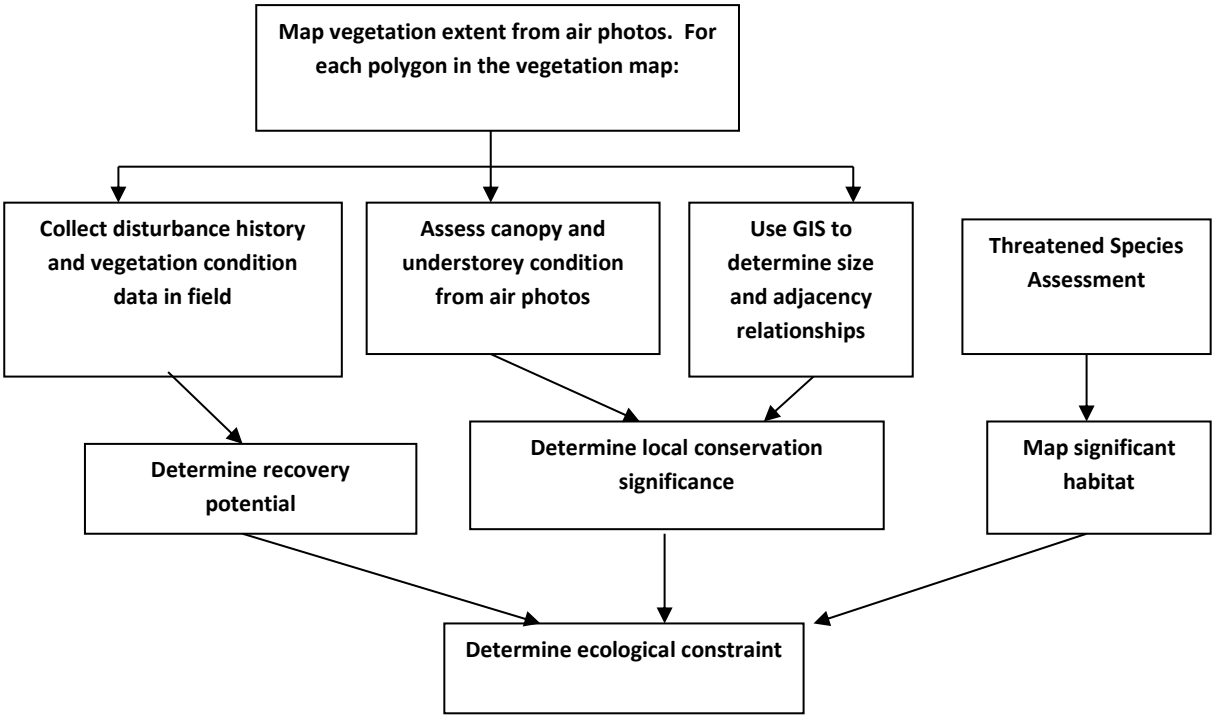

Figure 17: Ecological Constraints Flowchart

Table 11: Conservation significance matrix (NSW NPWS, 2002)

Community type	Condition code	Patch size^	Connectivity	Code	Conservation significance
Endangered Ecological Community (Critically endangered) (CEEC)	ABC, TX or Txr	Any	Any	C3	Core
	Txu	Any	Any	URT	Urban remnant trees (critically endangered communities)
Endangered Ecological Community (EEC)	ABC (with Understorey in good or moderate condition)	> 10 ha	Any	C1	Core
			Adjacent to C1 or CEEC	C2	Core
		< 10 ha	Adjacent to S1	S2	Support for core
			None	O	Other remnant vegetation
	TX or Txr, ABC (with poor Understorey condition)	Any	Adjacent to any Core	S1	Support for core
			None	O	Other remnant vegetation
	Txu	Any	Any	O	Other remnant vegetation

^ Patch size is based on a 15m adjacency analysis

Table 12: Decision matrix step one

Recovery Potential					
Conservation Significance		High	Moderate	Low	Very Low
	Core	High	High	High	High
	Support for core	High	Moderate	Moderate	Low
	Other	Moderate	Moderate	Low	Low

Table 13: Decision matrix step two

Combined Recovery Potential and Conservation Significance (result of Table above)				
Threatened Species Assessment		High	Moderate	Low
	Known (High)	High	High	High
	Likely (Moderate)	High	Moderate	Moderate
	Nil (Low)	High	Moderate	Low

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