Pondicherry Precinct Biodiversity Assessment

Department of Planning, Industry and Environment

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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
MNES	Matters of National Environmental Significance
NPWS	NSW National Parks and Wildlife Service
OEH	NSW Office of Environment and Heritage (known now as DPIE)
TSC Act	*Threatened Species Conservation Act 1995*
TSSC	Threatened Species Scientific Committee

Executive Summary

Eco Logical Australia Pty Ltd (ELA) was engaged by DPIE to undertake a Biodiversity Assessment for Precinct Planning of the Pondicherry Precinct. The aim of this report is to identify key ecological constraints to assist design of an Indicative Layout Plan.

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, planning and development of the precinct should proceed in accordance with these approvals.

The site was found to contain 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 a critically endangered ecological community under the EPBC Act) and habitat features associated with potential habitat for a number of threatened flora and fauna species.

Approximately 1.60 ha of existing native vegetation was identified in the Draft Growth Centres Conservation Plan 2007 within non-certified land. This becomes the minimum target for protection of existing native vegetation to maintain parity with the Biodiversity Certification Order. Field survey validated the existing native vegetation of 1.60 ha of ENV and 9.67 ha of Additional High Conservation Value Vegetation (AHCVV) in precinct, the vast majority of which is on certified land.

The vegetation on site has 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.

1. Introduction

1.1 Description of the project

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

The aim of this assessment is to identify key ecological features and constraints of the site to inform the rezoning process, as well as to provide recommendations with respect to terrestrial and aquatic ecosystem management.

Specific objectives of this project are to:

- Undertake a Biodiversity Assessment to inform the precinct planning process and preparation of the Indicative Layout Plan.
- Ensure the statutory requirements for the protection, restoration and enhancement of threatened species, populations, ecological communities and their habitats are met
- Achieve innovative and cost-effective management frameworks capable of implementation via the development approval process for vegetation issues which enable long term conservation and management of these issues while facilitating the development outcomes for the Precinct
- Ensure that precinct planning is consistent with the terms of the Biodiversity Certification granted on the SEPP, including the Relevant Biodiversity Measures outlined in the Biodiversity Certification Order
- Ensure that precinct planning is consistent with the endorsed Sydney Growth Centres Strategic Assessment Program under the EPBC Act, including the Commitments for matters of national environmental significance protected under the EPBC Act.

1.2 Subject site

Figure 1 illustrates the location of the precinct ('subject site'). Within the subject site, the Tranche 41 rezoning area is identified as currently being progressed by the landowner, however, the outcomes and planning for that portion of the precinct are not considered within this assessment.

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, including 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 1: 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 3) 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 biodiversity certified land is shown in Figure 2.

Figure 3 and Figure 4 show that there is 'existing native vegetation on non-certified land' within the precinct and therefore there is an expectation that 1.59 ha of ENV 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 Act 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, the Pondicherry Precinct will need to demonstrate how the biodiversity and other values of areas identified by the SEPP will be protected, maintained and enhanced.

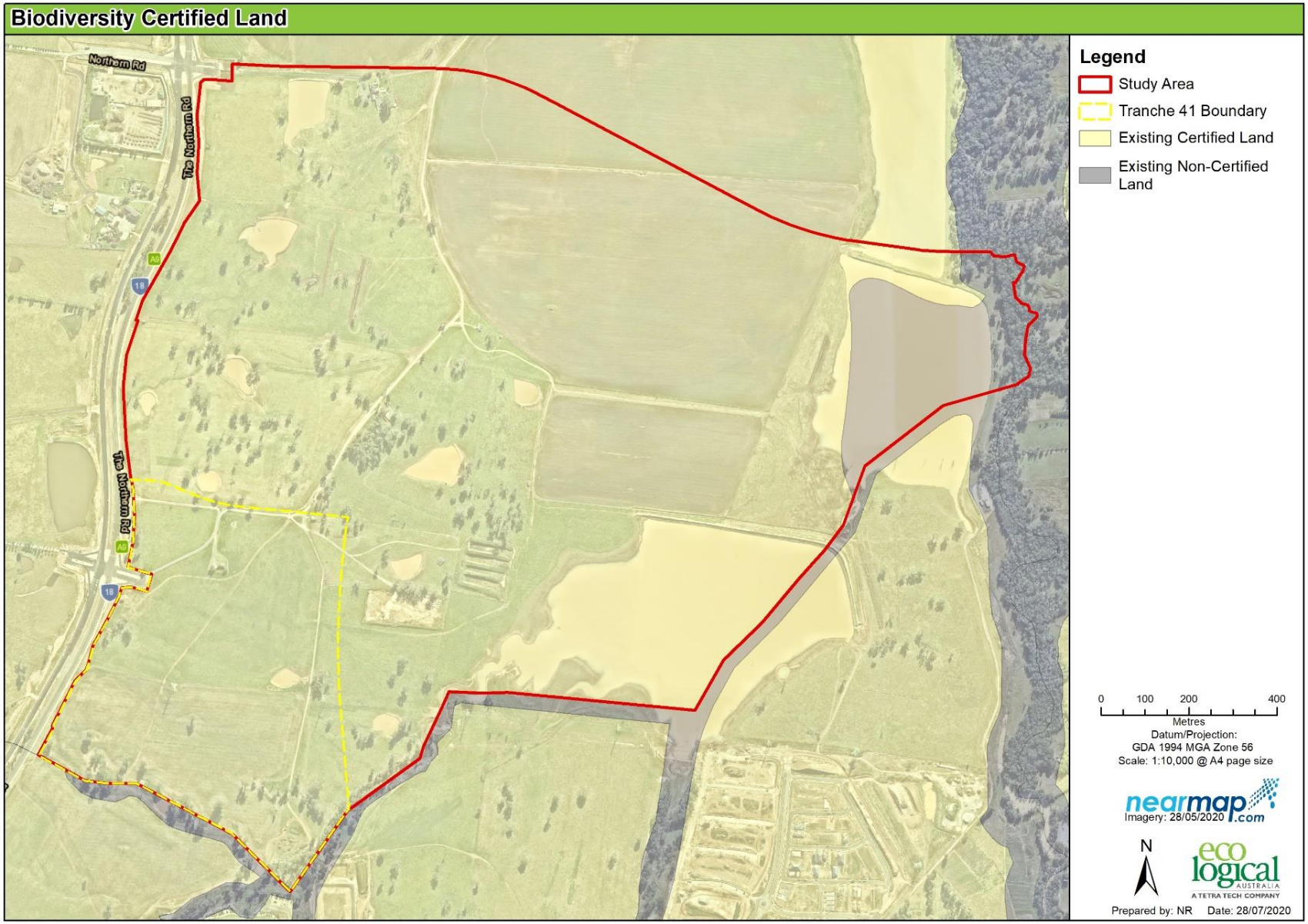

Figure 2: Biodiversity Certification

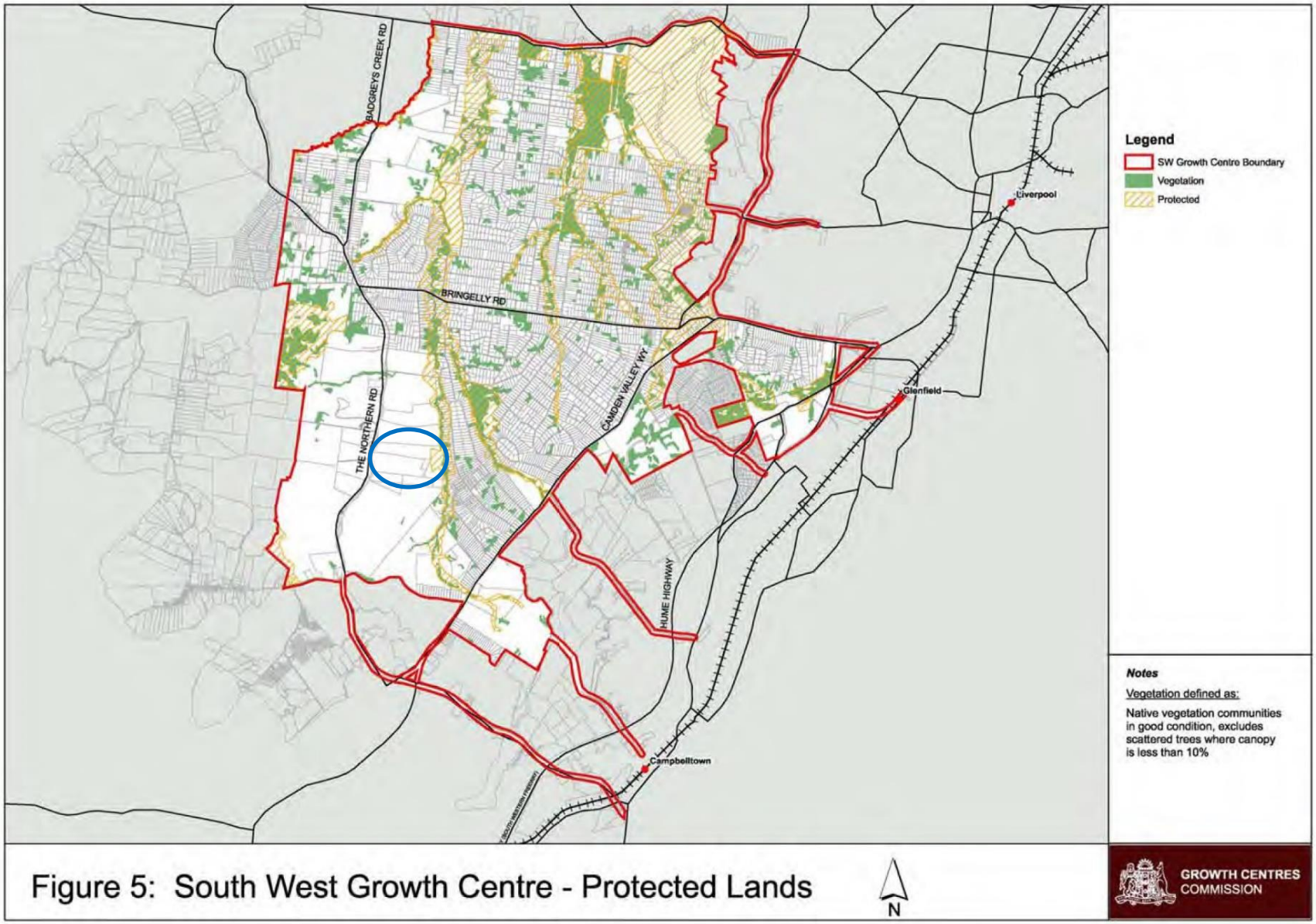

Figure 3: South West Growth Area Protected Lands from Draft Growth Centres Conservation Plan (Growth Centres Commission 2007)

Figure 4: 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

3.2 Field survey

Vegetation was ground-truthed over two days by two ecologists in September 2017 and validated again July 2020. The survey area is shown in Figure 1. 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 5 and 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).

Cumberland Plain Woodland within the subject site was confirmed to be PCT 849 Cumberland Shale Plains Woodland and was observed in two conditions, each detailed in Table 1 below.

Table 1: Conditions of Cumberland Plain Woodland identified within survey area.

Condition	Description	BC Act	EPBC Act and Justification[#]
Moderate (BC Act and EPBC Act)	Scattered patches of Cumberland Plain Woodland in moderate condition was present throughout the western half of the subject site (Figure 6). These patches were characterised by a canopy dominated by *Eucalyptus tereticornis* (Forest Red Gum) and *Eucalyptus moluccana* (Grey Box). 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 sparse layer of *Lycium ferocissimum* (African Boxthorn) or was absent. • The groundcover was dense and comprised of exotic pasture grasses and broadleaved weeds.	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.
Poor (BC Act)	Cumberland Plain Woodland in poor (BC Act) condition was scattered in small patches in the western half of the subject site (Figure 6). Cumberland Plain Woodland in this condition contained an assemblage of canopy species like that of the ecological community in moderate (BC Act) condition. However, Cumberland Plain Woodland in poor (BC Act) condition was characterised by the dominance of exotic groundcover species including *Cenchrus clandestinus* (Kikuyu Grass), *Chenopodium album* (Fat Hen), *Lolium* spp. (Ryegrass), *Rapistrum rugosum* (Turnip Weed) and *Chloris gayana* (Rhodes Grass).	CEEC	No – Cumberland Plain Woodland in poor condition did not meet condition thresholds because < 30% of the perennial understorey vegetation cover** is made up of native species.

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. This community equates to PCT 835 Cumberland River-Flat Forest. River-flat Eucalypt Forest is also listed as a threatened ecological community under the EPBC Act as Coastal Floodplain Eucalypt Forest of Eastern Australia.

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)*.*

The combination of features that distinguish River-flat Eucalypt Forest on Coastal Floodplains from other endangered communities on the coastal floodplains include: its dominance by either a mixed eucalypt canopy or by a single species of eucalypt belonging to either the genus *Angophora* or the sections *Exsertaria* or *Transversaria* of the genus *Eucalyptus*; the relatively low abundance or sub-dominance of *Casuarina* and *Melaleuca* species; the relatively low abundance of *Eucalyptus robusta*; and the prominent groundcover of soft-leaved forbs and grasses*.*

Desktop assessment identified River-flat Eucalypt Forest along the north-east boundary of the subject site adjacent to South Creek.

Field survey confirmed the presence of one small patch of River-flat Eucalypt Forest in good condition along South Creek (Figure 8). The canopy consisted of *Angophora floribunda* (Rough-barked Apple), *Angophora subvelutina* (Broad-leaved Apple), *Eucalyptus amplifolia* (Cabbage Gum). The midstorey was dense and contained *Bursaria spinosa, Casuarina glauca*, *Melaleuca decora*. The groundcover was dense and comprised of plants typical to this community including *Microlaena stipoides, Oplismenus aemulus, Dichondrarepens, Entolasia marginata, Pratia purpurascens* and *Echinopogon ovatus*. This occurrence of the community conforms to the endangered ecological community listed under the BC Act and the EPBC Act.

Derived native grassland was also identified adjacent to the good condition patch on South Creek. Derived native grasslands result from the removal of woody strata and are included in the BC Act listing of the ecological community (DPIE 2020b). This area was 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).

Condition classes are described in Table 2.

4.1.3 Cleared/Exotic

Vegetation mapped as Cleared/Exotic was prevalent throughout the subject site (Figure 5). The majority of this vegetation was characterised by groundcover dominated by exotic pasture grasses. The areas without any native canopy were mostly working crops or grazing lands and the species in the ground layer reflect this history and current use.

Table 2: Conditions of River-flat Eucalypt Forest identified within survey area.

Condition	Description	BC Act	EPBC Act and Justification#
Good (BC Act and EPBC Act)	A contiguous patch of River-flat Eucalypt Forest in good condition was present along South Creek (Figure 8). The canopy consisted of *Angophora floribunda* (Rough-barked Apple), *Angophora subvelutina* (Broad-leaved Apple), *Eucalyptus amplifolia* (Cabbage Gum). The midstorey was dense and contained *Bursaria spinosa, Casuarina glauca*, *Melaleuca decora*. The groundcover was dense and comprised of plants typical to this community including *Microlaena stipoides, Oplismenus aemulus, Dichondra repens, Entolasia marginata, Pratia purpurascens* and *Echinopogon ovatus*.	EEC	EEC – River-flat Eucalypt Forest in this condition met the key diagnostic characteristics for listing under the EPBC Act and met the following condition thresholds for a Category B3: • Large patch that meets key diagnostics and • Has a predominantly native understory and • Groundcover richness more than six native species and • At least 10 large trees per hectare.
Poor (BC Act)	River-flat Eucalypt Forest in poor (BC Act) condition was found at the southern boundary where the riparian corridors extend upstream into the adjacent Oran Park precinct. This condition contained a limited assemblage of canopy species like that of the ecological community in moderate (BC Act) condition. However, in poor (BC Act) condition was characterised by significant disturbance, bare soil and the dominance of exotic groundcover species including *Cenchrus clandestinus* (Kikuyu Grass), *Chenopodium album* (Fat Hen), *Lolium* spp. (Ryegrass), *Rapistrum rugosum* (Turnip Weed) and *Chloris gayana* (Rhodes Grass).	EEC	No – River-flat Eucalypt Forest in poor condition did not meet minimum condition.
DNG (BC Act)	Derived native grassland was also identified adjacent to the good condition patch on South Creek. Derived native grasslands result from the removal of woody strata and are included in the BC Act listing of the ecological community (DPIE 2020b). This area was 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).	EEC	No – River-flat Eucalypt Forest does not meet key diagnostics

EEC = 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.*

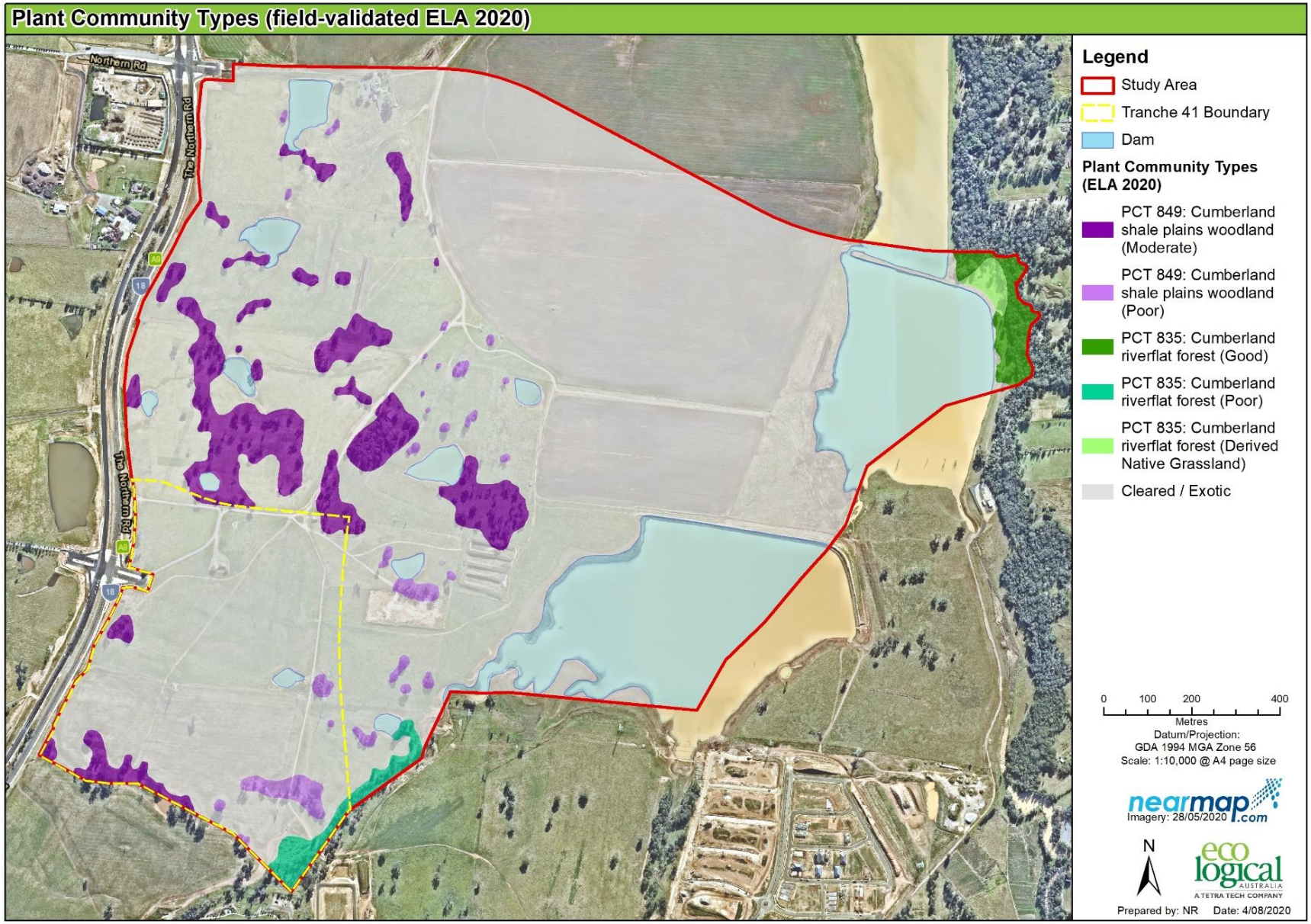

Figure 5: Vegetation communities and conditions identified during field survey.

Figure 6: Cumberland Plain Woodland identified in varying conditions. Top left: Moderate (BC Act and EPBC Act). Bottom left: Good (BC Act). Bottom right: Poor (BC Act)

Figure 7: Derived Native Grassland.

Figure 8: Good condition River-flat Eucalypt Forest

Figure 9: Poor condition River-flat Eucalypt Forest

Figure 10: Areas of exotic cover in the foreground

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	Moderate	15.16
Cumberland Plain Woodland	Low	2.76
	Total	**17.92**
River-flat Eucalypt Forest	Good	2.14
River-flat Eucalypt Forest	Low	2.01
River-flat Eucalypt Forest	DNG	0.67
	Total	**4.82**
	Combined Total	**22.75**

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. The majority of this is located on biodiversity certified land.

Areas of ENV and AHVCC within the subject site are presented in Table 4 and Figure 11.

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

	Certified Land	Non-Certified Land	Total
Mapped ENV in Draft Conservation Plan (2007 Extant)	0	1.60	**1.60**
Validated ENV by 2020 survey	0	1.60	**1.60**
Additional High Conservation Value Vegetation (AHCVV)			**9.67**

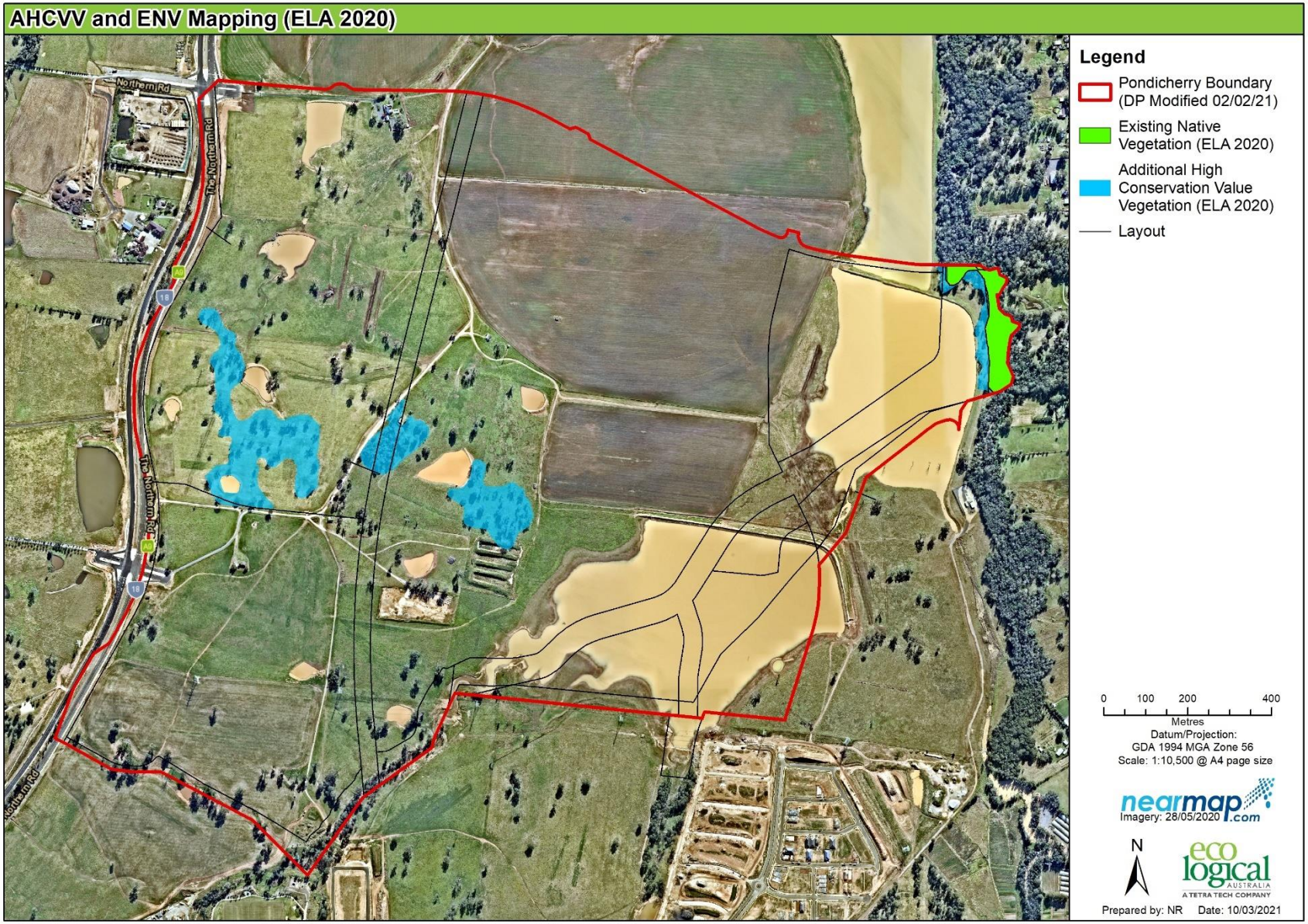

Figure 11: ENV and AHCVV within the subject site

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.

Two classes of recovery potential have been identified within the precinct which has been informed by the assessments (desktop and field) conducted in this report. The classes are shown in Figure 12 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
- 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

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	2.81
Low	238.63

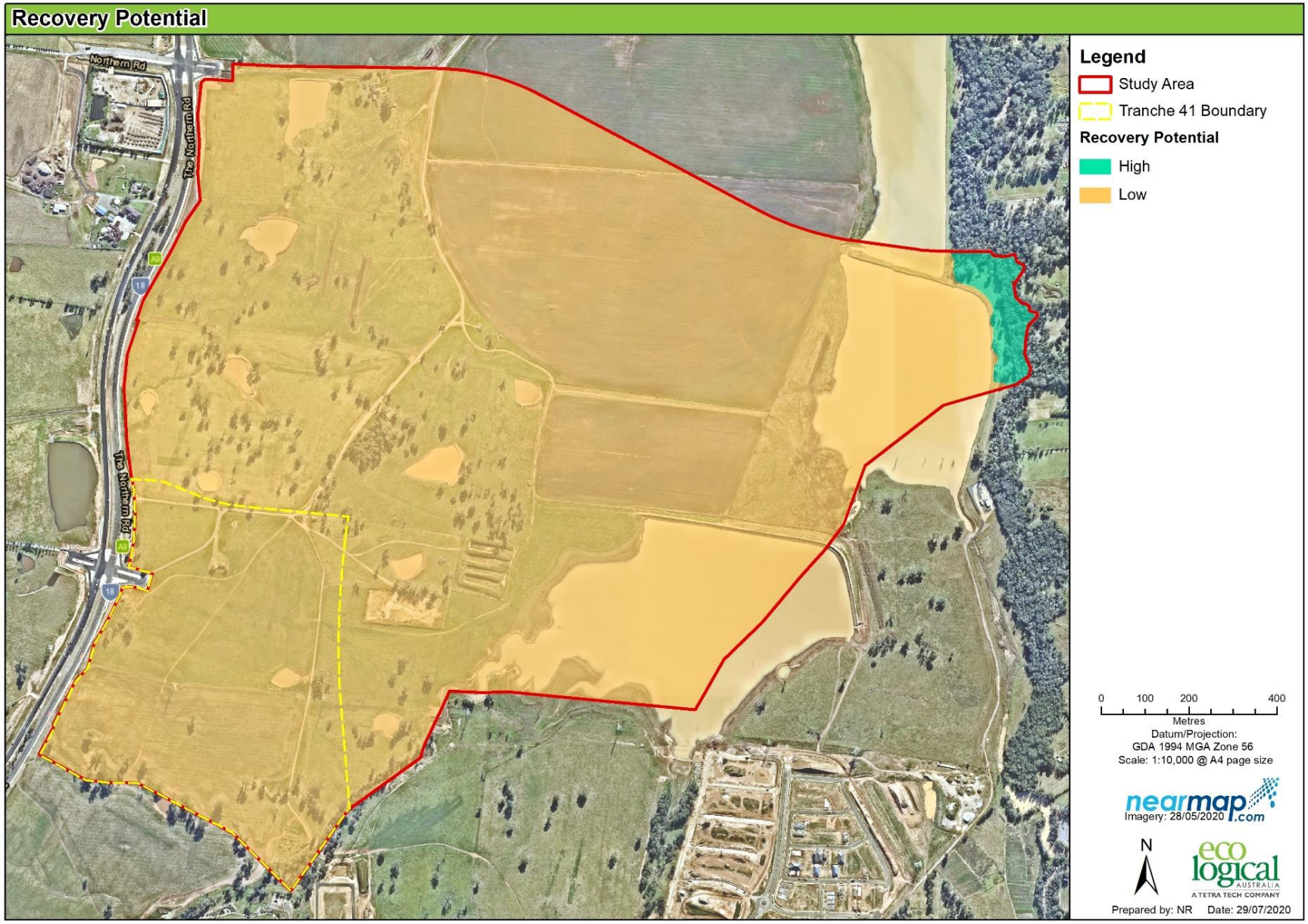

Figure 12: Recovery potential

4.4 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 13):

- *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 6 and Figure 13.

Table 6: Threatened fauna species with the potential to occur in the subject site.

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, although no large stick nests were observed.
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 contained *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 River-fat Eucalypt Forest 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 good quality native vegetation.
Miniopterus orianae oceanensis	Large Bent-winged Bat	V	-	The survey area contained good quality of native vegetation.
Myotis macropus	Southern Myotis	V	-	The survey area contained hollow bearing trees and good quality native vegetation.
Ninox strenua	Powerful Owl	V	-	The survey area contained good quality 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 good quality native vegetation.
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-	The survey area contained hollow bearing trees and good quality native vegetation.
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	The survey area contained hollow bearing trees and good quality native vegetation.

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

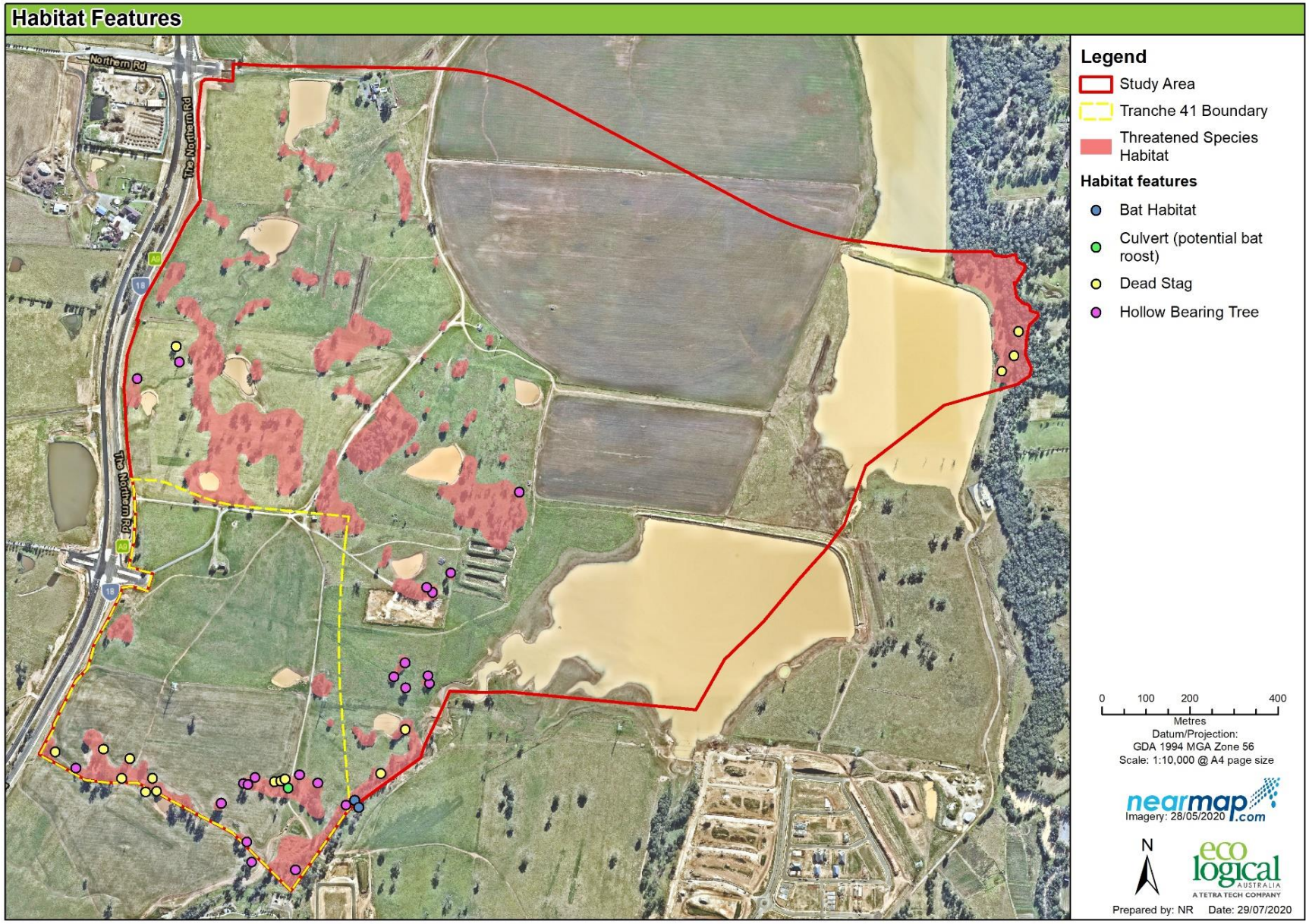

Figure 13: Areas of potential habitat for threatened species.

4.5 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 does take into account the fact that the land is currently biodiversity certified.

The categories are as follows:

- High constraint = current vegetated non-certified land, 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, and non-certified land lacking vegetation (dams) or cleared/exotic.

The results of this analysis are presented in Table 7 and Figure 14.

Table 7: Area of different ecological constraints rankings identified within the subject site.

Ecological constraints ranking	Area (ha)
High	2.70
Moderate	19.93
Low	218.81

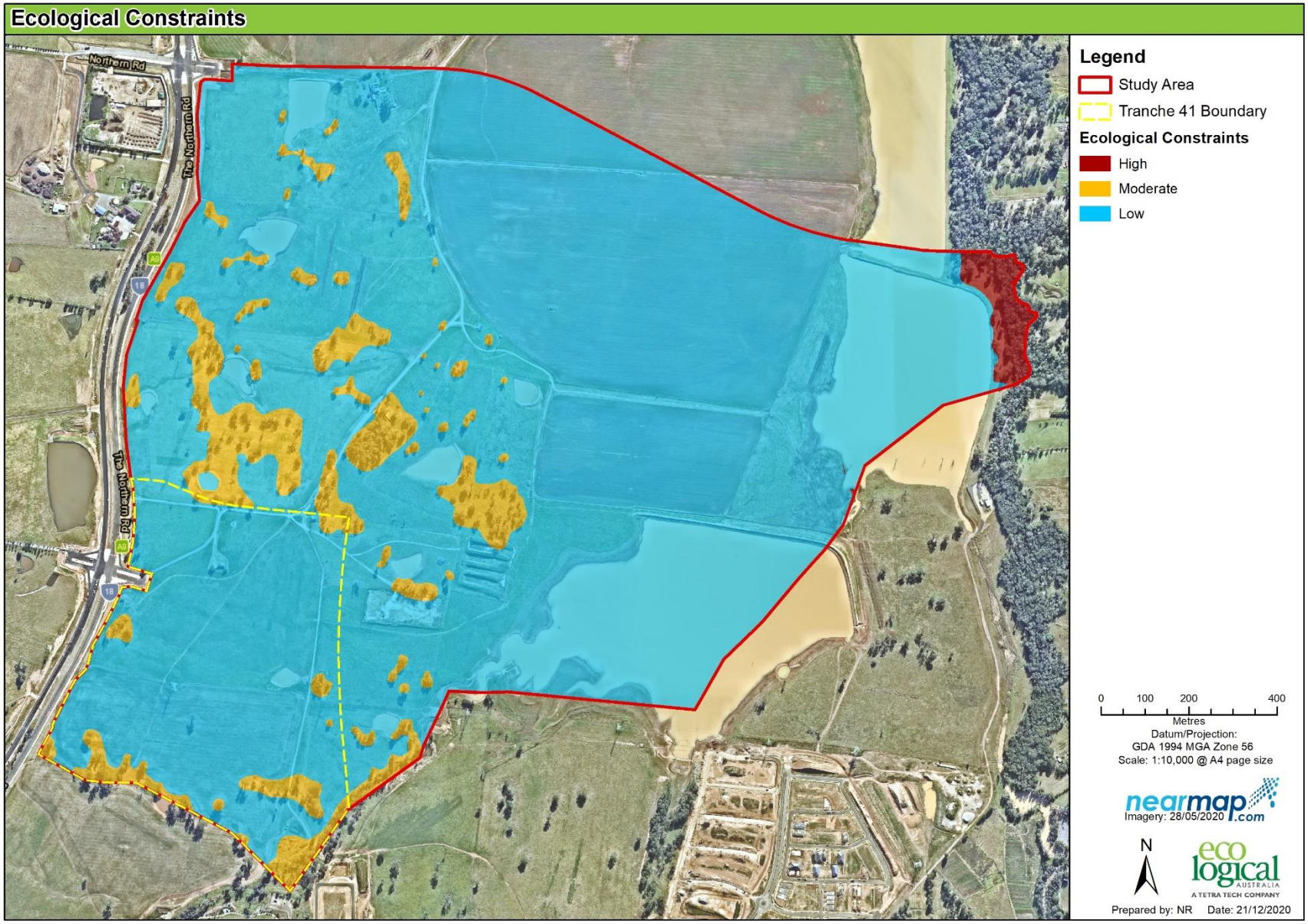

Figure 14: Ecological constraints analysis

5. Recommendations for Indicative Layout Plan

5.1 Recommendations for Consistency with the Biodiversity Certification Order

To maintain parity with the Biodiversity Certification Order, a minimum of 1.60 hectares of existing native vegetation must be protected in the precinct. Protection of the 1.60 hectares of ENV located within the riparian area of South Creek will achieve this target. Riparian habitat and proposed management strategies are further discussed within the Pondicherry Precinct Riparian Assessment (ELA, 2020).

5.2 Zoning, Ownership and Management

Areas of ENV that are to be protected have generally been zoned E2 in other Precinct Plans. In some instances, the Precinct Plan has protected ENV via a Recreation zone or an Infrastructure zone, however this has generally been where they were also placed in public ownership and conservation of the ENV was a clear priority for the site. The permissible uses within the E2 zone are shown below.

Table 8: 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

For the Pondicherry Precinct it is recommended that the ENV in the south creek corridor be zoned E2 Environment Conservation. We recommend an E2 zoning is applied to land identified on the ILP as 'riparian', 'environmental conservation' and 'drainage'. To ensure biodiversity values are maintained in the areas to be zoned E2 (or similar) management of the vegetation for a minimum five years is recommended. This allows for weeding, planting and maintenance in accordance with a Vegetation Management Plan.

5.3 Biodiversity Consistency Reports

To confirm that the Precinct Plan is consistent with the Sydney Region Biodiversity Certification Order and the Commonwealth Strategic Assessment, two Biodiversity Consistency Reports are to be prepared and publicly exhibited with the package of plans.

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 2019

This guide (*Planning for Bushfire Protection: a Guide for Councils, Planners, Fire Authorities, Developers and Home Owners, NSW Rural Fire Service 2019*) 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 Pondicherry Precinct is not located on land to which this policy applies.

Appendix B Methodology

B1 Field Survey

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 Avenza Maps 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 9 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 9: 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	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 15. 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 10, Table 11 and Table 12.

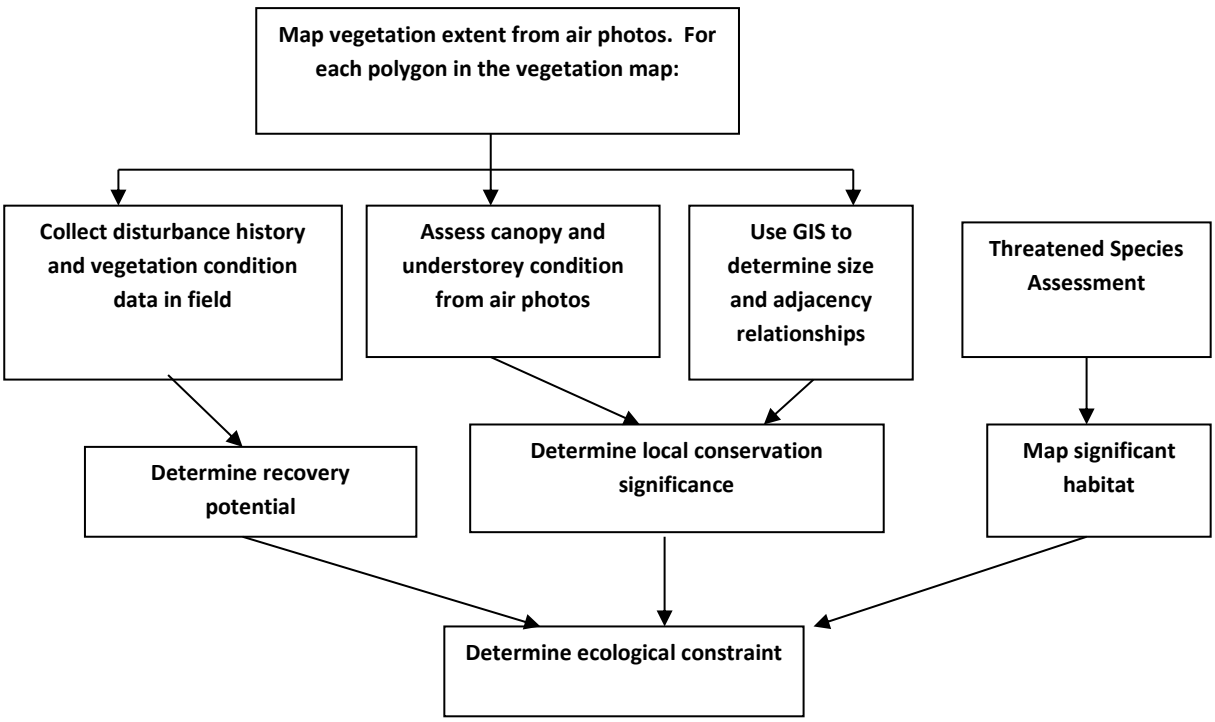

Figure 15: Ecological Constraints Flowchart

Table 10: 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 11: 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 12: 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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