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Western Sydney Parklands Bungarribee Precinct Project Ecological Impact Assessment

Report prepared for:
Landcom and
Department of Planning

(087-011)

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Contents

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Executive Summary

The Regional Western Sydney Parklands (the Parklands) occupy a strategic position linking the North-West and South-West Development Sectors of Sydney. They include the Bungarribee Parklands Precinct that is adjacent to the Doonside Residential Parcel north of the Great Western Highway and west of Doonside Road.

The Doonside residential footprint is approximately 60 ha in area, 85% of which is exotic grassland. Shale Plain Woodlands and Swamp Oak Floodplain Forest (Alluvial Woodland) both endangered ecological communities listed under the NSW Threatened Species Conservation Act 1995*, also occur within Doonside Residential Parcel. These communities are part of the Cumberland Plain Woodland complex listed under the (Cth)* Environment Protection and Biodiversity Conservation Act 1999*. The residential parcel also contains areas of native grassland containing threatened species habitat and known locations of Grevillea juniperina, Cumberland Plain Land Snail and micro bats.*

Bushfire and aquatic assessment were also undertaken as part of this assessment.

The proposed residential development necessitates the loss of approximately 12.5 hectares of remnant native vegetation including areas of EEC and known threatened species habitat. Mitigation measures are recommended in addition to additional seasonally appropriate surveys.

In order to adhere to the principle of "maintain or improve" in Part 3A of the Environmental Planning and Assessment Act 1979*, some 27.88 hectares of 'like for like' habitat communities within the Bungarribee Parklands Precinct will be protected and/or enhanced. The extent of impact for each vegetation community type and the offset ratios proposed are outlined in the table below.*

***Table E1:** Offset Ratios and Extent of Impact*

Community	Condition*	Area (ha) Impacted	Offset Ratio	Type of Offset	Area (ha) Required
Alluvial Woodlands	ABC	0.37	3:1	Recreation	1.11
	TX	0.00	2:1		
Shale Plains Woodland	ABC	2.43	3:1	Revegetation	7.29
	TX	2.14	2:1	Revegetation	4.28
Grassland	Native	7.6	1:1	Protection	7.6
	Relocation	(7.6)	1:1	Relocation	7.6
Total		**12.54**	**(2.1:1)**		**27.88**

Indicative areas for offsets have been identified and prioritised within the Bugarribee Parklands Precinct. These areas aim to consolidate and strengthen existing remnant vegetation on site and improve habitat linkages, area to edge ratios within the Parklands and are in line with the Western Sydney Regional Parklands Management Vision (Department of Infrastructure, Planning and Natural Resources November 2004).

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1. Introduction

1.1 The Parklands Bungarribee Precinct

The Regional Western Sydney Parklands occupy a strategic position linking the North-West and South-West Development Sectors of Sydney. The Parklands cover 5,500ha of land and stretch 27km from Quakers Hill in the north to Leppington in the south. The Parklands corridor contains existing recreation facilities such as the Olympic Equestrian, Shooting and Baseball centres, Prospect Reservoir and the Eastern Creek raceway.

The study area covered by this report is illustrated in Figure 1 and contains:

- Parklands Precinct 2: Bungarribee
  - one of the nine precincts that make up the 5,500ha Western Sydney Parklands.
  - comprises approximately 300ha of land in Blacktown LGA.
  - described in greater detail in The Western Parklands Management Vision (Department of Infrastructure, Planning and Natural Resources 2004).

- Interface lands:
  - Doonside Residential Parcel: a 79.2ha (approx) site, adjoining the Parklands at Doonside, to be developed for residential purposes.
  - The residential footprint is approximately 55ha.
  - Huntingwood West: a 56ha (approx) site, adjoining the Parklands at West Huntingwood, to be developed for employment purposes.

The land is owned by the NSW Department of Planning (DoP). A Parklands Trust will be created to administer and manage these lands. The Parklands Trust will manage the natural and public recreational areas of the Parklands. Development of the Interface Lands will generate funds that will be directed to the Parklands Trust for ecological restoration and management of these parkland areas.

1.2 Parklands Management Vision

The strategic ecological objectives of the Western Sydney Regional Parklands Management Vision are set out in the Western Sydney Parklands Management Vision Summary Report (Department of Infrastructure, Planning and Natural Resources November 2004). The Western Sydney Regional Parklands Management Vision is to:

> "*… form a unique component of the Sydney metropolitan open space system, linked to surrounding areas and providing a diverse range of recreation and cultural learning experiences integrated with the natural and cultural values of the land.*"

A key element of the Management Vision is the establishment of an ecological network that maintains core habitat areas linked by habitat corridors. Core Habitats of endangered ecological communities (EECs), and a 200m wide Habitat Corridor centred on Eastern Creek are identified in the Management Vision for the Parklands.

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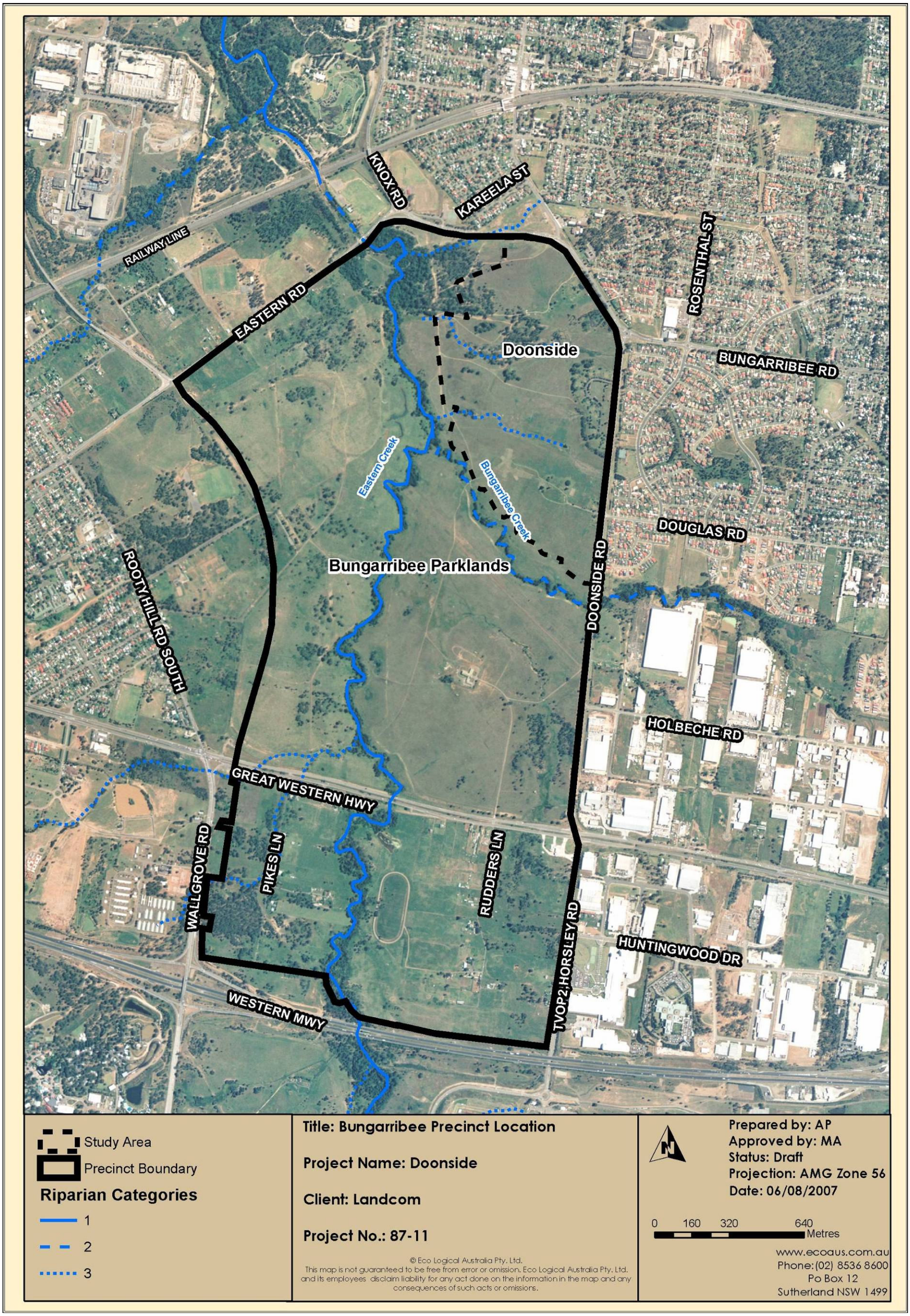
Figure 1: The Parklands Bungarribee Precinct and Doonside Residential Parcel



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1.3 History of Project

Eco Logical Australia was initially engaged to document the conservation significance, recovery potential and development constraints for the Bungarribee Parklands – part of the Western Sydney Parklands. The findings of these field investigations are documented in 'Western Sydney Parklands Ecological Assessment' (Eco Logical Australia (ELA), Feb 2006 - Project No. 87-03). A Bushfire Assessment was also completed under the RFS Planning for Bushfire Protection Guidelines (2001) as part of the ecological assessment (Western Sydney Parklands Bushfire Advice, ELA Feb 2006 Project No. 87-06).

Following this, specific ecological advice was provided, and offsets were examined, for Huntingwood West Employment Lands – in the south western corner of the Bungarribee Precinct. The ELA report 'Strategic Offset Directions for Huntingwood West Employment Lands' (ELA Sept 2006, Project No. 087-007) documents the proposed conservation initiatives for this site.

This current report documents the ecological impacts and proposed offsets related to the development proposed within the Doonside Residential Parcel. The assessment also provides additional detail on potential ecological restoration areas within Bungarribee Parklands. This additional detail is provided in order for required offsets to be accurately allocated, targeted and to assist in achieving broader landscape scape planning outcomes for the Bungarribee Parklands Precinct.

1.4 Aim of this Assessment

The aim of this assessment is to describe the ecological values of the Doonside Residential Parcel, assess the impact of the proposed development and propose mitigation and offset strategies to ameliorate and counterbalance these impacts for the purpose of supporting a 'Concept Plan' under Part 3A of the *Environmental Planning and Assessment Act 1979*.

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2. Background – Doonside Residential Parcel

2.1 Regional Context - Bungarribee Precinct

The study area is part of the Sydney Regional Environment Plan (SREP) 31 – Regional Parklands and creates a vital north-south link along Eastern Creek, linking Nurragingy Reserve in the north, and Prospect Reservoir in the south. The study area provides the following corridor linkages:

- Primary internal link;
- Critical – core to core link, and;
- Supportive – general link.

The internal link is central to SREP31 and provides a continuous band of native vegetation supporting wildlife and genetic movement from Edmondson Park in the south to Quakers Hill in the north. The link is also vital to the maintenance of genetic flow among plant communities. This study area is considered to be a tenuous part of the internal link, because for the majority of the site's native bushland is restricted to a narrow band along Eastern Creek. Immediately to the north of the study area the internal link consists of riparian forest and open woodland forming a wider vegetation band to support corridor function.

Eastern Creek and its tributaries (Reedy and Bungarribee Creeks) flow into and through the study area. These creek lines support the occurrence and distribution of Swamp Oak Floodplain Forest, but the natural flow of water is highly modified by the presence of culverts and subsequent sedimentation.

At a local level the study area supports critical linkages between core habitats. The area and condition of core habitat is considered capable of supporting the life cycle requirements of a broad range of fauna classes and vegetation communities. Linkage between these core habitats is vital to species dispersal. It also provides areas large enough to support species with large territorial requirements.

A number of smaller links occur in the study area between isolated bushland remnants. These links support fauna foraging activities but are not vital to the maintenance of biodiversity.

The Bungarribee Precinct is proposed as a community recreation hub. The development of the Doonside residential parcel will provide financial resources to the Parklands Trust in support of ecological restoration works and ongoing environmental management of the Parklands.

2.2 Site Description

The Doonside Residential Parcel (Parcel 3) is located adjacent to the Bungarribee Parklands part of the Western Sydney Parklands. The Bungarribee Parklands, described in the Western Sydney Parklands Management Vision, will form the main community recreation hub for both active and passive recreation in the northern part of the parklands. Bushland is to be restored through the broad floodplain and current rural landscapes will be retained on the valley slopes to allow open areas for intensive community use.

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The Doonside Residential Parcel is defined by the following landscape features:

- Bungarribee Creek to the South
- Eastern Creek to the West
- Doonside Road to the East (which continues on to the Railway Station)
- Eastern Road to the North
- A large remnant in the north
- Creek lines running east west through the residential parcel (Northern and Southern Creeks).

2.3 Ecological Planning Information

Ecological Australia was engaged previously to define the ecological and bushfire constraints of the Bungarribee Precinct. As part of this, the following information was mapped:

- Vegetation communities and condition
- Fauna habitat
- Aquatic ecosystem condition
- Ecological constraint
- Recovery potential
- Conservation significance
- Bushfire Risk and Protection
- Riparian Buffers

Based on this information, additional ecological site surveys and other technical and planning studies, the project team prepared a concept design for the development of Doonside Residential Parcel (See Figure 2).

2.4 Planning Context

In relation to biodiversity and conservation planning, there are a number of environmental planning instruments that are required to be considered in the development of the Bungarribee Precinct and the Doonside Residential Parcel. These instruments are outlined below.

2.4.1 International and Commonwealth Framework

The international and national instruments that deal with biodiversity that have been considered as part of this assessment include:

- Japan–Australia Migratory Bird Agreement (JAMBA) and China–Australia Migratory Bird Agreement (CAMBA)
- International Convention on Biological Diversity
- International Declaration on Environment and Development and Agenda 21
- Intergovernmental Agreement on the Environment (IGAE)
- The *Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*
- National Strategy for the Conservation of Australia's Biological Diversity
- National Local Government Biodiversity Strategy

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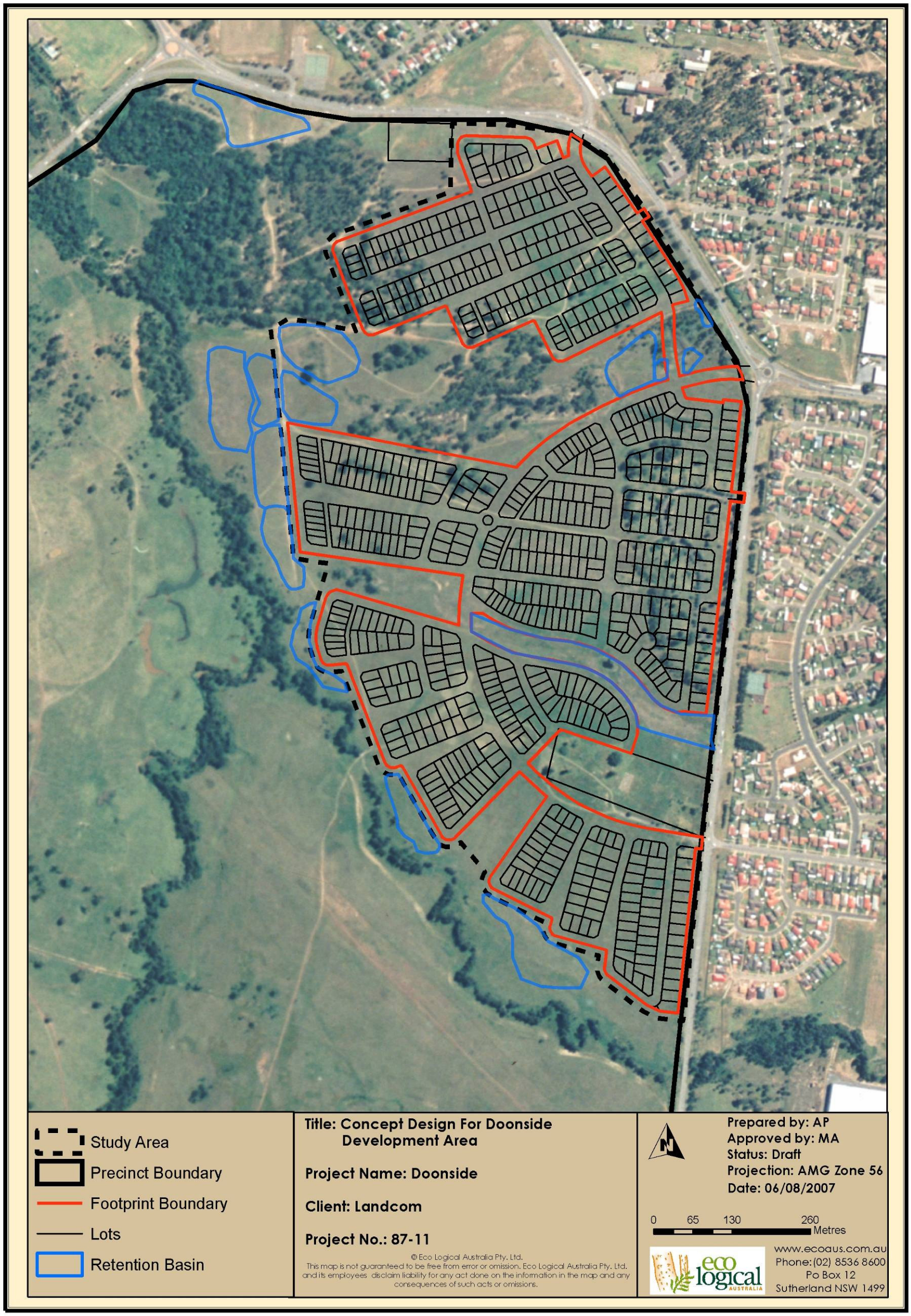
Figure 2: Doonside Residential Parcel Concept Plan



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2.4.2 State Framework

The state instruments that deal with the management and conservation of Biodiversity that have been considered as part of this assessment (although may not be binding under a Part 3A application) include:

- *Threatened Species Conservation Act, 1995 (TSC Act)*
- *Local Government Act, 1993*
- *Local Government Amendment (Ecological Sustainable Development) Act 1997.*
- *Environmental Planning and Assessment Act, 1979 (EP&A Act)*
- *Catchment Management Authorities Act 2003*
- *Catchment Management Act, 1989 (CM Act)* and associated NSW Rivers and Estuaries Policy, Estuary Management Policy, Wetlands Management Policy. This Act was superseded by the *Catchment Management Authorities Act 2003*
- *Nature Conservation Trust Act, 2001 (NCT Act)*
- *NSW Fisheries Management Act, 1984*
- *Water Management Act, 2001 (WM Act)*
- *Natural Resources Commission Act 2003*
- *Native Vegetation Act 2003* which replaces the *Native Vegetation Conservation Act,*
- *Rivers and Foreshores Improvement Act, 1948* (RFI Act)
- *Protection of the Environment Operations Act, 1997* (POEO Act)
- *Conveyancing Act, 1919*
- NSW Biodiversity Strategy 1999
- State Environmental Planning Policy No. 19: Bushland in Urban Areas
- State Environmental Planning Policy No. 44 Koala Habitat Protection

2.4.3 Regional Framework

The relevant regional plans and policies that deal with the management and conservation of biodiversity include:

- Buffer requirements described in Sydney Metro CMA guidelines
- Planning for Bushfire Guidelines (2006)
- Fish Habitat Protection Plans prepared under the *Fisheries Management Act 1994*. Habitat Protection Plan No. 3 for the Hawkesbury Nepean 1998
- Cumberland Plain EEC Recovery Plan Working Paper (NPWS, unpublished)
- Sydney Regional Environmental Plan No 31—Regional Parklands aims:
    - to strengthen the perception of the Regional Parklands as a unit that is a focus for the conservation of natural systems and a diverse range of recreational uses in Western Sydney
    - to maintain, enhance and rehabilitate the natural systems of the Regional Parklands, particularly those that include threatened species, populations or ecological communities, or their habitats
    - to improve management of the Regional Parklands by all those responsible for land within the Regional Parklands
- Sydney Regional Environmental Plan No 31—Regional Parklands matters of consideration for development approval such as:
    - whether the proposal will protect and enhance the natural systems of the Regional Parklands?

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  - the adequacy of measures proposed to conserve and enhance remnant vegetation to ensure protection of biodiversity, and threatened species, populations and ecological communities, and their habitats, and areas of environmental importance,
  - the adequacy of measures proposed to conserve and enhance watercourses and riparian areas,
  - the ability of the proposal to protect public health by having a neutral or beneficial effect on drinking water
- The Western Sydney Parklands ecological objective for the Precinct:
  - enhancement of the existing habitat within the Precinct, including along Eastern and Bungarribee Creeks
  - the protection and enhancement of other core habitats including Rooty Hill
  - alignment with broader corridor objectives (Rooty Hill and Eastern Creek Sportlands and Prospect Reservoir)
- Offsets already agreed for West Huntingwood under the *Environmental Planning and Assessment Act* (Part 3A application) including:
  - consolidation of the Shale Plain Woodlands west of Eastern Creek
  - riparian corridors on Eastern Creek.
- Blacktown Local Environmental Plan 1998, although not applicable to the development does contain a tree preservation order.

2.4.4 Part 3A Threatened Species Assessment Guidelines

There are 'Draft Guidelines for Threatened Species Assessment' prepared by the Department of Environment and Climate Change (DECC) and the Department of Primary Industries (DPI) that identify important factors and heads of consideration that must be considered by proponents and consultants when assessing potential impacts on threatened species, populations, or ecological communities, or their habitats for development applications assessed under Part 3A of the *Environmental Planning and Assessment Act 1979*. These Guidelines are attached in **Appendix A**.

These guidelines are provided for in section 75F in Part 3A of the ***Environmental* Planning and Assessment Act 1979**. The guidelines outline that the objective of the assessment process is to provide information to enable decision makers to ensure that developments deliver the following environmental outcomes:

1. Maintain or improve biodiversity values (ie. there is no net impact on threatened species or native vegetation).
2. Conserve biological diversity and promote ecologically sustainable development.
3. Protect areas of high conservation value (including areas of critical habitat).
4. Prevent the extinction of threatened species.
5. Protect the long-term viability of local populations of a species, population or ecological community.
6. Protect aspects of the environment that are matters of national environmental significance.

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3. Methodology

This section outlines the desktop and field survey methods used in compiling and gathering information for this assessment. They included a database review, multiple flora and fauna field surveys and a habitat assessment.

3.1 Database review

The following information and databases were reviewed prior to site surveys:

- Atlas of NSW Wildlife
- EPBC Protected Matters Search Tool
- Western Sydney Vegetation Mapping (NPWS 2002a)
- Western Sydney Condition and Conservation Significance Mapping (NPWS 2002b)
- Relevant soil mapping

Vegetation communities present within the study area were reviewed (NSW NPWS, 2002a) along with aerial photography of the study area (LPI, 1998 approx.) prior to field survey.

A search of the online EPBC Protected Matters Search Tool (DEH 2007), and Atlas of NSW Wildlife (DEC 2007) was performed on 7/08/2007. The search of the EPBC Protected Matters Search Tool used a radius of 5 km around coordinates -33.759 150.865. The search of the Atlas of NSW Wildlife covered the area from latitude -33.723 to -33.823, and longitude 150.815 to 150.925.

Species from both searches were combined to produce a list of threatened species. Species that were clearly aquatic (e.g. fish species) were removed from the list as it was considered that suitable habitat for these species does not occur at the study site.

Table 1 and 2 (below) identify the threatened species returned by the database searches together with an assessment of the likelihood of occurrence for each species. Each species likely occurrence was determined by records in the area, habitat availability and knowledge of the species' ecology.

Five terms for the likelihood of occurrence of species are used in this report. The terms for likelihood of occurrence are defined below:

- "yes" = the species was or has been observed on the site.
- "likely" = a medium to high probability that a species uses the site.
- "potential" = suitable habitat for a species occurs on the site, but there is insufficient information to categorise the species as likely to occur, or unlikely to occur.
- "unlikely" = a very low to low probability that a species uses the site.
- "no" = habitat on site and in the vicinity is unsuitable for the species.

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Table 1: Threatened flora species recorded within a 5km radius of the study area.

Scientific Name	Common Name	Habitat	TSC Status	EPBC Status	Likelihood of Occurrence
Acacia pubescens	Downy Wattle	Scattered through the Cumberland plain where it grows on clay and clay-shale soils.	V	V	Potential
Cynanchum elegans	White-flowered Wax Plant	Occurs mainly at the ecotone between dry subtropical rainforest and sclerophyll forest/woodland communities. Is a clonal species and suckers in response to disturbance.	E1	E	Unlikely
Dillwynia tenuifolia		Castlereagh Ironbark Forest to Castlereagh Scribbly Gum Woodland.	V	V	Unlikely
Grevillea parviflora subsp.parviflora	Small-flower Grevillea	Grows in sandy or light clay soils usually over thin shales. Occurs in a range of vegetation types from heath and shrubby woodland to open forest. Found over a range of altitudes from flat, low-lying areas to upper slopes and ridge crests often in open, slightly disturbed sites such as along tracks.	V	V	Unlikely
Pimelea curviflora var. curviflora		Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands.	V	V	Unlikely
Pimelea spicata		Occurs on undulating topography on substrates derived from Wianamatta Shale in areas of Cumberland Plain Woodland Vegetation Community.	E1	E	Potential
Pomaderris brunnea	Rufous Pomaderris	Uncommon in moist forests.	V	V	Unlikely
Pultenaea parviflora		May be locally abundant, particularly within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays.	E1	V	Potential
Pterostylis saxicola	Sydney Plains Greenhood	Most commonly found growing in small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines. The vegetation communities above the shelves where Pterostylis saxicola occurs are sclerophyll forest or woodland on shale/sandstone transition soils or shale soils.	E1	E	Unlikely
Grevillea juniperina subsp. juniperina	Juniper-leaved Grevillea	Grows on reddish clay to sandy soils derived from Wianamatta Shale and Tertiary alluvium (often with shale influence), typically containing lateritic gravels.	V		Yes

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Table 2: Threatened fauna species recorded within a 5km radius of the study area.

Scientific Name	Common Name	Habitat	TSC Status	EPBC Status	Likelihood of Occurrence
Litoria aurea	Green and Golden Bell Frog	Large permanent freshwater wetlands, with dense stands of reeds.	E1	V	Potential
Heleioporus australiacus	Giant Burrowing Frog	Found in heath, woodland and open forest with sandy soils and will travel several hundred metres to creeks to breed.	V	V	Unlikely
Pyrrholaemus sagittatus	Speckled Warbler	Lives in a wide range of eucalypt dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy.	V		Potential
Xanthomyza phrygia	Regent Honeyeater	Densely timbered woodlands and forests, particularly ironbark, yellow box, yellow gum.	E1	E, M	Likely
Lathamus discolor	Swift Parrot	Breeds in Tasmania, but winters on mainland in diverse timbered habitats, including forests, woodlands, plantations, banksias, street trees and gardens	E1	E	Potential
Rostratula benghalensis australis	Australian Painted Snipe	Well-vegetated shallows and margins of wetlands, dams, sewerage ponds, wet pastures, marshy areas, open timber.	E1	V	Unlikely
Meridolum corneovirens	Cumberland Plain Land Snail	Primarily inhabits Cumberland Plain Woodland (an endangered ecological community). This community is a grassy, open woodland with occasional dense patches of shrubs.	E1		Yes
Dasyurus maculatus maculatus (SE mainland population)	Spotted-tailed Quoll	Occurs in wide variety of habitats in large remnants. Dens in tree hollows, hollow log or rock crevice.	V	E	Unlikely
Mormopterus norfolkensis	Eastern Freetail-bat	Evidence suggests that the species depends on hollows and tree fissures for roosting sites.	V		Yes
Phascolarctos cinereus	Koala	Swamp Mahogany and Tallowwood are of primary importance to this Koala population. Other local native tree species used by Koalas include Broad-leaved Paperbark, Blackbutt, Red Bloodwood, Flooded Gum and Smooth-barked Apple	V		Unlikely
Pteropus poliocephalus	Grey-headed Flying-fox	Roosts in large camps in Botanic Gardens.	V	V	Likely
Falsistrellus tasmaniensis	Eastern False Pipistrelle	Usually roosts in tree hollows in the higher rainfall forests within	V		Likely

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Scientific Name	Common Name	Habitat	TSC Status	EPBC Status	Likelihood of Occurrence
		its range.			
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	Forages above the canopy and eats mostly moths. Roosts in caves, old mines, road culverts.	V		Yes
Myotis adversus	Large-footed Myotis	A range of habitats close to water from lakes, small creeks to large lakes and mangrove lined estuaries.	V		Yes
Chalinolobus dwyeri	Large-eared Pied Bat	Uncommon but observed in wet and dry eucalypt forests.	V	V	Likely
Scoteanax rueppellii	Greater Broad-nosed Bat	Moist gullies in mature coastal forests or rainforests. Roosts in hollow tree trunks and branches.	V		Yes
Petrogale penicillata	Brush-tailed Rock-wallaby	Rocky areas of sclerophyll forest of inland and subcoastal southeastern Australia.	E1	V	Unlikely
Potorous tridactylus tridactylus	Long-nosed Potoroo (SE mainland)	Known from coastal heathy woodland but also occurs in rainforest, wet sclerophyll and coastal wallum. Dense cover for shelter adjacent to open areas for foraging.	V	V	Potential
Hoplocephalus bungaroides	Broad-headed Snake	Occur under large exfoliating slabs of sandstone and rock crevices in areas of undisturbed bushland, usually on tops of cliffs.	E1	V	No
Haliaeetus leucogaster	White-bellied Sea-Eagle	Established pairs usually maintain a territory in coastal areas or flooded inland swamps, lagoons and floodplains. Also often occur far inland along major rivers.		M	Unlikely
Hirundapus caudacutus	White-throated Needletail	Occupy high open spaces of sky above a variety of habitats including oceans. Often fly ahead of unsettled weather preceding thunderstorms.		M	Unlikely
Merops ornatus	Rainbow Bee-eater	Occurs in open country in a variety of habitat including open woodland, open forest, semi-arid scrub, grasslands, clearings in more wooded areas and farmland. Nests within tunnels dug into loamy soil in clearings, paddocks or road cuttings.		M	Potential
Monarcha melanopsis	Black-faced Monarch	Occurs in a range of habitats including rainforests, mangroves, forests and woodlands. A summer migrant to the south.		M	Potential
Myiagra cyanoleuca	Satin Flycatcher	Favors dense wet sclerophyll forest during the breeding season and mangrove, coastal heath, woodland and forests outside of the breeding season. A summer breeding migrant to south eastern Australia		M	Potential

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Scientific Name	Common Name	Habitat	TSC Status	EPBC Status	Likelihood of Occurrence
Rhipidura rufifrons	Rufous Fantail	A summer breeding migrant in the south east of Australia. Occurs in rainforest as well as dense wet eucalypt forest, paperbark forests, mangrove swamps and riverside vegetation. Occupies open country during summer migration.		M	Unlikely
Ardea alba	Great Egret	A common and widespread species that utilises any suitable permanent or temporary habitat. Inhabits wetlands and flooded pastures, dams, estuarine mudflats, mangroves and reefs.		M	Unlikely
Ardea ibis	Cattle Egret	Forages in moist pasture with tall grass as well as shallow open wetlands and margins. Also utilises mudflats.		M	Unlikely
Gallinago hardwickii	Latham's Snipe	Occupies low vegetation around wetlands in shallows, sedges, reeds, heaths salt marsh and irrigated crops.		M	No
Rostratula benghalensis s. lat.	Painted Snipe	Well-vegetated shallows and margins of wetlands, dams, sewerage ponds, wet pastures, marshy areas, open timber.		M	No
Apus pacificus	Fork-tailed Swift	Utilises low to very high airspace over varied habitat from rainforest to semi-desert. Foragers ahead of summer storms.		M	Unlikely

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3.2 Field Surveys

Field surveys of the study area were conducted over three nights and four days from the 29th August to 1st September 2005 and also on the 27th July 2007.

The field survey conducted in 2005 was aimed at surveying the entire Bungarribee Parklands Precinct and was aimed at assessing the broad range of vegetation and habitat types occurring in the study area. The study was undertaken by Lachlan Sutherland and Alex Debono of Eco Logical Australia. Approximately 100 person hours were utilised in completing the survey.

Field surveys were undertaken in 2006 to assess vegetation, the extent of native grasslands, identifying habitat trees and specific threatened species habitat within the Doonside Residential Parcel. These surveys were undertaken by Will Introna and Alex Debono of Eco Logical Australia and approximately 80 person hours were utilised in completing these surveys.

Additional field surveys conducted in July 2007 were aimed at assessing the vegetation and habitat types occurring within the north-western remnant of the Doonside Residential Parcel. These surveys were undertaken by Alex Debono, Will Introna and Daniel Magdi of Eco Logical Australia. Approximately 24 person hours were utilised in completing these surveys.

3.2.1 Vegetation Community and Condition Assessment

Each vegetation remnant identified in the NSW National Parks and Wildlife Service (NPWS) Cumberland Plain Vegetation Mapping Project (2002), was visited during the 2005 field survey. Surrounding areas of cleared and partially cleared land were also traversed to obtain an understanding of the entire site's conservation significance.

Information collated relating to vegetation included:

- Vegetation community type
- Degree and types of disturbance
- Proportion of native species in canopy and understorey
- Clearing history of each site

Each area of remnant vegetation was given a condition rating according to the rule-set outlined in the table below.

Table 3: Canopy and condition codes.

Code	Canopy Density	Description
A	>10%	Canopy and understorey in good condition
B	<10%	Canopy thinner, some understorey
C	<10%	Non-eucalypt canopy with high level of disturbance
TX	<10%	Scattered tree overstorey over agriculture
TXr	<10%	Scattered tree overstorey over rural residential
TXu	<10%	Scattered trees over urban development

Source: Table 4 in the Interpretation Guidelines for the Native Vegetation Maps of the Cumberland Plain Western Sydney (NPWS 2000).

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3.2.2 Target Threatened Fauna Survey

In 2004 Ian Perkins, within a Land and Vegetation Management Plan for the study area (Perkins 2005), identified nine scheduled species of fauna as previously recorded in the locality. These 9 species were targeted during the field survey carried out by Eco Logical Australia Pty Ltd in 2005 and included:

Common Bentwing Bat	Grey headed Flying Fox	Eastern Freetail Bat
Cumberland Land Snail	Swift parrot	Regent Honeyeater
Green and Golden Bell Frog	Barking Owl	Squirrel Glider

Surveys were conducted in habitats likely to be utilised by each threatened species. A number of techniques are currently used to survey for these species; these are summarised below (Table 4). Detailed methodology for the Eco Logical Australia fauna surveys is presented in **Appendix B**.

Additional targeted threatened species surveys for the Cumberland Land Snail were undertaken during the field survey in 2007.

Table 4: Targeted threatened fauna species. Table summarises likely habitat of each species and appropriate survey technique. Techniques consistent with DEC (2004).

Common name	Scientific name	Likely Habitat in study area	Survey Technique
Barking owl	*Ninox connivens*	Roosts in leafy trees usually along watercourses, nests in tree hollows.	Call play back, opportunistic sightings during Aquatic assessment
Common bent-wing bat	*Miniopterus schreibersii*	Above bushland patches and over cleared land	Harp trapping, Anabat
Cumberland Plain land snail	*Meridolum corneovirens*	Bushland patches	Litter and rubbish searches
Eastern free-tail bat	*Mormopterus norfolkensis*	Limited knowledge on species, possibly foraging over entire site and roosting in tree hollows	Harp trapping, Anabat
Green and golden bell frog	*Litoria aurea*	Permanent swamps / ponds with emergent reeds	Call play back and nocturnal stream census
Grey-headed flying fox	*Pteropus poliocephalus*	Flowering eucalypts and opportunistic sightings over cleared land	Spotlighting
Regent honeyeater	*Xanthomyza phrygia*	Bushland patches	Bird Census
Squirrel glider	*Petaurus norfolcensis*	Bushland patches with large hollow bearing trees	Tree Mounted Elliott trapping
Swift parrot	*Lathamus discolor*	Bushland patches	Bird Census

Surveyed areas are illustrated in Figure B1 in Appendix B.

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3.2.3 Fauna Habitat Assessment

A total of 33 fauna habitat assessments were undertaken within the study area during field surveys. A rapid appraisal form was used to record fauna habitat characteristics such as:

- Physical fauna refuge
- Vegetation cover abundance
- Disturbance history
- Dominant vegetation community
- Recovery potential

An additional survey of fauna habitat occurred during the field survey in 2007. Remnant native trees with a DBH greater than 30cm and are regarded as potential faunal habitat trees were recorded within the north-western development footprint of the Doonside Residential parcel.

3.2.4 Aquatic Ecosystem Condition Assessment and DIPNR Riparian Buffers

The aquatic assessment carried out in 2005 included desk top review of aerial photography and associated drainage mapping, and an on-site appraisal of aquatic ecosystem condition. A proforma was used during the field survey to clarify the occurrence of key aquatic habitat components and the health of the creek system. A total of 12 sites were surveyed during the condition assessment in 2005.

The overall condition of the aquatic ecosystem was assessed by examining characteristics such as native vegetation, connectivity, disturbance and barriers to natural stream flow. Criteria used to evaluate the condition of aquatic habitat are outlined below**:**

- **High**: aquatic habitat components are usually all present (for example, old-growth trees, fallen timber, unaltered stream flow, diverse instream habitat, unrestricted riparian zones and terrestrial and aquatic habitat linkages laterally and longitudinally) and habitat linkages to other remnant ecosystems in the landscape are intact;

- **Medium**: some aquatic habitat components are often missing (for example, old-growth trees, fallen timber), but natural stream flow is not significantly affected (eg. weir or dam) and linkages with other remnant habitats in the landscape are usually intact, although often degraded; and

- **Low**: many aquatic habitat elements have been lost, including old-growth trees and native aquatic vegetation. Stream flow is often altered and significantly restricts the natural movement of water and aquatic organisms. Habitat linkages with other remnant ecosystems in the landscape have usually been severely compromised by extensive past clearing.

Information from the aquatic habitat assessment results was used to determine appropriate riparian widths for each creek system in the study area, based on the Sydney Metro CMA guidelines for riparian corridor categories.

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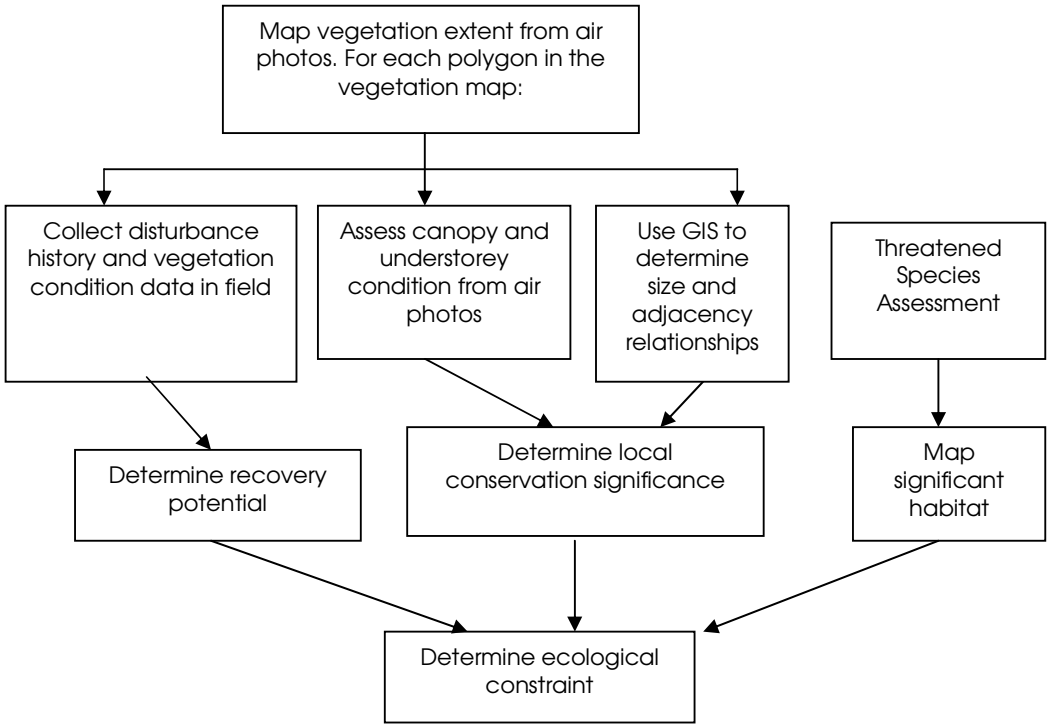
3.3 Ecological Constraints Analysis

An analysis of ecological constraint was undertaken using the DEC endorsed method from the Edmondson Park Ecological Assessment (Eco Logical Australia, 2003) as a guide. This is a stepped analysis of the environmental values of an area. It provides a combined measure of ecological values, including:

- rarity 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
- the value of the remnant as threatened species habitat

The steps involved in this type of ecological constraints analysis are illustrated in the flowchart below (Figure 3). Vegetation mapping is combined with field survey work, threatened species assessment and the NPWS (2002b) conservation significance assessment methodology to determine the relative level of ecological value or constraint across a site.

Figure 3: Ecological constraints flowchart



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3.3.1 Conservation Significance Assessment

Conservation Significance Assessment (CSA) is a process that enables a number of habitat values to be evaluated. The end result is a map of conservation priority. Conservation significance is determined by a range of factors including:

- rarity
- condition
- patch size
- connectivity

The CSA ranks remnant vegetation into one of four categories (NPWS, 2002b):

- 'Core Habitat'; defined as "areas that constitute the backbone of a viable conservation network across the landscape; or areas where the endangered ecological communities are at imminent risk of extinction"
- 'Support for Core Habitat'; "areas that provide a range of support values to the Core Habitat, including increasing remnant size, buffering from edge effects, and providing corridor connections"
- 'Urban Remnant Trees'; "areas of the critically endangered ecological communities which remain as remnant trees in an urban landscape"
- 'Other Remnant Vegetation'; "all native vegetation that does not fall within the above significance categories"

The decision criteria are outlined in Table 5.

Table 5: Conservation Significance Matrix (Adapted from 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)
Not critically endangered	ABC (with Understorey in good or moderate condition)	> 10 ha	Any	C1	Core
		< 10 ha	Adjacent to C1 or CEC	C2	Core
			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

3.3.2 Recovery Potential

The recovery potential of a site is determined using information collected in the field, and then applying this information to a recovery potential matrix. This recovery potential of a site 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"*

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(Ian Perkins Consultancy Services and Aquila Ecological Surveys 2002). Table 6 outlines the decision rules used in this step, which results in a ranking of *high*, *moderate*, *low* or *very low* recovery potential for each vegetation remnant.

3.3.3 Threatened Species

Threatened species information was collated for the study area and used to determine significant habitat. Each remnant vegetation patch is classed as having either Known, Likely or Nil chance of supporting threatened species.

3.3.4 Ecological Constraints

Information derived from recovery potential, conservation significance and threatened species information was combined to give indications of 'ecological constraint'. The steps followed can be seen in Tables 7 and 8.

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Table 6: Recovery Potential Matrix

Current condition and land use	Past land use and disturbance	Soil Condition	Vegetation	Recovery Potential	Recovery Code
Cleared (no woodland canopy). Includes *Bursaria* thickets in grassland	Recently cleared (<2 years)	Unmodified or largely natural. Uncultivated.	Native dominated	High	C1
			Exotic dominated	Moderate	C2
		Modified. Heavily cultivated and/or pasture improved. Imported material.	Either	Low	C3
	Historically cleared (>2 years) and consistently managed as cleared.	Unmodified or largely natural. Uncultivated.	Native dominated	Moderate	C4
			Exotic dominated	Low	C5
		Modified. Heavily cultivated and/or pasture improved. Imported material.	Either	Very Low	C6
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	W1
			Native understorey significantly structurally modified, absent or largely absent. Includes areas dominated by African Olive.	Moderate	W2
			Exotic dominated	Low	W2.1
		Moderately modified by long term grazing or mowing.	Native dominated	Low	W2.2
		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	W3
			Native understorey present. Heavily weed invaded.	Low	W4
	Understorey patchily intact	Disturbed	Native dominated	Moderate	W4.1
			Exotic dominated	Low	W4.2
	Recent clearing of understorey and or native understorey significantly structurally modified due to existing land use (eg. Mowing, grazing)	Unmodified or largely natural. Uncultivated.	Native dominated. If no vegetation present, assume native dominated.	High	W5
			Exotic dominated	Moderate	W6
		Modified. Heavily cultivated and/or pasture improved. Imported material.	Native dominated	Low	W7
			Exotic dominated	Very Low	W8

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Table 7: Ecological Constraint Matrix **Step 1**

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

Source: Eco Logical Australia (2003). This step combines the recovery potential and conservation significance maps.

Table 8: Ecological Constraint Matrix **Step 2**

	Combined Recovery Potential and Local Conservation Significance (Step 1)				
Threatened Species Assessment		**High**	**Moderate**	**Low**	**Very Low**
	Known	High	High	High	High
	Likely	High	Moderate	Moderate	Moderate
	Nil	High	Moderate	Low	Very Low

Source: Eco Logical Australia (2003). This step combines results from Table 3 with the threatened species layer to determine overall ecological constraint.

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4. Results

4.1 Vegetation Communities

Four vegetation communities are present within the study area;

1. Cumberland Plain Woodland (Shale Plains Woodland sub-community),
2. Swamp Oak Floodplain Forest (previously named Alluvial Woodland),
3. Grassland (native dominant), and
4. Grassland (exotic dominant)

Figure 4 illustrates where these vegetation communities that are located on site. The woodlands and floodplain forests are classified as an Endangered Ecological Community (EEC) under the *TSC Act*, and Cumberland Plain Woodland (of which the Shale Plain Woodland is part of) is also classified as an EEC under the *EPBC Act*.

4.1.1 Swamp Oak Floodplain Forest EEC

Alluvial Woodland dominated by *Casuarina glauca* was recently renamed Swamp Oak Floodplain Forest. It occurs along both Eastern and Bungarribee Creeks. The canopy is dominated by swamp oak (*Casuarina glauca*) with emergent cabbage gum (*Eucalyptus amplifolia)* and broad-leaved apple (*Angophora subvelutina*) co-occurring but less common.

The shrub layer of this community within the Doonside development area is dominated by weed species, although open native dominated patches of the shrub layer occur. Dominant weed species include African olive (*Olea europaea*), green cestrum (*Cestrum parqui*), kei apple (*Doryalis caffra*) and small-leaved privet (*Ligustrum sinense*). The native species blackthorn (*Bursaria spinosa*), Parramatta wattle (*Acacia parramattensis)* and prickly-leaved paperbark (*Melaleuca styphelioides*) were common. The ground cover is generally low and, in heavily shaded weedy areas, dominated by wandering jew (*Tradescantia fluminensis*) with species such as *Microlaena stipoides, Oplismenus aemulus* and couch (*Cynodon dactylon*) occurring in the more open areas.

4.1.2 Shale Plains Woodland

This vegetation community was the most widely distributed community on site. Shale Plains Woodland is part of the *Cumberland Plains Woodland* Endangered Ecological Community. It is located on flat to gently sloping land and characteristically contains a canopy dominated by forest red gum (*Eucalyptus tereticornis*) and grey box (*E. moluccana*). Cabbage gum and *A. subvelutina* also occur, but at low densities. The shrub layer on site is dense to scant with blackthorn and regenerating cabbage gum prominent in most patches. The weed species African boxthorn (*Lycium ferocissimum*) and African olive were also common. *Aristida ramosa*, *Aristida vagans*, kangaroo grass (*Themeda australis*), fleabane (*Conyza* sp.), *Microlaena stipoides* and *Senecio madagascariensis* were common through the ground layer.

4.1.3 Grassland (native dominant)

Several grassland areas of predominantly native ground cover occurred in the study area. Kangaroo grass was the dominant native grass, creating monocultures in a number of areas around the study area. Native grassland patches also contained

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Aristida ramosa, *Aristida vagans* and barbwire grass (*Cymbopogon refractus*) at varying densities. Cover throughout the grassland was high (>90%) with few bare patches.

4.1.4 Grassland (exotic dominant)

Pasture areas consisted of exotic dominated grassland and improved pasture. Many of these areas showed a history of grazing and slashing, some of which appeared very recent.

As this vegetation type includes areas of improved pasture and is predominately cleared (for improved pasture) of native vegetation, cover varied from almost bare to almost complete cover. Common exotic species included *Briza minor,* kikuyu (*Pennisetum clandestinum*), paspalum (*Paspalum dilatatum*) and Rhodes grass (*Chloris gayana*).

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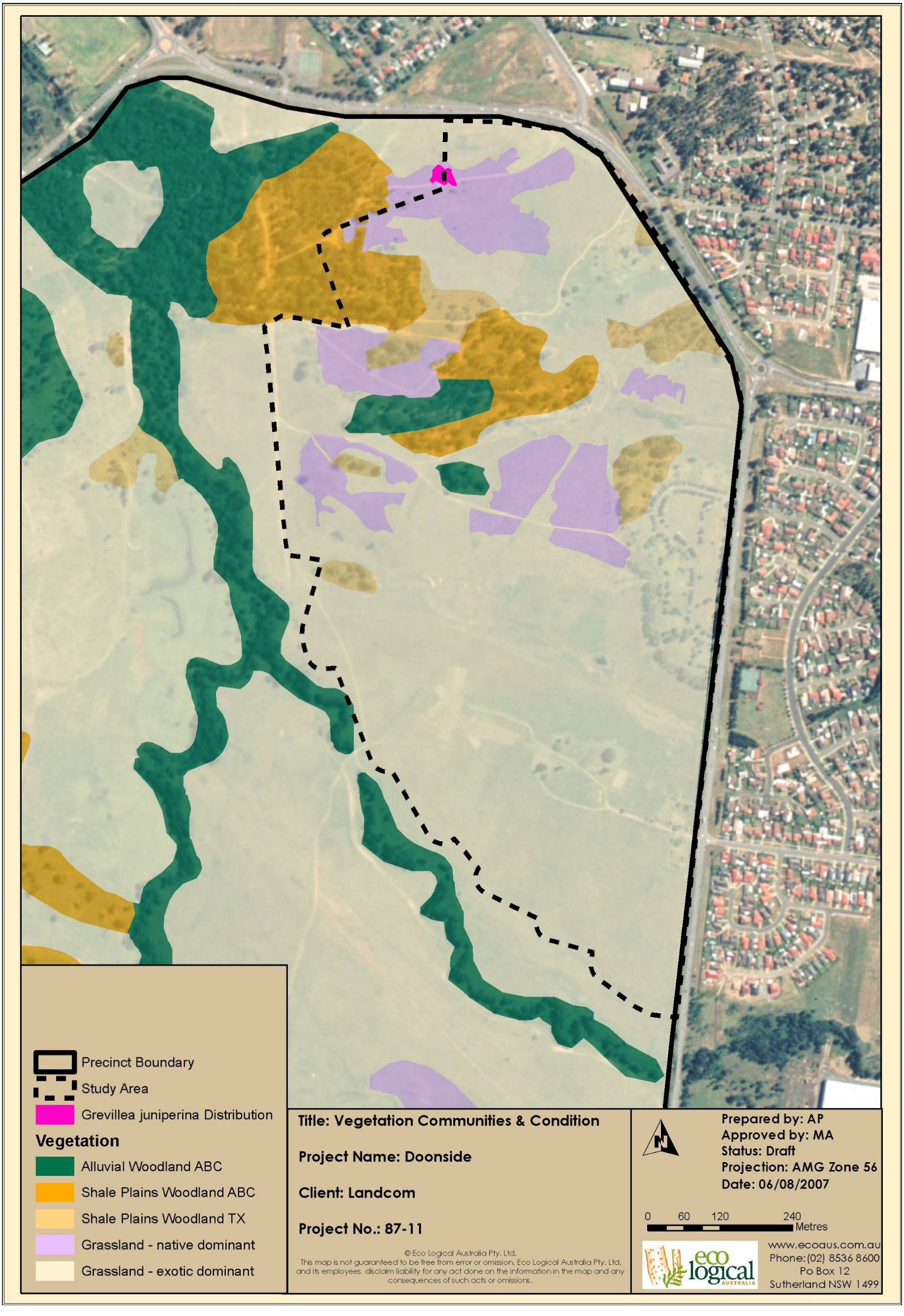
Figure 4: Vegetation Communities and condition, and *Grevillea juniperina subsp. juniperina* locations.



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4.2 Flora

The study area has large areas of grassland, dominated by exotic species. In the north-west of the residential parcel are remnant patches of Shale Plains Woodland and adjacent to native grasslands. These remnant patches of Shale Plain Woodlands have a high diversity and cover of native species in the canopy, mid-storey and groundcover.

Table 1 of Section 3.1 outlines potential threatened flora species that occur within a 5 kilometre radius of the study area. Of the eleven threatened species identified as potentially occurring within the study area, only one species, *Grevillea juniperina subsp. juniperina* was recorded by ELA during surveys. Other species that have a high potential to occur within the study area include *Acacia pubescens, Pimelea spicata*, and *Pultenaea parviflora*.

The threatened *Grevillea juniperina* R. Br. subsp. *juniperina (G. juniperina)* is confined to Western Sydney and is known from the area bounded approximately by St Marys – Londonderry - Prospect. It has been reported from the local government areas of Blacktown, Hawkesbury, Liverpool, Parramatta and Penrith, often persisting along roadsides or areas of disturbance. The plant has a restricted range occurring on red sandy to clay soils – often lateritic on Wianamatta Shale and Tertiary alluvium in Cumberland Plain Woodland and Castlereagh Woodland. Populations are also known to occur in Castlereagh Nature Reserve and Shanes Park.

It is found on site in an area previously disturbed (appears to be a previous borrow pit). The location of the *Grevillea juniperina subsp. juniperina* recorded on site is illustrated in Figure 4.

4.3 Fauna

Five threatened fauna species were recorded within the study area during the field surveys in both 2005 and 2007. The north-western part of the study area that will be impacted, is considered to provide considerable habitat value for these threatened fauna species.

Table 2 of Section 3.1 outlines potential threatened flora species that occur within a 5 kilometre radius of the study area. There are 29 fauna species listed under either the TSC or EPBC Acts have been recorded within a 5 kilometre radius of the study area, five of these species were recorded within the study during the field surveys. There are a number of other species that are likely or have the potential to occur within the study area, including *Xanthomyza phrygia, Pteropus poliocephalus, Falsistrellus tasmaniensis, Chalinolobus dwyeri, Litoria aurea, Pyrrholaemus sagittatus, Lathamus discolor, Potorous tridactylus tridactylus, Merops ornatus, Monarcha melanopsis*, and *Myiagra cyanoleuca*.

Barking owl (Ninox connivens) Survey

Five call play back surveys were undertaken for barking owl during the survey period. Call play back failed to attract a return call by barking owl and follow up listening and spotlighting periods did not identify the species. One nocturnal bird species,

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tawny frogmouth (*Podargus strigoides*), was identified opportunistically in Shale Plains Woodland in the north of the study area.

Common bent-wing bat (Miniopterus schreibersii) and eastern free-tail bat (Mormopterus nofolkensis) Survey

A total of 13 microchiropteran bat taxa were identified during the survey including 4 threatened species. Anabat detection and harp trapping were both utilised to identify bat species in the study area and the results are discussed below.

Two Anabat recording devices were used to survey for the 2 target bat species each night of the survey period. A total of 6 survey sites were utilized in representative vegetation in the study area.

Anabat detection recorded a large number bat passes. A total of 12 species including 4 threatened bat species. Certainty of bat identifications are recorded confident (C), probable (P), possible (Po) and unidentified (#). The threatened species, common bent-wing bat (*Miniopterus schreibersii*), eastern free-tail bat (*Mormopterus nofolkensis*), fishing bat (*Myotis adversus*) and greater broad-nosed bat (*Scoteanax rueppellii*) were confidently identified.

Table 9: Anabat results (analysis of calls by Glenn Hoye, Fly By Night Bat Surveys Pty Ltd)

Date	Detector	T.au	M.no*	M.sp2	C.go	C.mo	M.sc*	M.ad*	N.sp	S.or	S.ru*	V.re	V.vu	UD	Total Passes
29/08/05	A	C		P	P	P	C	P					P	#	**61**
30/08/05	A	C	P		C		C	C	Po	C	Po		P	#	**175**
31/08/05	A		C		C		C	C	P	C			C	#	**136**
29/08/05	B		C	C	C	C	C	C		C		P		#	**167**
30/08/05	B		Po		Po		P	C				P	P	#	**29**
31/08/05	B						C								**4**

Species

T.au	White-striped mastiff bat	*Tadarida australis*
M.no*	Eastern free-tail bat*	*Mormopterus norkolkensis**
M.sp2	Little free-tail bat	*Mormopterus sp.2*
C.go	Gould's wattled bat	*Chalinolobus gouldii*
C.mo	Chocolate wattled bat	*Chalinolobus morio*
M.sc*	eastern bent-wing bat	*Miniopterus schreibersi*i*
*M.ad**	*Fishing bat*	*Myotis adversus**
N.sp	*Unidentified Long-eared bat*	*Nyctophylus sp.*
S.or	*Eastern Broad-nosed bat*	*Scotorepens orion*
*S.ru**	*Greater Broad-nosed bat*	*Scoteanax rueppellii**
V.re	Southern forest bat	*Vespedelus regulus*
V.vu	little forest bat	*Vespedelus vultumus*
UD	unidentified calls	

* denotes threatened species listed under TSC Act

Harp trapping captured a total of 8 individuals consisting 4 species (*Chalinolobus morio*, *Nyctophylus geoffroyi*, *Vespadelus darlingtoni* and *Vespadelus vulturnus*). These species are considered to be common in the Sydney Basin.

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Cumberland Plain Land Snail (Meridolum corneovirens) Survey
During the surveys conducted in 2005, a number of random leaf litter, woody debris and rubbish searches were undertaken for Cumberland Plain land snail in bushland remnants in the study area. One empty snail shell was discovered in Core Shale Plains Woodland in Parcel 3 – Doonside.

During the survey conducted in 2007, a number of random leaf litter, woody debris and rubbish searches were undertaken for Cumberland Plain Land Snail in bushland remnants in the study area. Eight empty snail shells were discovered and two live snails were recorded across eight sites within the north-western remnant of the Doonside Residential Parcel. All these records are within the proposed development footprint.

Cumberland Plain Land Snail is a native snail species with a typical adult shell diameter ranging between 15-30mm. The colour is generally tan to dark brown with a green or yellow tinge (DEC 2007b).

Current knowledge suggests that Cumberland Plain Land Snail is restricted to the Cumberland Plain and Castlereagh Woodlands of Western Sydney and also along the fringes of River-flat Eucalypt Forest, especially where it meets Cumberland Plain Woodland. It is currently known from over 100 locations. However, most of these populations are scattered throughout the region and are often small and isolated (DEC 2007b). Cumberland land snail typically occurs under logs and other debris, amongst leaf and bark accumulations and sometimes under grass clumps. Where possible it will burrow into loose soil (DEC 2007b).

The locations of Cumberland Plain Land Snail are illustrated in Figure 5.

Plate 1: Cumberland Land Snail recorded on site.

Green and golden bell frog (Litoria aurea) Survey
No green and golden bell frogs were identified in the frog census surveys across the site. Habitat suitable for the species was identified but none were heard calling. The survey was undertaken at the commencement of their breeding period.

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Grey-headed flying fox (Pteropus poliocephalus) Survey
A total of 9 grey-headed flying fox were observed flying over the study area. No flying fox were identified feeding in the study area. The bats were observed above the culvert on Eastern Creek and Great Western Hwy flying in a northerly direction along the creek line.

Regent honeyeater (Xanthomyza phrygia) and swift parrot (Lathamus discolour) Survey
No regent honeyeaters or swift parrots were identified during the survey. The survey period is considered unsuitable for survey of these species as no eucalypts were flowering and by September swift parrots have returned to Tasmania to commence breeding.

Squirrel glider (Petaurus nofolcensis) Survey
A total of 75 trap nights were undertaken during the survey period. Two sugar gliders (*Petaurus breviceps*) were the only captures during the trapping period. These occurred within the large remnant in the northwest corner of Doonside residential parcel.

Figure 5 details the location of these threatened fauna species records.

4.4 Habitat Assessment

The study area comprises area of Low and High fauna habitat potential. The study area provides 4 broad fauna habitat types:

- Open grassland;
- Open woodland;
- Closed riparian forest, and;
- Creek lines and dams.

Open grassland is considered to be of Low habitat quality because of a lack of structural diversity. However, grassland provides foraging and hunting habitat for a broad range of bird and bat species. The dense grass cover observed in the study area also provides refuge for native ground dwelling mammals, reptiles and birds.

Open woodland in the study area provides Moderate to High quality fauna habitat. Remnants within the north-west area of the study area have well established canopy, shrub and ground layers, which also exhibited developed litter layers and accumulations of large woody debris. These areas have a greater carrying capacity than more simplified woodland remnants. There are a large number of mature hollow bearing trees within this area that may provide habitat for a variety of fauna species, including threatened species (See Figure 5).

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Figure 5: Known Threatened Fauna Species Locations.

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4.5 Aquatic and Riparian Habitat

The study area borders both Eastern Creek to the west and Bungacarribee Creek to the south. Eastern Creek is categorized as a Category 1 stream, with moderate to low aquatic habitat condition. Bungarribee Creek is categorized as a category 2 stream, with moderate aquatic habitat condition.

The two tributaries that located east of Eastern Creek, Northern and Southern Creek flow through the proposed residential development. These tributaries are categorised as Category 3 streams, and have low aquatic habitat condition.

The Sydney Metro CMA guidelines for assessing riparian categories, released by DIPNR, require that category 1 and category 2 streams have minimum riparian buffers on either side, of 40 m and 20 m respectively. Enough land is currently available within the proposed development footprint to support these riparian buffer requirements. The establishment and maintenance of these areas will fall within the site's establishment plan and ongoing plan of management.

A number of outcomes summarised in Table 10 are proposed for riparian areas on site and are illustrated in Figure 6.

Table 10: Sydney Metro CMA requirements for riparian categories.

Outcome	Eastern Creek	Bungarribee Creek	Eastern tributaries of Eastern Creek: Northern and Southern Creeks
Available Riparian Width	Potential 40 m either side	< 40 m on east side	Potential 40m either side
Aquatic Ecosystem Condition	Moderate to Low	Moderate	Low
Existing or Potential connectivity	Regional connection within stream length.	Local connection within stream length	Study area connection within stream length
Potential for corridor maintenance – reinstatement or restoration	High – Remnant riparian vegetation present, high recovery potential	High – Remnant riparian vegetation present, high recovery potential.	Low – Remnant riparian vegetation discontinuous and patchy, Low recovery potential.
Relative length and location of piped sections (urban context)	Majority open (approximately 90% or more). 5 culverts in study area.	Majority open (approximately 90% or more). 2 culverts in study area.	Truncated by Doonside Rd,
Category	**1**	**2**	**3**
Riparian Buffer Width	**40m either side**	**20m either side**	**10m either side**

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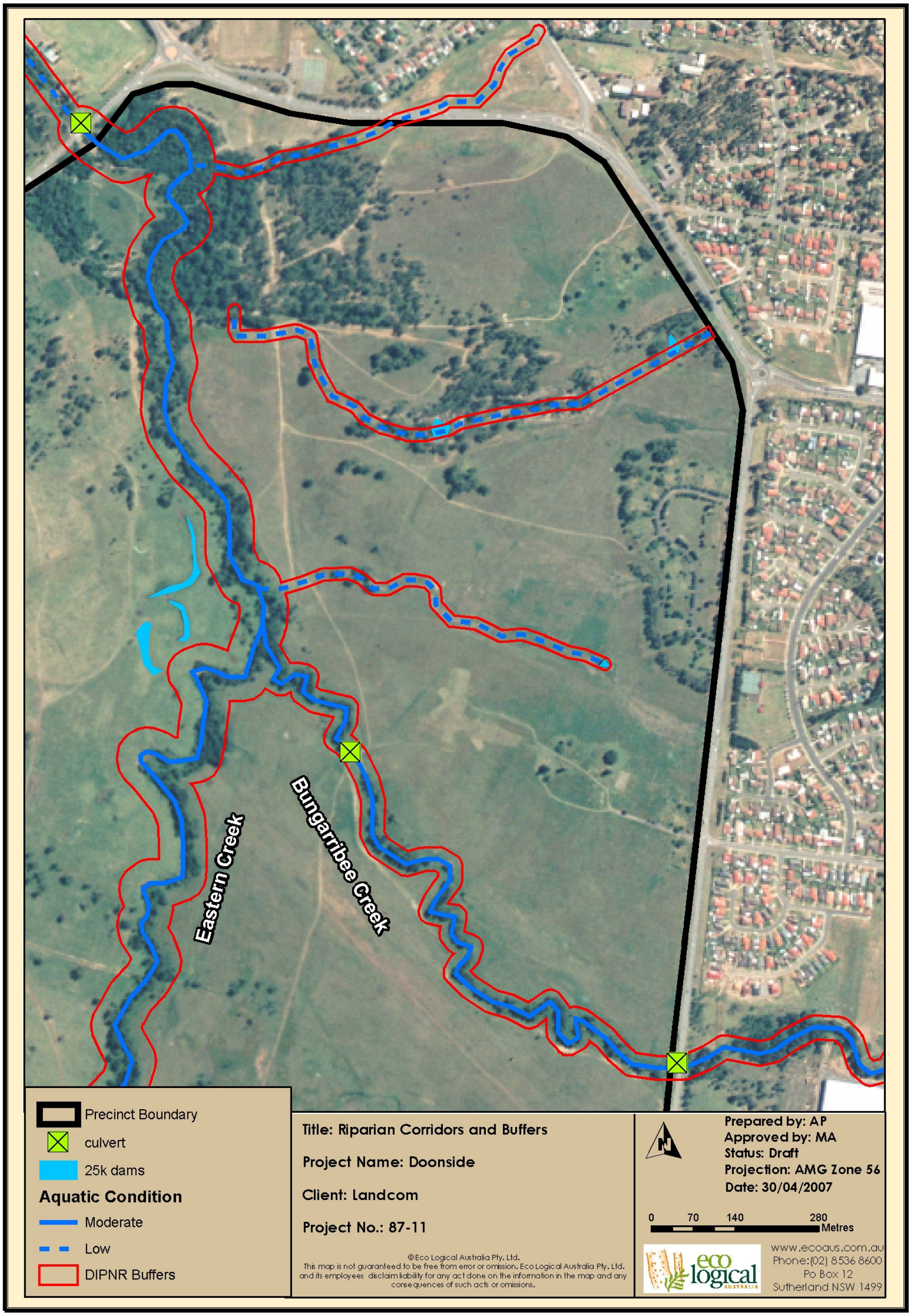
Figure 6: Riparian Corridors and Buffers



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4.6 Ecological Constraints Analysis

4.6.1 Conservation Significance Assessment

Areas that were classified as the high conservation significance category; "core" are located in the north-west of the study area, and along the western boundary abutting Eastern Creek. Areas classified as "support for core' only occur within the north-west corner of study area, abutting the "core" area. There are other areas scattered throughout the study area that are classified as "other remnant vegetation," whilst a large portion of the site is categorized as Non-native.

The results of the conservation significance assessment can be seen in Figure 7. Summary area calculations for conservation significance are outlined in Table 11.

4.6.2 Recovery Potential

The majority of remnant vegetation within the study area was classified as having "moderate" to "high" recovery potential due to the presence of a native canopy, generally undisturbed soil profile and presence of native understorey vegetation. Vegetation designated as having "high" recovery potential was confined to the north-western corner of the study site.

Vegetation with a "low" recovery potential was scattered in the northern half of the study site, within the Shale Plains Woodland and Grassland (native dominant) vegetation communities. Vegetation with a "very low" recovery potential occupies a large portion of the site, incorporating the entire southern portion of the study area.

The results of the recovery potential assessment can be seen in Figure 8. A summary of hectares for each category of recovery potential are provided in Table 11.

4.6.3 Ecological Constraints Analysis

Ecological constraint analysis was undertaken (Eco Logical Australia 2006) for the entire Bungarribee Precinct. The assessment was derived applying methodology developed by NPWS 2002b (see Section 3 of this report). An ecological constraint ranking was identified on the site as follows:

- High constraint: Woodland, forest and wetlands, as these vegetation communities may be utilised by a wide range of species including some that are threatened or regionally significant.
- Moderate constraint: Areas that have some habitat value for a narrower range of species but are generally dominated by edge species and have moderate or low recovery potential
- Low constraint: other vegetated areas, generally isolated and small in size, normally with a low recovery potential
- Very Low Constraint: all remaining vegetated areas, generally isolated and small in size, normally with a very low recovery potential
- Non Native: unconstrained pasture or clear ground

High ecological constraint areas occupy approximately 15% of the study precinct. These areas represent bushland remnants of good condition with high recovery potential. They provide habitat, and corridors for movement for threatened or

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regionally significant species. A further 12% is considered to be of moderate ecological constraint. The remaining areas are predominately dominated by exotic grass and forb species and thus considered to have no ecological constraint (non-native).

The results of the ecological constraints analysis are presented in Figure 9. A summary of hectares for each category of ecological constraint is provided in Table 11 (below).

Table 11: Summary of study area

CSA Category	**Area (ha)**	**% of Study Area**
Core	2.03	2.59%
Support for Core	4.65	5.94%
Other Remnant	14.16	18.06%
Non-native	57.56	73.41%
Recovery Potential	**Area (ha)**	**% of Study Area**
High	7.08	9.03%
Moderate	3	3.83%
Low	10.76	13.73%
Very Low	57.56	73.41%
Ecological Constraints	**Area (ha)**	**% of Study Area**
High	6.92	8.84%
Moderate	13.92	17.75%
Non-native	57.56	73.41%

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Figure 7: Conservation Significance Assessment results.

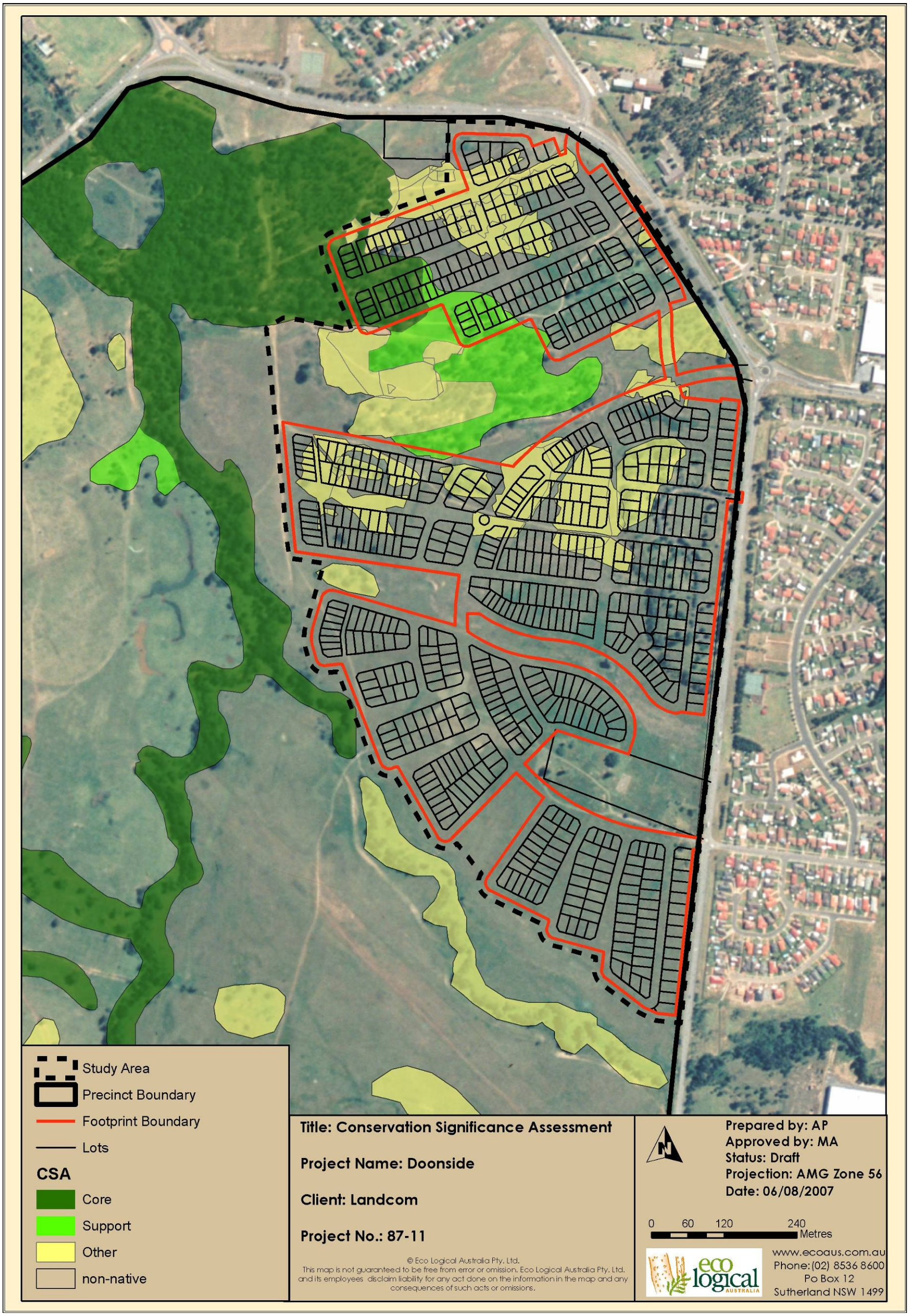


Figure 8: Recovery Potential Results

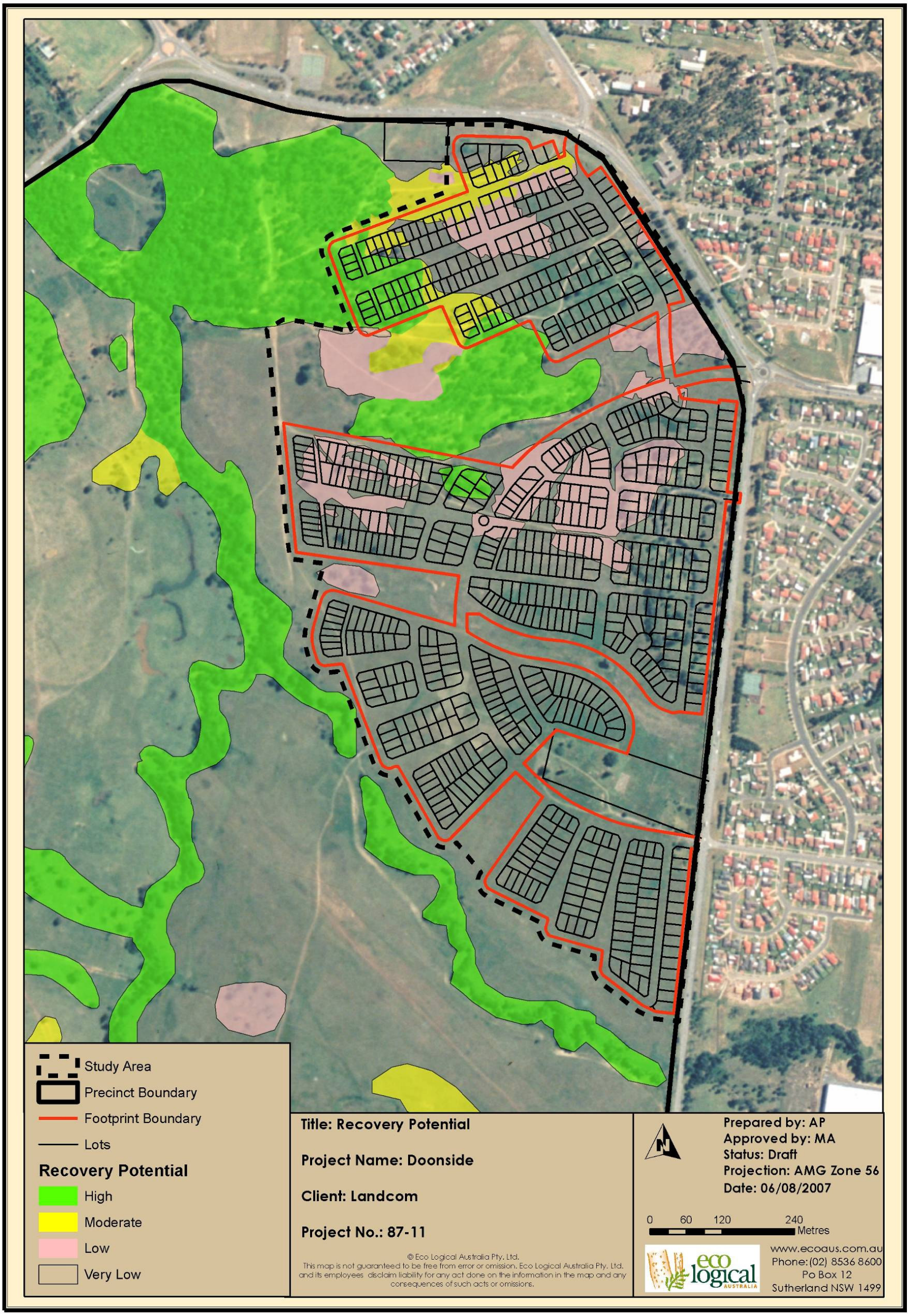
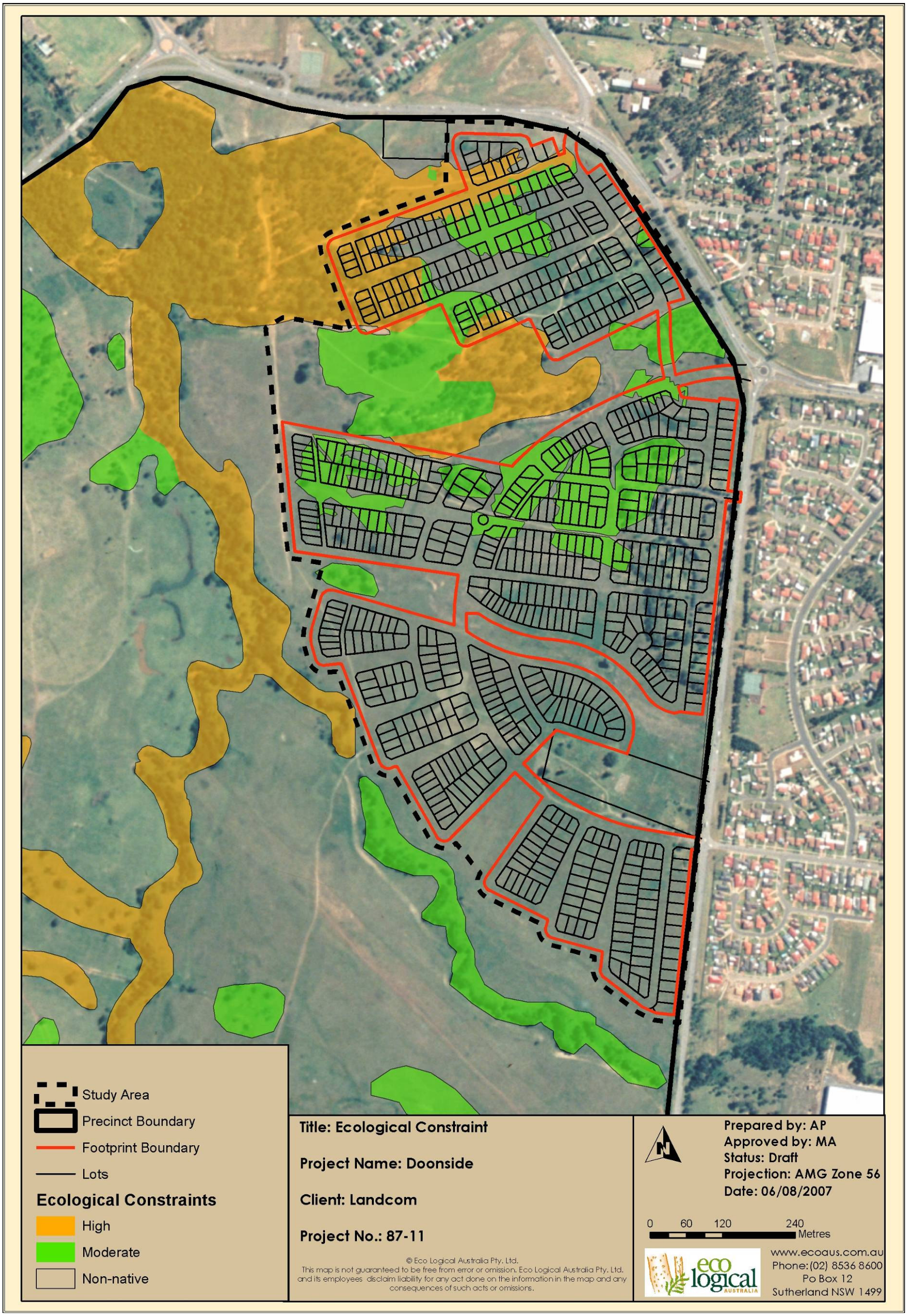


Figure 9: Ecological Constraints Results.



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5. Impact Assessment

5.1 Vegetation Communities

The proposed development will require the removal on approximately 12.54of native vegetation (See Table 12), consisting of:

- 0.37 ha of Swamp Oak Floodplain Forest
- 2.43 ha of Shale Plain Woodlands in relatively good condition* (See condition codes below)
- 2.14 ha of Shale Plain Woodlands in relatively poor condition*
- 7.6 ha of native grassland
- It will also impact on approximately 49ha ha of exotic grassland (over 85% of the development footprint).

This impact assessment includes the requirements of asset protection zones (APZ) required under the Planning for Bushfire Protection Guidelines (2006) as part of the development. The APZ and their management are outlined in Section 8.4.

Spatially these impacts are illustrated by the overlay of the development footprint with vegetation communities in Figure 10. The majority of impacts occur where the development footprint extents into the northern Shale Plain Woodland remnant. This area was mapped as high conservation significance, high recovery potential, high ecological constraint and contains a concentration of threatened flora and fauna species and habitat.

In order to maintain or improve conservation values, the impacts identified above will require offsetting both within Doonside Residential Parcel, and in the adjacent Western Sydney Parklands – Bungarribee Precinct managed by the Parklands Trust. A proposed offset strategy is outlined in Section 6 of this report.

An EPBC Act referral will need to be undertaken for this proposal, given that a Endangered Ecological Community, Cumberland Plain Woodland will be significantly impacted by the current development footprint. A draft referral is provided in **Appendix C**.

5.2 Threatened Flora Species

The current development footprint does not impact on current or known location of threatened flora species. However the woodland habitat may support seed material within the soil profile for threatened plants known to occur elsewhere within the region.

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Table 12: Extent and Condition of Vegetation Communities impacted by the Proposed Development.

Community	Condition	Bungarribee Parkland Total (ha)	Area in Doonside Parcel (ha)	Area Impacted (ha)	Percent of Parcel Impacted	Percent of Parkland Impacted
Swamp Oak Floodplain Forest	**ABC**	**42.78**	**1.79**	**0.37**	**21%**	**0.8%**
	TX	**3.51**	**0.00**	**0.00**	**0.0%**	**0.0%**
Shale Plains Woodland	**ABC**	**33.89**	**5.28**	**2.43**	**46%**	**7%**
	TX	**25.08**	**4.16**	**2.14**	**51%**	**9%**
Grassland	**Native**	**39.6**	**9.61**	**7.6**	**79%**	**19%**
	Exotic	**329.58**	**57.55**	**48.92**	**85%**	**15%**
Total Native Vegetation		**144.86**	**20.84**	**12.54**	**60%**	**9%**
Grand Total		**502.64**	**78.39**	**61.46**	**78%**	**19%**

5.3 Threatened Fauna Species

5.3.1 Cumberland Plain Land Snail

The development footprint will impact on habitat areas containing known records of Cumberland Plain Land Snail. It is known that other areas of remnant woodland vegetation within the residential parcel and Bungarribee Parklands Precinct are also likely to contain Cumberland Plain Land Snails. The results reported in this assessment reflect targeted survey effort undertaken to date i.e recent surveys focused on impacted areas. As a consequence of the results from this targeted survey effort, it is necessary to conduct further surveys for Cumberland Plain Land Snail in known habitat within and adjacent to the development in order to establish this population's relative significance and thus confirm the context and scale of the proposal's impact.

These additional surveys have been commissioned. However, the results were not available at the time of writing.

5.3.2 Micro bats

Microbat records exist for the proposal area, and specifically for the remnant woodland proposed to be impacted by development works. Microbats recorded include the common bent-wing bat (*Miniopterus schreibersii*), eastern free-tail bat (*Mormopterus nofolkensis*), fishing bat (*Myotis adversus*) and greater broad-nosed bat (*Scoteanax rueppellii*). For those species that utilise tree hollows (*Mormopterus nofolkensis, Myotis adversus, Scoteanax rueppellii),* it will be necessary to establish that no roost sites exist within or adjacent to the development footprint. An assessment should also be completed to quantify impacts on foraging habitat and resources. Such surveys need to be undertaken in Spring/Summer when targeted species are active following their winter torpor period.

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5.4 Aquatic

It is predicted that the attenuation of flooding and stormwater discharges will improve water quality and partially restore natural flow regimes to Eastern Creek. Water sensitive urban design features incorporated into the design of the concept plan are predicted to improve aquatic ecological habitat within, and downstream of the Bungarribee Parklands Precinct.

The construction of the detention basins is unlikely to pose a significant risk or impact to the environment or remnant native vegetation as they predominately occur in exotic grasslands.

5.5 Associated Infrastructure

Detailed assessments and alignment of associated infrastructure such as pedestrian paths, cycle ways, detention basin mounds, stormwater piping and creek crossings have not been undertaken as part of this assessment. This detailed assessment is anticipated in the Project Approval stage of this Part 3A application.

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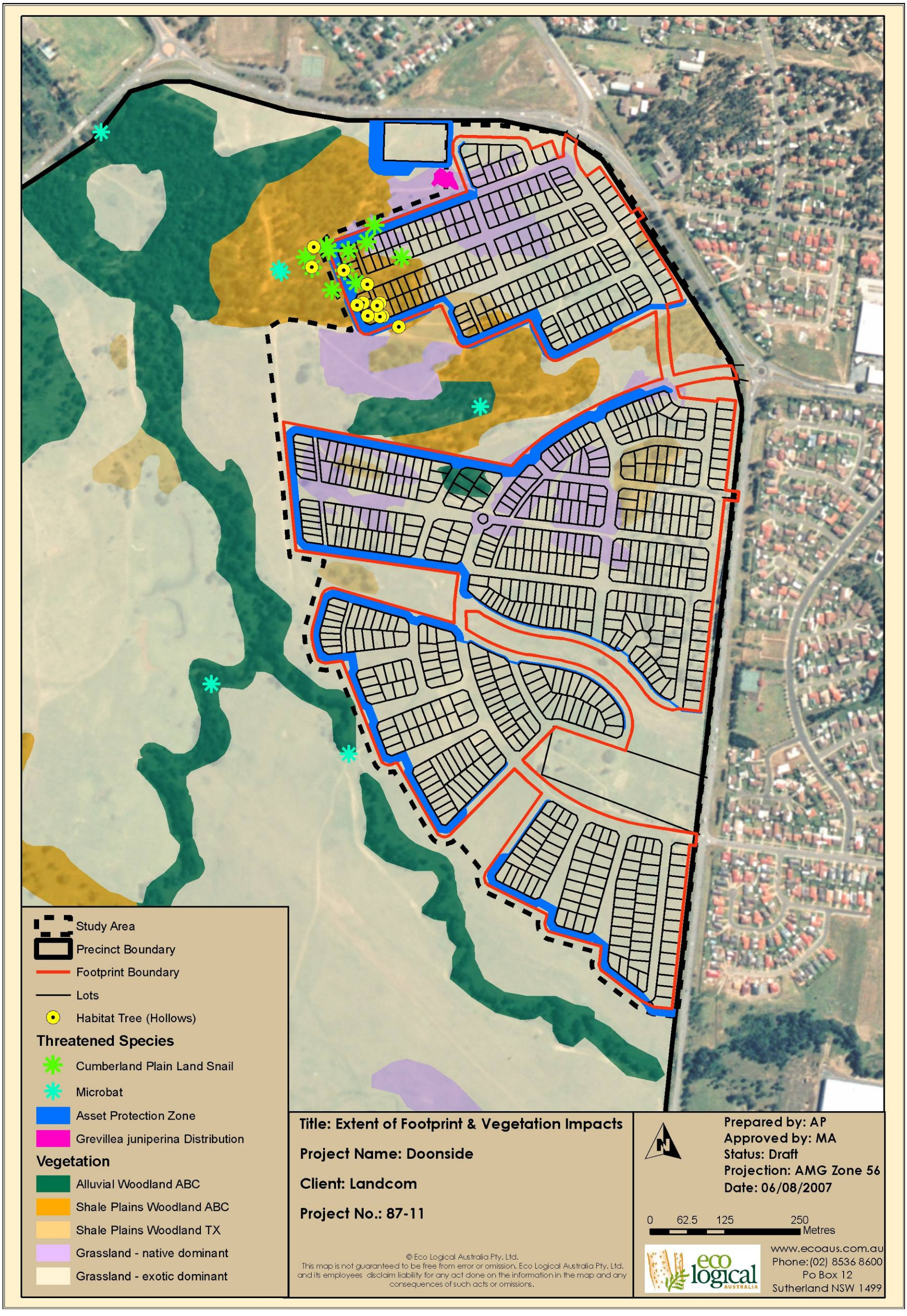
Figure 10: Development Footprint and Vegetation Communities Impacted



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6. Context for Offsetting

6.1 What is Biodiversity Offsetting?

A biodiversity offset is one or more actions that are put in place to counterbalance (offset) the impacts of development on biodiversity (Department of Environment and Conservation 2006). Such offsets have potential to deliver the maintenance of both local environmental values as well as an overall improvement in environmental values across a region.

There are different types of offsets, including:

- an on-site offset, where biodiversity values on another part of the same site are secured and improved;
- an off-site offset, where the developer secures and improves biodiversity values on another piece of land, and
- an off-site offset through a third party, where a developer purchases credits from or pays a third party to provide an offset either in advance, or at the time, of the development. The third party then must secure and maintain the offsets on behalf of the developer.

In the case of Doonside, combinations of on-site and off-site offsets are proposed.

6.2 Biodiversity Offsetting Principles

The following principles have been developed from various sources including NSW Government (2002), Eco Logical Australia Pty Ltd (2003) and NSW Department of Natural Resources (2005) and experience in developing offsets for project through New South Wales.

Principles underpinning habitat offsetting include:

- impacts must be avoided first by using prevention and mitigation measures, offsets are then used to address remaining impacts;
- offsets cannot be used as a substitute for assessment requirements;
- offset schemes must not encourage landholders to deliberately degrade or mismanage offset areas in order to increase their value from the offset;
- offsets should complement other government conservation programs;
- offsets must be underpinned by sound ecological principles;
- offsets should aim to deliver a net improvement in biodiversity over time;
- offsets must redress the impact of the development for the time period that the impact occurs;
- offsets should be agreed upon prior to the impact occurring;
- the impacts and benefits of the offset must be reliably estimated;
- offsets must be targeted – i.e. they must offset impacts on a basis of like-for-like or better conservation outcome;
- offsets must be located in the same region;
- offsets must go beyond existing requirements of other programs and not be already funded by another scheme, and
- offsets and their actions must be enforceable.

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6.3 Biodiversity Offsetting Actions

The kinds of actions that could be taken to offset impacts on biodiversity need to be determined at a local level and need to contribute to the overall environmental objectives of an area. Actions which are commonly associated with biodiversity offsetting include:

- **Protection of habitat** – overall aim is to contribute to the number of hectares in the most secure tenure for conservation.

  In the case of the Parklands Bungarribee Precinct, the Western Sydney Parklands are, to a large degree, already protected as it is publicly owned, however maintenance of natural values will require ongoing resources and funding to maintain the ecological condition of these communities.

- **Enhancing habitat viability** – in addition to increasing the conservation security of habitat, it is important to increase the viability of habitat that has become degraded. Ensuring the health and integrity of the habitat secured for conservation is a vital part of ensuring that protecting land is a successful mechanism for protecting and enhancing biodiversity.

  Weed removal and regeneration techniques applied to existing native vegetation. There is a range of action dependent on the condition/quality of the native vegetation being treated. The condition of the vegetation directly impacts on the projected costs of undertaking this bush regeneration.

- **Creating habitat** – to increase the area of important ecological communities creating new habitat in areas that are adjacent to existing habitat or in areas where there is a sound ecological reason to do so (e.g. corridor network or stream buffers). Any habitat creation works would have to be planned, appropriate, enforced and managed over time.

  Planting has already begun in some areas of the Parklands Bungarribee Precinct. The 200m wide habitat corridor and core habitat area outlined in the Management Vision for the Western Sydney Parklands in some areas require enhancement in order to meet these objectives. The Parklands Bungarribee Precinct contains areas of core habitat that are in a moderate or poor condition and has areas of partial and incomplete links within the riparian corridor. Initial intensive weed control measures are also required in some remnants.

  Well established methods such as those currently employed on site to return structure and function to the landscape and typically applied at a broad scale (see http://www.nationalparks.nsw.gov.au/pdfs/cumberland_plain_site_easterncreek.pdf).

  Recreating endangered ecological communities is one of the aims of the ecological restoration. This expansion of existing areas of endangered ecological communities will improve their longevity and condition.

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- **Recreation**: this term is used to describe advanced revegetation where the objective is to re-establish as close to the full suite of flora species and structure of a vegetation community, in this case Alluvial and Shale Plain Woodlands and native grasslands. Tree planting alone does not provide sufficient diversity in structure, habitat and plant species to support diverse wildlife or trigger the regeneration of Cumberland Plain Woodland.

  Previous theories were that planting trees would facilitate the spread of other species from nearby remnant vegetation but this has been shown not to be the case. Studies have been undertaken on DoP land at Hoxton Park where trees have been planted in abandoned agricultural land and after 11 years, the species composition of the tree planting sites did not begin to resemble that of remnant vegetation (Nichols, P.W.B et al. Evaluation of restoration. CPW Conservation and Restoration of the Cumberland Plain Symposium proceedings, 2006). Some potential reasons for this are that the soil seed bank in former agricultural lands in western Sydney lack seeds of many desirable native species. (Morris C. Soil seed bank: size, species composition in pasture, revegetation, remnants. CPW Conservation and Restoration of the Cumberland Plain Symposium proceedings, 2006). Furthermore, the seed of 70% of Cumberland Plain species is not dispersed further than a few meters. So this means that if these species are not in the soil seedbank, then they will never be naturally dispersed to areas of tree plantings. (Assoc. Prof. Kris French UOW The role of seed dispersal in restoration CPW Conservation and Restoration of the Cumberland Plain Symposium proceedings, 2006).

  Attempted recreation of CPW in this context is proposed through broad scale direct seeding of a greater diversity of groundcover species than previously attempted. ***Appendix D*** *contains a proposed species list and it is envisaged that this will be direct seeded on an agricultural scale.*

  The method proposed for this project is to attempt recreation (noting that recreation of an EEC has not yet to been successful) is to broadly apply a more diverse suite of only groundcover seed utilising agricultural tilling and air seeding approaches. This would require spraying herbicide and scarifying the receiving site prior to seed application. It is proposed that tree and shrub tube stock planting would be carried out following the establishment of the groundcover and mimic the woodland patch and cluster composition.

The primary objective of an offset action should be to create, enhance, or maintain ecologically viable habitat for locally endemic species, in the same or adjacent area/s. These three actions form the basis of planning for offsets within the Parklands Bungarribee Precinct.

6.4 Assessment of Offsetting Potential in Parklands Bungarribee Precinct

As a result of the developments proposed for Doonside and West Huntingwood, an Ecological Restoration Plan is recommended in this report to direct appropriate actions and strategies for offsets and funding and to coordinate ecological outcomes from development proposals (previous, present and future) that will fund the bush

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regeneration with in the Parklands Bungarribee Precinct. Details of where restoration is to occur and how, directly relate to the security of offsets and also determine spatial, temporal and financial considerations.

The capacity of the Parklands Bungarribee Precinct to act as a target area for offsetting required assessment. ELA has based an assessment of the ecological restoration potential of the Parklands Bungarribee Precinct on the following:

- The natural values of the site
- The conservation significance of remnant vegetation and riparian areas
- Their recovery potential
- Consolidation and/or links between existing vegetation and habitat
- The offsetting principles outlined above
- Ecological objectives for area of regeneration and recreation as they relate to existing natural, recreational, social and cultural values
- Priorities for regeneration based on bush regeneration theories
- Current and experimental bush regeneration methods suitable to the site
- The scale of data current available
- Proposed recreational, cultural and development requirements

The ecological restoration potential of the Parklands Bungarribee Precinct determines the level and type of offsets available. The conservation significance and impact assessment of development parcels initially determines footprints, however the offsets available capture an opportunity previously unrealised by traditional mitigation and design.

6.5 Restoration Areas

The ecological restoration areas proposed and their associated ecological outcomes are outlined below. A map of proposed restoration areas has been developed and is presented in Figure 11a (all communities), 11b (Alluvial Woodlands), 11c (Shale Plain Woodlands) and 11d (Grasslands). These proposed restoration actions aim to establish the ecological network and enhancement of the ecological viability in the Bungarribee Parklands, including development parcels.

There are broadly five areas of potential offset locations each with different characteristics and features. These areas are illustrated in Figure 12 and described below in Table 13 together with the ecological objectives. Proposed implementation methods are broadly described for each area.

Table 13 outlines the areas within the Bungarribee Precinct that are available for offsetting beyond the remnant vegetation currently and proposed development concept plans for the site.

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Table 13: Areas identified for Ecological Restoration

Area	Features	Ecological Objective	Implementation strategy
1. Riparian Corridor	Dominated by Eastern Creek and Bungarribee Creek. Eastern and Western tributaries are of low quality and act as stormwater drains from surrounding suburbs.	• Protection of Water Quality • Maintenance of as near a natural flows as possible • Creation and enhancement of 200m wide biodiversity corridor (Mgt Vision for WSP) • Expansion of existing EECs	Development controls (eg GPTs) Stormwater controls, WSUD, potable water conservation, Broadscale revegetation works along the creeklines, with backplanting and/or intensive area planting (recreation) Recreation of vegetation communities through appropriate offset ratios and targeted plantings adjacent to creek
2. Northern Remnant Area	Largest remnant on site and contains sugar glider, snail and mircobat habitat. Large pockets of cleared land and the multiple tracks within the remnant act as a vector for weeds and ongoing disturbance. A fire regime driven by arson has impacted on the condition and structure of the remnant but aided the associated Themeda grasslands. Western edge is subject to future sports development and of lower ecological significance and recovery potential.	• Expansion of existing EECs through consolidating remnant and reducing edge to area ratios • Removing current threats such as weeds and erosion (channels and from multiple tracks) • Extending connections west to other patches of remnant vegetation for larger area of arboreal mammals	Recreation targeted in smaller or surrounded areas Bush regeneration and development controls including the relocation of grasslands. Revegetation linking with Alluvial and Shale Plain Woodlands west of Eastern Creek that will not be impacted by the sports complex. Revegetation to provide canopy and foraging habitat (flowering species) for gliders and possums.
3. Western Remnant Area	Network of long narrow Shale Plain Woodland in good and moderation condition with high recovery potential. There is no connectivity west due to the M7. However, small links extend from the Eastern Creek west.	• Expansion of existing EECs • Consolidating remnant and reducing edge to area ratios • Expand connections and vegetation community transitions to Eastern Ck	West of Eastern Creek, high diversity of grass, forbs, and herbs species direct seeded on a broadscale with follow up tree species planting (if required) Recreation through intensive planting in gaps between remnants

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Area	Features	Ecological Objective	Implementation strategy
4. Southern Remnant Area	Shale Plain Woodlands is good and poor condition. Limited opportunity for connection as surrounded by M7, M4 and Great Western Highway. Some tenuous connections to Eastern Creek	• Consolidating remnant and reducing edge to area ratios • Expand connections and vegetation community transition from Eastern Creek • Utilisation of production land	Trial areas of broadscale direct seeding a diverse ranges of grass, herbs and forbs species, to be later planted out with shrub, Acacia and tree species (if required) Proposed establishment of a grass orchard to resource the techniques required to achieve this plan and assist filling the grass (forb and herb) seed shortage in Western Sydney
5. Grassland Area	Subject to future zoo development. However, contains large areas of native grasslands that are uncommon on the site. Previous community plantings and Shale Plain woodlands in the corner of the Great Western Highway and Doonside Road.	• Area of native grasslands to be protected and utilised for recreational open space. • Consolidation of remnants (subject detailed design of zoo)	Consolidation of grasslands and relocation from development areas if required. Revegetation and recreation of communities in the degraded drainage line.

Note: These objectives and actions have been developed to create some context for the development of offsets from the proposed Doonside Residential Parcel and potentially other developments in the area (such as West Huntingwood Employment Lands).

A finer scale of mapping and planning is required during development application/project approval stages in order to better achieve the ecological outcomes sought and to build upon the large amount of revegetation works already undertaken on site.

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Figure 11a: Proposed Bungarribee Parklands Restoration Plan

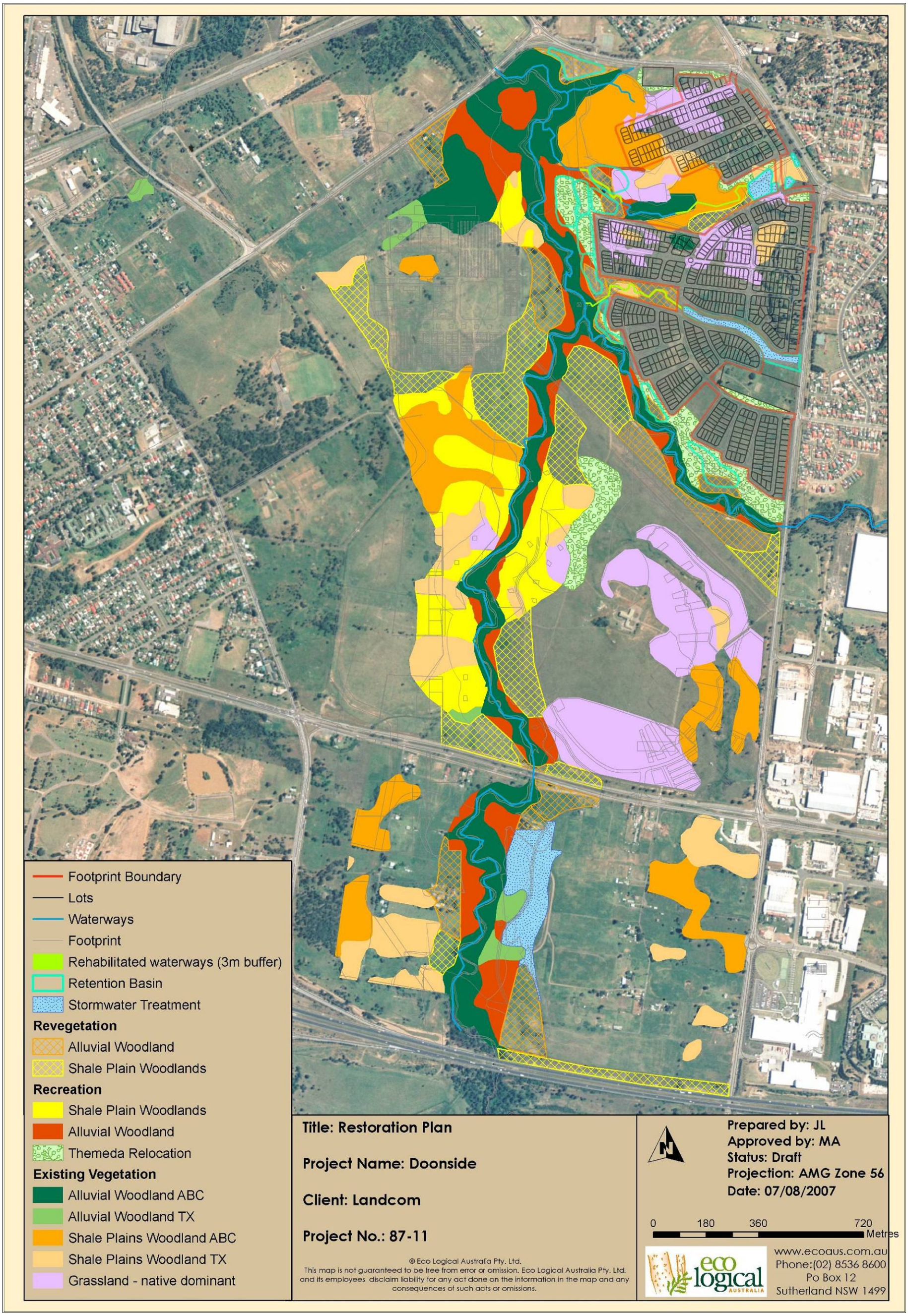

Figure 11b: Alluvial Woodland Restoration

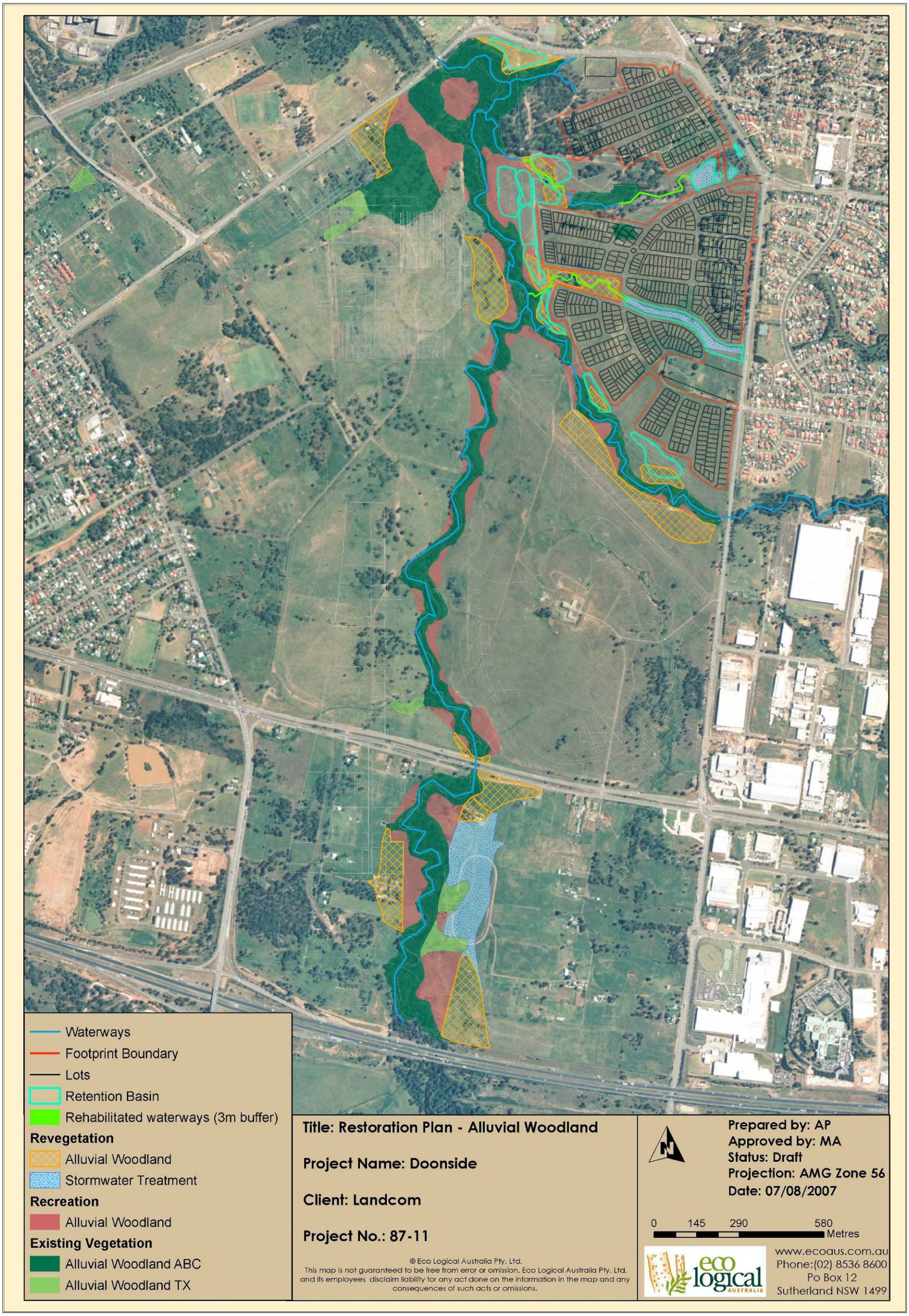

Figure 11c: Shale Plain Woodland Restoration

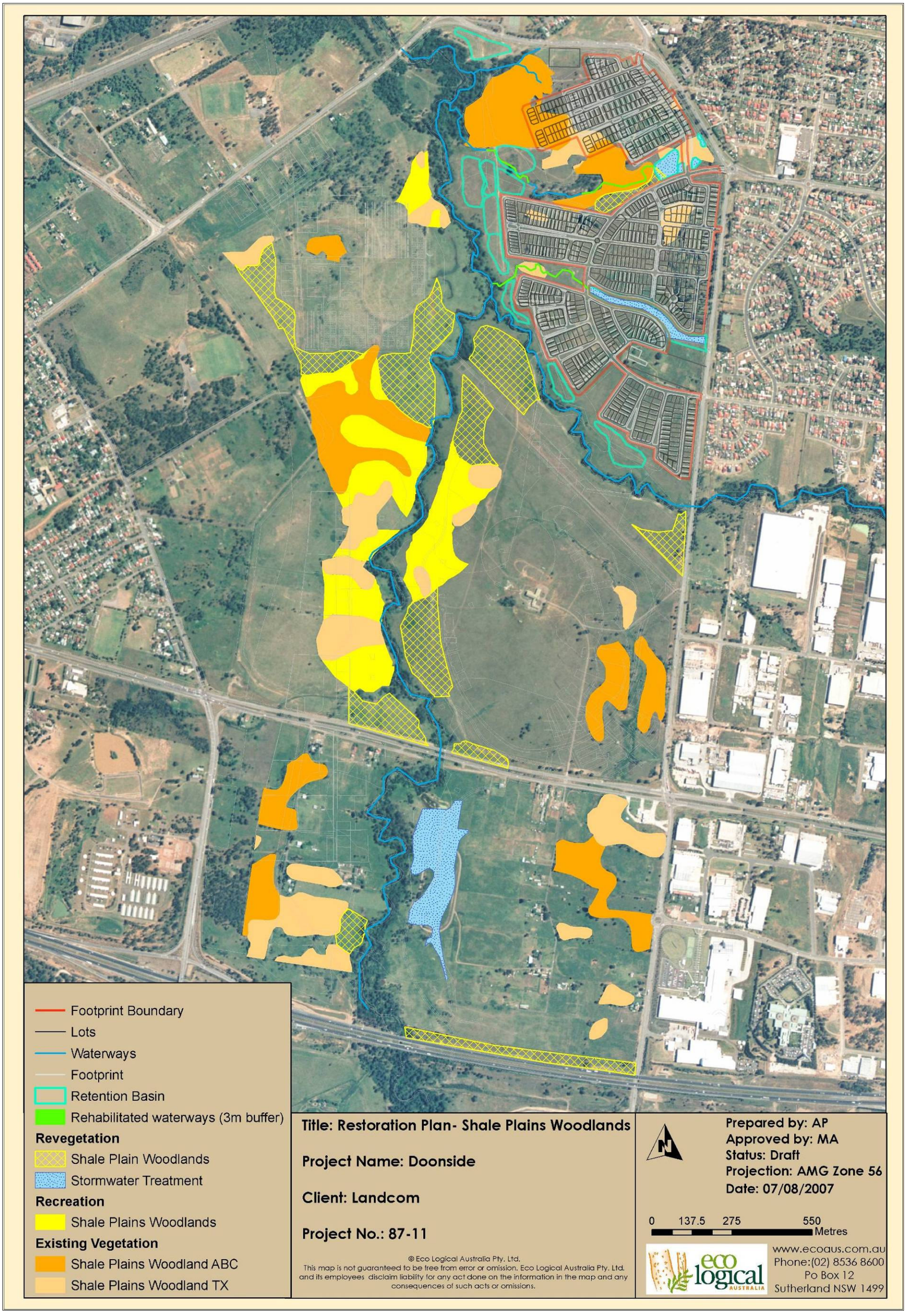

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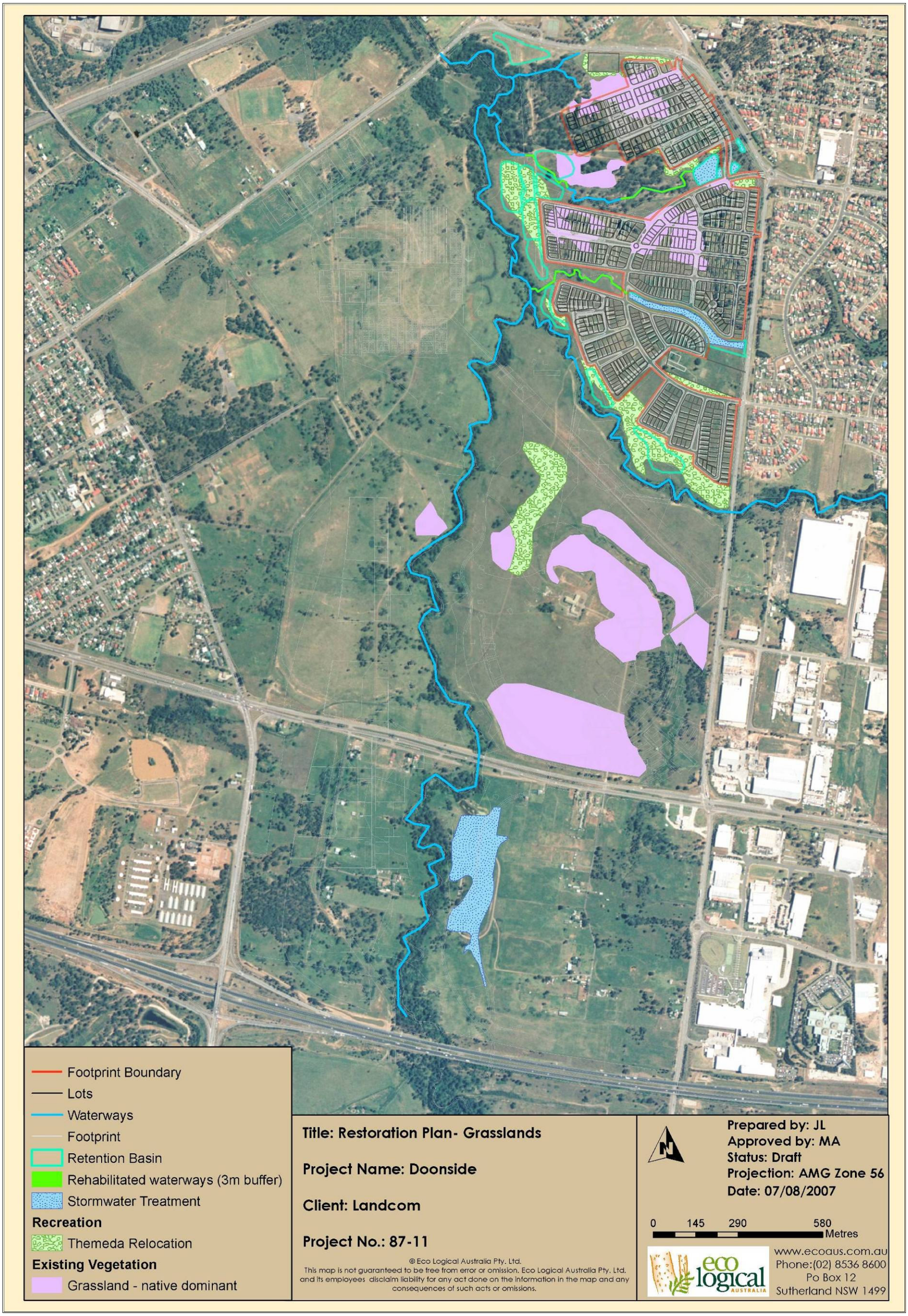
Figure 11d: Grassland Restoration



The areas in hectares proposed to receive offsetting actions are outlined below in Table 14.

Table 14: Potential Area for Recreation and Revegetation within Bungarribee Precinct.

	Vegetation Communities	Number of Polygons	Hectares
Recreation	Themeda Relocation	13	17.43
	Alluvial Woodland	36	23.17
	Shale Plain Woodlands	10	20.37
	Total	**59**	**60.97**
Revegetation	Shale Plain Woodlands	12	29.88
	Alluvial Woodland	17	20.58
	Total	**29**	**50.46**
Regeneration	All extant vegetation	**88**	**127.00**

The proposed restoration strategies adopted within the Parklands Bungarribee Precinct indirectly identify target offset vegetation communities, and the extent to which offsets can be achieved at this local level. The development and adoption of a detailed ecological restoration plan for the Bungarribee Precinct places individual development offsets within a broader context and allows approval authorities greater certainty with regard testing thresholds such as 'improving and maintaining' ecological values within the Parklands Bungarribee Precinct.

The offsets proposed to counterbalance ecological impacts assessed for the Doonside development area have been made within the context of this proposed restoration plan.

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7. Doonside Offset Strategy

7.1 Vegetation

The Doonside development area has 43.57 ha of exotic grassland of negligible ecological constraint (Figure 3). Of the 4.57 ha of Shale Plains Woodland impacted by the development, 2.43 ha is of high ecological constraint (Eco Logical Pty Ltd 2005), whilst the remaining 2.14 ha is of moderate ecological constraint. The 0.37 ha of Swamp Oak Floodplain Forest impacted by the development proposal is of high ecological constraint. The 1.43 ha of native grasslands on site are of high ecological constraint, while 6.17 ha are of moderate ecological constraint. The proposed offsetting is aimed at counterbalancing these impacts and is discussed below.

It should be noted that these impacts are significant, and will also require a referral under the *Environmental Protection and Biodiversity Conservation Act 1999*. A referral under the Commonwealth Act is triggered as Cumberland Plain Woodland, of which Shale Plain Woodlands forms a part, is listed as an endangered ecological community and therefore a matter of national environmental significance (See **Appendix C**).

7.1.1 Shale Plain Woodlands

There are two patches of Shale Plain Woodland of high ecological constraint that will be within the development footprint. These areas of high ecological constraint will be impacted by the proposal. There are two patches of Shale Plain Woodland of moderate ecological constraint that are also within the development footprint and require removal.

These areas of Shale Plains Woodland contain habitat for the Cumberland Plain Land Snail and microbats. The development footprint does impact on these threatened species locations and habitat.

7.1.2 Swamp Oak Floodplain Forest

There is a 0.37 ha patch of Swamp Oak Floodplain Forest that will be impacted by the development footprint. This area occurs as a relatively isolated patch in the north of the site. It has tenuous links to the larger Swamp Oak Floodplain Forest to the north.

7.1.3 Native Grasslands

Native grasslands on the northern boundary to Eastern Road have been mapped as high ecological constraint as they contain potential habitat for Cumberland Land Snail and *Grevillea juniperina.*

7.2 Proposed Offset Ratios

The proposed offsetting ratio requirements are partly informed by the conservation and ecological outcomes planned for the Parklands: Bungarribee Precinct. Based on the indicative protection, enhancement and creation prescriptions in the Western Sydney Parklands Management Vision and Master Plan for Bungarribee Precinct (PSB 2006) there are 82 ha that can accommodate revegetation. Analysis completed for this report also identified 144.8 ha of existing native vegetation requiring protection

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and maintenance over the larger term in within the context of broader parkland objectives. Suggested offset ratios are as follows.

7.2.1 Shale Plain Woodlands

The areas of high ecological constraint Shale Plain Woodland will need a higher offset ratio (3:1) than the stands of moderate ecological constraint (2:1).

7.2.2 Swamp Oak Floodplain Forest

A similar offset ratio (3:1) to the Shale Plain Woodland of high ecological condition will be required counterbalance the impact on this community.

7.2.3 Native Grasslands

The trial proposed for relocating Themeda grasslands in this strategy is potentially a mitigation measure. However, due to its uncertainty should not be considered in calculating conservation offsets.

As the native grasslands were previously part of the Shale Plain Woodlands, protection and/or enhancement of other remnants of Shale Plain Woodlands within an intact understory within the precinct can be considered for offsetting native grasslands at a ratio commensurate with their ecological value (1:1 offset ratio + 1:1 relocation).

Table 15 below details the calculations basis for the extent of offsets required for the Doonside development.

Table 15: Extent of Offsets

Community	Condition*	Area (ha) Impacted	Offset Ratio	Type of Offset	Area (ha) Required
Alluvial Woodlands	ABC	0.37	3:1	Recreation	1.11
	TX	0.00	2:1		
		0.37			**1.11**
Shale Plains Woodland	ABC	2.43	3:1	Revegetation	7.29
	TX	2.14	2:1	Revegetation	4.28
		4.47			**11.57**
Grassland	Native	7.6	1:1	Protection	7.6
	Relocation	(7.6)	1:1	Relocation	7.6
		7.6			**15.2**
Total		**12.54**	**(2.1:1)**		**27.88**

7.3 Potential Biodiversity Offsetting Actions

Potential offsetting actions aim to counterbalance the loss of 12.54 ha of native vegetation in the Doonside Development Area. This is necessary as avoidance and mitigation measures are not available.

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Potential offsetting actions for vegetation include:

- Targeted offsetting measures in the Parklands Precinct aimed at counterbalancing the loss of the particular values at appropriate ratios. This would include attempting to:
    - Attempted recreation and then protection of 1.11 ha of Swamp Oak Floodplain Forest
    - Relocating 7.6 ha of native grassland
    - Protecting and managing a further 7.6 ha of native grassland
    - Revegetation of 7.29 ha of Shale Plain Woodlands in relatively good condition
    - Revegetation of 4.28 ha of Shale Plain Woodlands in relatively poor condition
    - Enhancement of existing vegetation through:
        - Formalising and controlling access to the conservation areas using fencing, gates, and formed walking tracks physically linked to Department of Planning (DoP) fencing initiative (fencing and formed paths facilitates controlled access through native vegetation and encourages users to stay within predetermined areas);
        - Development of managed buffer areas between the development and retained native vegetation;
        - A financial contribution to a sinking fund created to maintain and manage the natural values of the Parklands Bungarribee Precinct.
        - Insurance of the recreation and revegetation plantings against catastrophic failure (drought, fire etc)

7.4 Performance Objectives

To ensure that the Biodiversity Principles (See Section 6.2) of like for like, and estimated benefits are met, the following performance measures are proposed for recreation offset areas:

- Offsets meet 80% of the benchmark score for each respective vegetation type as outlined for the Biometric Tool (See BioMetric Benchmark for Hawkesbury Nepean) developed by DECC. This benchmark relates to
    - Native plant species richness
    - Native over-storey cover
    - Native mid-storey cover
    - Native ground cover (grasses)
    - Native ground cover (shrubs)
    - Native ground cover (other)
    - Cover estimates
- Vegetation structure in offsets is to mimic that of lost vegetation patches
- Benchmark condition is demonstrated in an area equal to that required by the offset ratio (See Table 15)
- Weed, erosion and sedimentation, stormwater, human activity, and fire management practices are in place and effective.

The following performance measures are proposed for revegetation offset areas:

- Offsets meet 50% of the benchmark score for each respective vegetation type as outlined for the Biometric Tool

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- Vegetation structure in offsets is to mimic that of lost vegetation patches
- The above is demonstrated in an area equal to that required by the offset ratio (See Table 15)
- Issues that can influence ecosystem function (ie: weeds, erosion and sedimentation, stormwater, human activities, fire) are managed.

It is envisaged that these performance objectives will be measured following implementation ie: after 5 years.

7.5 Location of Offsets

The concept plan for the Bungarribee Precinct has been developed (EDAW). Development, establishment and management arrangements for the Western Sydney Parklands Trust have also progressed and established a structure for implementing offset works within the precinct (DoP pers comms 18/5/07). The preferred location of offsets is illustrated in Figure 12 and provides detailed locations for the proposed areas of offsets outlined in Table 15 (above).

7.6 Responsibilities and Timeframes

The future Parklands Trust will have overall responsibility for delivering the conservation management outcomes for the Parklands Precinct.

It is envisaged that an offsetting structure will include:

- A three (3) year establishment period (capital expenditure)
- A two (2) year maintenance period (capital expenditure)
- A contribution to a sinking fund for the going maintenance of established bushland areas to generate $2000/yr/ha
- An insurance against catastrophic failure of establishment (1% of capital expenditure per year for five (5) years

Deliverance of conservation outcomes will also include involvement of other stakeholders with interests in the Parklands Precinct including Department of Environment and Climate Change (DECC), Department of Natural Resources (DNR) prior the recent agency restructuring, Greening Australia (GA) and potentially other federal or state government agencies, community groups and landholders. To date, consultation has only occurred with relevant agencies (DoP, DECC) and stakeholders (GA) in regard to offset ratios and approach, restoration approaches, conservation significance and works completed to date.

The developer of Doonside would be responsible for providing the financial contribution that will protect, restore and manage 27.88 ha of Shale Plains and Alluvial Woodland and native grasslands in the Parklands. The developer will also be responsible for negotiating the funding scheme and reporting with the future Parklands Trust and with DECC. It is understood that a sinking fund will be established to provide for the ongoing management of the Parklands. Offsets within the Doonside development area will also require implementation by the developer.

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7.7 Monitoring

The Parklands Trust will have responsibility for the management of the Parklands Precinct, as well as for the creation, protection and management of offset areas outside the development area. The targeted offsets will need to demonstrate performance against the objectives outlined in Section 6.5 and should be audited at the end of the 5 year capital expenditure program. Accountability and reporting arrangements will need to be agreed between the Parklands Trust and DECC.

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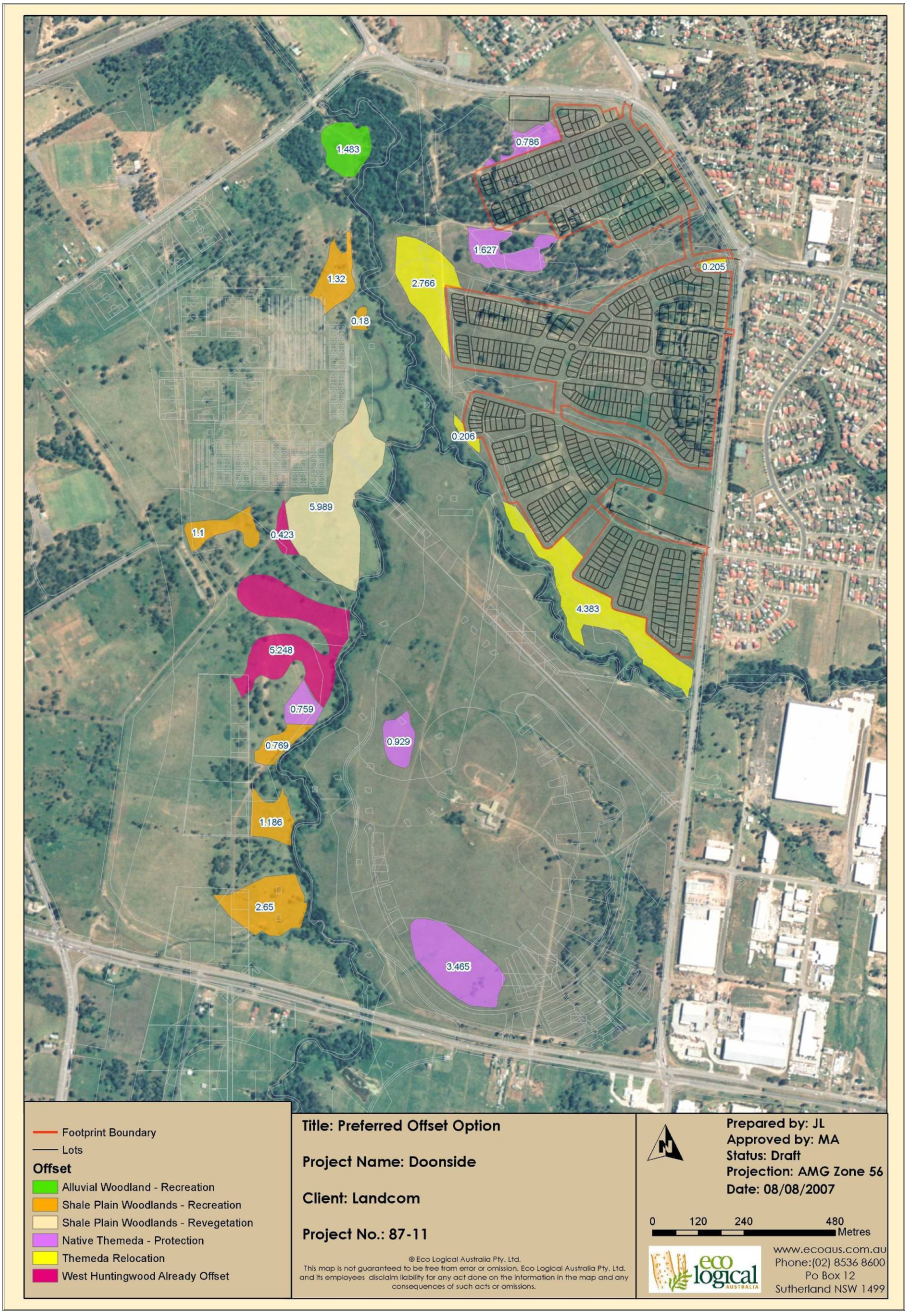
Figure 12: Offset Target Areas



8. Urban / Parkland Interface

The interface between the urban development and parklands has the potential to create additional environmental impacts such as:

1. Garden escapes (weed invasion)
2. Predation of native fauna by domestic animals (cats)
3. Spread of disease from domestic animals to native fauna (eg hydatids)
4. Introduction of inappropriate fire regimes (too few/or frequent burning)
5. Uncontrolled access and rubbish

It is understood that the development boundary to the parkland areas will be the proposed bike path on the western edge of residential development.

8.1 Ecological Guidelines for Urban Edge

Within the area between park edge road and the bike path the following considerations should be included in landscape plans to minimise impacts and enhance outcomes at the urban/parkland interface:

- Adjacent to retained remnant vegetation, use of native species of local providence only in landscaping plans beyond the external loop road.
- Fencing of intact remnants prior to construction.
- Adjacent to remnants, it is suggested that a more permanent, robust, fire resistant and aesthetically acceptable barrier will be required due to the proximity and significance of these remnant in this locations.
- Landscape plantings should reflect potential higher soil moisture levels below stormwater / flood detention basins located beyond the external loop road.

8.2 Ecological Guidelines for Bushland within the Development Parcel

For management of lands currently without existing remnant vegetation and beyond the development footprint but within the Doonside Residential parcel, the following measures are recommended:

- Utilisation of intact native grasslands, particularly those dominated by *Themeda sp*, through a relocation trial. It is proposed that the existing native grasslands impacted by the development be excavated intact (ie: one loader bucket at a time) and placed on pre-prepared disturbed areas adjacent to urban development. Some irrigation will be required initially. It is hoped that the diversity of forbs and herb species in the inter-tussock spaces will remain, as will a viable seed bank. Such species diversity and composition has not yet been implemented through revegetation.
- Regeneration of the Swamp Oak Floodplain Forest by management of the western edge of the creek lines encouraging spread of native species out from remnant vegetation through appropriate bush regeneration techniques
- Retention of rural view sheds in the vicinity of the historic Bungarribee House
- No new access tracks or recreational facilities be established within existing native vegetation. Bike paths and access tracks in areas of native vegetation to follow existing tracks and areas of previous disturbance (motor bike tracks).
- In larger Themeda relocation area between the junction of Eastern Ck and Northern Ck, to the north of Area C, mapping of native grass patches and

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retention of these where possible is be undertaken prior to preparation for relocation.

- Open space areas within the development to adhere to the Protection for Bushfire Planning Guidelines (2006) requirements for management of asset protection zones adjacent to urban areas (see below).

8.3 Bushfire Management Requirements

8.3.1 Bushfire Asset Protection Zones

Bushfire asset protection zones have been mapped for the proposed development layout (see Figure 9). The site (located within the Greater Sydney Region) according to table A2.3 (PBP 2006) has a Fire Danger Index (FDI) rating of 100.

Required APZ (setbacks) are shown within Table 16.

Table 16: Required APZs

Vegetation communities	Vegetation formation - PBP 2006	Slope (Degrees)	Type	APZ required (PBP 2006)
Alluvial Woodland ABC	Forested wetlands	0-5	Downslope	20
Alluvial Woodland TX	Forested wetlands	0-5	Downslope	20
Grassland - exotic dominant	Grassland	0-5	Downslope	10
Grassland - native dominant	Grassland	0-5	Downslope	10
Shale Plains Woodland ABC	Open Forest	0-5	Downslope	25
Shale Plains Woodland TX	Woodlands	0-5	Downslope	15
Freshwater Wetland - Wetland/Stormwater Management Area	Freshwater Wetland	0-5	Downslope	10
Relocated, revegetated and recreated vegetation - Alluvial Woodland	Forested wetlands	0-5	Downslope	20
Relocated, revegetated and recreated vegetation - Shale Plains	Woodlands	0-5	Downslope	15
Relocated, revegetated and recreated vegetation - Grassland - native dominant	Grassland	0-5	Downslope	10

Shale Plains Woodland ABC has assessed as forest due to dense shrub layer on site. Where the shrub layer is not dominate (ie: TX) the woodland category has been applied.

Reduced APZs are possible where vegetation remnants are upslope. No assessments for Special Bushfire Protection Developments (Child Care, Aged Care etc) has been undertaken.

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8.3.2 APZ Management

Asset Protection Zone Management should be incorporated within long term site management plans. This will include

- Internal monitoring and fuel management programs. Including surface removal of leaf litter on an annual basis prior to the fire season
- Consideration of soil erosion and stability
- Removal of weed species (such as Blackberry)

Vegetation within the APZ will be management to provide:

- Clearly defined on ground APZ management boundaries. E.g. Logs placed on the ground, tagged star pickets, a boundary fence, roads etc
- A minimum height clearance above roads, access paths and staging areas of 4 metres
- Tree canopy cover of less than 15%
- Discontinuous shrub layer (clumps or islands of shrubs not rows)
- Tree canopies not overhang structures
- No landscaping shrubs within 2 metres of any dwelling
- Maintained low ground cover:
    - Mowing / sipper sniper / slashing during the summer months

With regard to landscape plantings within APZs the following is recommended:

- Where possible plantings should include fire retardant/ less flammable species
- Planting should consist of native, local providence stock
- Plantings should include species present within onsite community assemblages

8.3.3 Construction requirements

Using an FDI (Fire Danger Index) of 100 in accordance to the methodology identified in Table A 3.4 of *Planning for Bushfire Protection, 2006,* Table 17 below highlights the required construction standards for Doonside.

Table 17: Construction Standards under PBP 2006 (Downslope, > 0-5 degrees)

Vegetation	**Distance from Vegetation (m)**				
	Flame Zone	***Level 3***	***Level 2***	***Level 1***	***N/A***
Forested wetlands	<20	20 - <29	29 - <40	40 - 100	>100
Freshwater Wetland	<10	10 - <15	15 - <22	22 - 50	>50
Grassland	N/A	N/A	N/A	N/A	N/A
Open Forest	<25	25 - <36	36 - <49	49 - 100	>100
Woodlands	<14	14 - <20	20 - <29	29 - 100	>100

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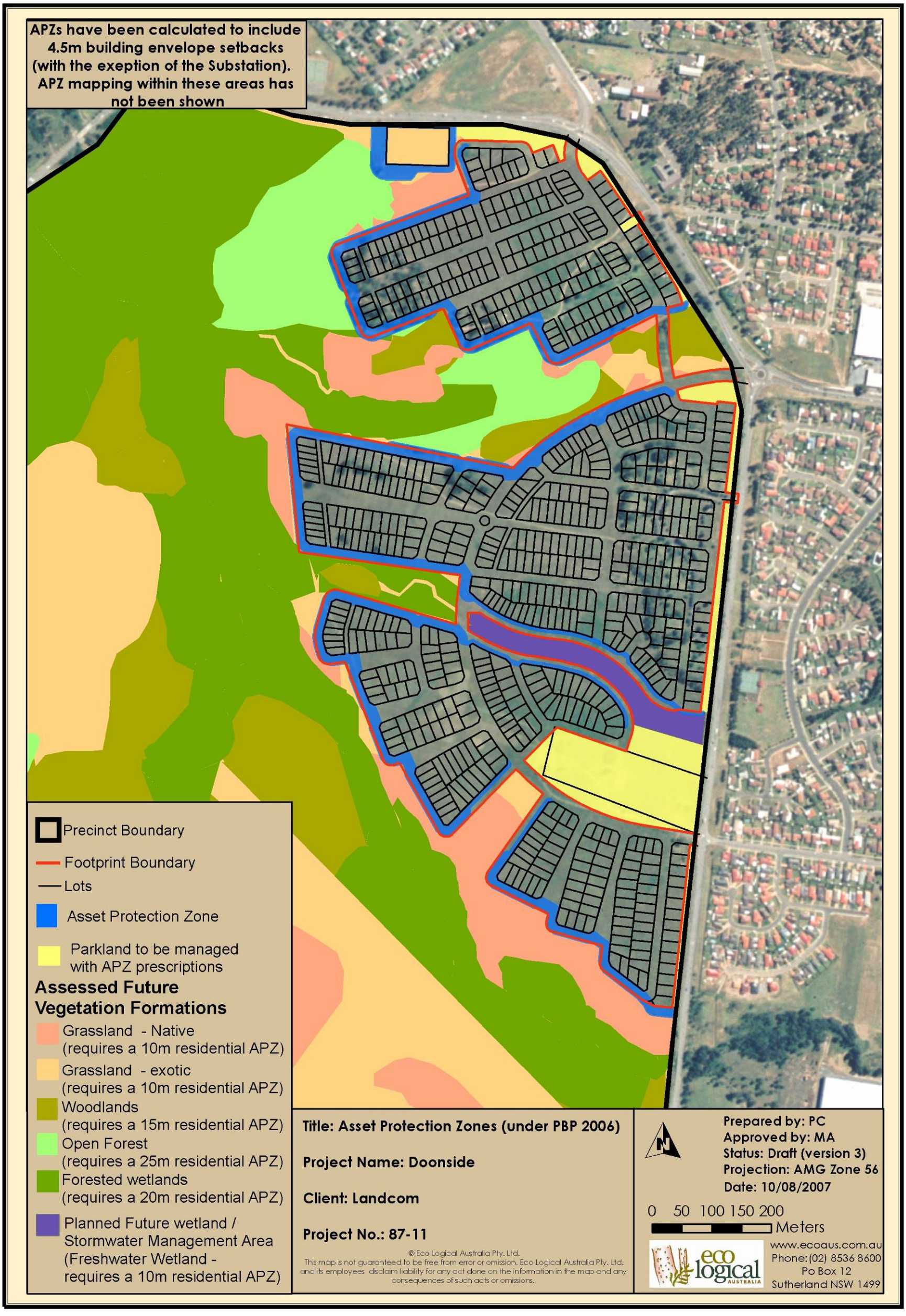
Figure 13: Asset Protection Zones



9. Recommendations

Impacts on conservation values on site will occur as a consequence of proposed residential development. In order to mitigate some of these impacts it is recommended that the following (as outlined in this assessment) be incorporated into detailed design:

- Appropriate riparian buffers according to Sydney Metro CMA guidelines
- Minimum asset protection zones are suggested varying between 10 and 25m
- Ecological Guidelines for Bushland within residential parcel
- Ecological Guidelines for the treatment of the Urban Edge
- Hazard Reduction guidelines and management recommendations for APZ
- Implementation of an offsetting strategy as outline in Section 7
- A trial of relocation of *Themeda* grasslands
- Permanent pedestrian friendly fencing the northern remnant prior to construction

Further ecological investigation in remnant vegetation is recommended prior to project approval under Part 3A of the *Environmental Planning and Assessment Act 1979*. Recommended targeted surveys include:

- Micro bat detection focused on hollows that will be impacted by the proposed development to confirm that no roost sites exist.
- Targeted seasonal searches for other potential threatened flora species including *Acacia pubescens, Pimelea spicata,* and *Pultenaea parviflora* within impacted areas.
- Complete targeted Cumberland Plain Land Snail searches across Bungarribee Precinct in order to establish the relative significance of the snail population within the Doonside Residential Precinct, to confirm the significance of the likely impact of the development, and to identify suitable areas for possible/potential snail relocation.
- Undertake seasonably appropriate surveys for swift parrot.
- Provide more detailed assessment of final alignment of associated infrastructure such as pedestrian paths, cycle ways, detention basin mounds, stormwater piping and creek crossings.

This assessment relies on proposed targeted offsetting measures including protection, enhancement and creation of high priority areas of Swamp Oak Floodplain Forest EEC, Shale Plains Woodland and relocation and protection of native grasslands. These actions will be dependent upon finalising a EPC Act referral and Department of Environment and Water Resources determinations regarding impacts on matters of national environmental significance.

A financial contribution to the Parklands Trust of a sufficient value to protect, create and manage 27.88 ha of vegetation within the Parklands Precinct is recommended. This contribution is to provide for offsets on a like for like basis and in accordance with the offset principles outlined in this report. For these offsets (and others) to be effectively targeted and managed for ecological outcomes, a preliminary Ecological Restoration Plan has been proposed as part of this assessment.

10. Conclusion

This document provides recommendations for ecological outcomes for the proposed development of the Doonside residential parcel and more broadly an approach for the ecological restoration of the Parklands: Bungarribee Precinct.

The impacts on endangered ecological communities and threatened species are significant, and rely on offsetting to maintain ecological values within the Bungarribee Parklands. Further investigation is required on fauna habitat in particular to be able to quantify impacts, and better understand their significance and context, at a landscape scale. Further approvals will be required under the EPBC Act.

Recommendations are made with regard to the management of impacts between the urban interface, Bushlands and APZ's in order to reduce secondary ecological impacts prior, during and after construction. Part of this is a trial of relocation of *Themeda* grasslands within the development parcel.

This assessment provides, and quantifies, the requirements for offsetting the loss of Shale Plains Woodland, Swamp Oak Floodplain Forest and native grassland as a result of the proposed development. The proposed targeted offset actions include a financial contribution to protect, restore and manage at least approximately 27.88 ha within the Parklands Precinct and performance objectives for these offsets.

These recommendations are made in the context of the Management Vision for the Western Sydney Parklands and under Part 3A of the EP&A Act.

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11. References

Department of Environment and Conservation (2006). *BioBanking. An investigation of market-based instruments to secure long-term biodiversity objectives Background Paper*. Department of Environment and Conservation.

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Appenidx A: Draft Part 3A Threatened Species Assessment Guidelines.

DRAFT

GUIDELINES FOR THREATENED SPECIES ASSESSMENT

DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DEPARTMENT OF PRIMARY INDUSTRIES

JULY 2005

This Guideline identifies important factors and/or heads of consideration that must be considered by proponents and consultants when assessing potential impacts on threatened species, populations, or ecological communities, or their habitats for development applications assessed under Part 3A of the *Environmental Planning and Assessment Act 1979*.

1. PURPOSE AND SCOPE OF THE GUIDELINES

1.1 Background

This document identifies matters which are relevant to the assessment of impacts to threatened species, populations, or ecological communities, or their habitats[1] arising from a develop proposal assessed under Part 3A of the *Environmental Planning and Assessment Act 1979*.

This Guideline is complemented by profiles for threatened species and specific environmental impact assessment profiles and guidelines being compiled by the DEC[2] and DPI[3]. The environmental impact assessment profiles and guidelines contain ecological information to assist in the survey and assessment of individual species, populations and ecological communities.

1.2 Guiding principles for threatened species assessment

The objective of the assessment process is to provide information to enable decision makers to ensure that developments deliver the following environmental outcomes:

1. Maintain or improve biodiversity values (ie. there is no net impact on threatened species or native vegetation).
2. Conserve biological diversity and promote ecologically sustainable development.
3. Protect areas of high conservation value (including areas of critical habitat).
4. Prevent the extinction of threatened species.
5. Protect the long-term viability of local populations of a species, population or ecological community.
6. Protect aspects of the environment that are matters of national environmental significance.

The assessment is designed to provide information and analysis to demonstrate that feasible alternatives have been considered, that the project has been designed to be consistent with the principles outlined above, and where there are impacts, that adequate mitigation measures are implemented.

1.3 Threatened species

What are threatened species?
Schedules 1, 1A and 2 of the *Threatened Species Conservation Act 1995* (TSC Act) and Schedules 4, 4A, 4 & 5A of the *Fisheries Management Act 1994* provide for the listing of:

- species as presumed extinct, critically endangered, endangered and vulnerable in NSW;
- populations as endangered in NSW; and
- ecological communities as critically endangered, endangered and vulnerable in NSW[3].

[1] For the remainder of this document the term 'threatened species' is used to refer to the whole statutory formulation of 'threatened species, populations or ecological communities'.
[2] Species profiles have been completed for a limited number of species, populations and ecological communities at this time.
[3] Profiles for species listed under the Fisheries Management Act 1994 are included in the DEC Threatened Species Tool.

The current list of threatened species can be found at:
http://www.nationalparks.nsw.gov.au/PDFs/TSCA_schedules_050429.pdf
http://www.fisheries.nsw.gov.au/threatened_species/threatened_species2/what_is_currently_listed

What is critical habitat?
Critical habitat is defined as an area that is critical to the survival of an endangered species, population or ecological community. The declaration of critical habitat provides greater protection and stricter controls over activities in that area. Critical habitat is only declared after consultation with the Scientific Committee or Fisheries Scientific Committee, public authorities, landholders and the wider community. Once declared, it becomes an offence to damage critical habitat.

The current list of recommended and declared critical habitat can be found at:
http://www.nationalparks.nsw.gov.au/npws.nsf/Content/Critical+habitat+protection+by+doctype
http://www.fisheries.nsw.gov.au/threatened_species/threatened_species2/species/gns_critical_habitats

2. FACTORS TO CONSIDER WHEN PREPARING A DEVELOPMENT APPLICATION

All development applications must include a statement as to whether or not threatened species are likely to occur in the study area. Study area means the development footprint and any additional areas that are likely to be affected by the proposal, either directly or indirectly. The study area should extend as far as is necessary to take all potential direct and indirect impacts into account.

If there is a likelihood of threatened species being present, which may be the situation depending on the type, quantity and quality of habitats present on the subject area, the application must include a threatened species assessment. The steps in the assessment process are described below.

See Appendix 1 for structure and content of threatened species assessment report.

3. STEPS IN THE ASSESSMENT PROCESS

This section provides an outline of the assessment process and should be read in conjunction with the Threatened Biodiversity Survey and Assessment Guidelines, any relevant recovery plans, threat abatement plans, profiles for threatened species (available at www.threatenedspecies.environment.nsw.gov.au) and specific environmental impact assessment profiles and guidelines being compiled by the DEC.

Step 1 Preliminary assessment

The main purpose of a preliminary assessment is to determine the likelihood of the study area and subject site supporting threatened species. This step is primarily a desk top assessment involving searches of relevant databases (refer to Appendix 2) and literature reviews to identify a list of threatened species that could potentially occur in the area. The following website provides search tools that will assist in compiling a list www.threatenedspecies.environment.nsw.gov.au. This website includes threatened species, populations, and ecological communities listed on the schedules of the *Threatened Species*

Conservation Act 1995 and the *Fisheries Management Act 1994*. Some preliminary site inspections may be required to refine this list.

A preliminary assessment should include:

- a description of the location and nature of the proposed development;
- a description of dominant vegetation types;
- a description of habitat features;
    - a list of threatened species that are known or likely to occur within the study area;
    - an assessment of which of the threatened species that are known or likely to occur are likely to be directly or indirectly affected by the proposal (Appendix 3 provides a list factors for consideration in identifying adverse impacts. This list is not necessarily exhaustive and is not development-specific).

If following a preliminary assessment, it is determined that threatened species are not likely to occur, no further assessment is required. This conclusion, and the rationale for this finding, must be documented in the preliminary information and subsequent application submitted for determination.

If threatened species are likely to be affected by the proposal proceed to next step.

Step 2. Field Survey and Assessment

Field surveys and assessments should be conducted by suitably qualified investigators that are experienced with survey and assessment of threatened species in the region of the study. The DEC and DPI are developing an accreditation scheme for professionals involved in threatened species and biodiversity assessments. Accredited professionals will be advertised on the DEC and DPI websites once the scheme has been established and implemented.

The required intensity and extent of survey will vary greatly depending upon the species likely to be present, size of the development area, the level of biological and habitat diversity on the site, and the type and complexity of vegetation on the site. Where developments occur over a large area the sampling regime must encompass the geographic extent of the development and sample the full range of environments that occur. In some instances, survey for threatened biodiversity listed on the Schedules of the *Fisheries Management Act 1994* will not be required subject to the nature and location of the development.

There are a number of sources of information on survey and assessment methodology. It may not be appropriate for field surveys to be limited to one type of survey method. The selection of survey techniques and effort must conform to accepted methodologies. Similarly, the field surveys may detect species or features not identified in the preliminary assessment. The survey design must be flexible to take into account these contingencies.

The objective of the field survey is to ensure that a reliable assessment of the presence or absence of threatened species can be made. Surveys are required to be undertaken during optimal climatic and seasonal conditions and consider issues such as migratory species movements, availability of shelter, breeding and food resources, and the statistical issues associated with minimising sampling error to meet this objective.

In some cases, there may be habitat present that indicates the possible presence of a species even if the species has not been conclusively found within the survey area.

Therefore, consideration must also be given to the presence in the survey area (or surrounding land) of the known or likely habitat components for the species.

Step 3. Evaluation of impacts

This step involves identifying not only the magnitude and extent of impacts, but also the significance of the impacts as related to the conservation importance of the habitat, individuals and populations likely to be affected.

Impacts will be more significant if:

- areas of high conservation value are affected;
- individual animals and/or plants and/or subpopulations that are likely to be affected by the proposal play an important role in maintaining the long-term viability of the species, population or ecological community;
- habitat features that are likely to be affected by the proposal play an important role in maintaining the long-term viability of the species, population or ecological community;
- the duration of impacts are long-term;
- the impacts are permanent and irreversible.

Step 4. Avoid, mitigate and then offset

This step requires the description and justification of measures to mitigate any adverse effects. Consideration is to be given to measures to avoid or minimise the impacts. The measures must be practical, must be implemented and there needs to be a reasonable level of confidence in their effectiveness. Acknowledged authorities with particular species or conservation practices should be consulted to determine if the measures proposed constitute appropriate management.

Where measures to avoid and mitigate are not possible, then offset strategies need to be considered. These may include offsite or local area proposals that contribute to the long term conservation of the threatened species.

Offset strategies are a last resort and should only be considered where the impacts cannot be avoided or mitigated. Considerable research indicates that relocation of flora or fauna is not successful in the medium or longer term.

The extent to which measures avoid, mitigate or offset impacts upon threatened species must reflect the conservation value of the feature including its formal status as a critically endangered, endangered or vulnerable species, population or ecological community.

Step 5. Key thresholds

The development application needs to contain a justification of the preferred option based on:

- whether or not the proposal, including actions to avoid or mitigate impacts or compensate to prevent unavoidable impacts will maintain or improve biodiversity values.
- whether or not the proposal is likely to reduce the long-term viability of a local population of the species, population or ecological community.
- whether or not the proposal is likely to accelerate the extinction of the species, population or ecological community or place it at risk of extinction.
- whether or not the proposal will adversely affect critical habitat.

APPENDIX 1

Structure and content of the threatened species assessment
It is not intended that every assessment contains all elements provided below. The content framework suggest below is indicative of the range of elements that can be present in documentation of the assessmentt

Section	Purpose	Content
Definitions	Ease of reference	• Explanation of technical terms used throughout the report.
Introduction	Sets the scene of the study	- the author of the study and who it was commissioned by; - a description of the proposal; - the regional context, location, geology, soils, landforms, climate, disturbance history and other relevant information relating to stratification requirements; and - any constraints or limitations on the study.
Methods	• Details the desktop and field survey methods employed. The technical information should be sufficiently detailed to enable the field survey to be replicated. The choice of field methods and extent of survey should be justified, and any constraints noted.	- data sources, and an explanation of how data was handled; - the methods used to determine the stratification units and how the units were sampled, and information about the spatial distribution and size of strata; - description of each stratification unit, the vegetation types in terms of structure and floristics, and a list of the dominant plant species in each growth stratum (trees, understorey, shrubs and groundcover); - as part of the habitat assessment requirements, each vegetation type must have a description of the area's disturbance (prior clearing/logging, fire regime, flooding), a description of the weeds present and their density, and comments on the suitability of the area as habitat for species, populations and ecological communities of conservation significance; - survey techniques utilised and the intensity of sampling in each strata; - type and number of traps, their layout described and mapped, baits, and the number of survey nights for each technique; - sampling dates, times and weather conditions; - the precise location and layout of the stratification units, quadrats, traverses and sampling sites, vegetation types, and relevant species distribution (presented as grid references and maps); and • - data analysis methods, including any criteria used to categorise areas of high biodiversity.

Structure and content of the threatened species assessment cont.

Section	Purpose	Content
Results	• Displays the findings of the study	- a list of all plant and animal species recorded; - a list of all threatened species, populations, ecological communities recorded or known or likely to occur in the locality; - summaries of the data, including which species were found at which sites, strata vegetation or habitat types, and by which methods they were located; - maps of survey method locations; - maps of environmental features, vegetation types and habitat types; - results of any modelling or statistical analysis of data; - maps showing the location of threatened species records or the extent of threatened species (in the case of ecological communities or plant populations) or modeled/predicted habitats of threatened species; - maps of any areas of high biodiversity or other areas of special significance; - raw data (copies of original data sheets are acceptable) should be included in an appendix.
Impact Evaluation	Describe context and intensity of impacts	
Mitigation	Discusses measures to minimise impacts	- measures to avoid impacts - mitigation measures; - amelioration measures; - offset strategies
Conclusion	Discusses the results	- a summary of the information collected, including statements on the likely presence/absence of threatened biodiversity, and the general habitat value of the study area; - interpretation of the results of the study, including statements as to key thresholds (refer to Step 7) ; and - limitations and further issues that may need to be addressed.
References	Cites publications used in the report	•
Appendices	Collates detailed information in the back of the report and allows the main body of the report to be concise.	- raw field survey data (copies of original data sheets are acceptable); - qualifications of the investigator and of all people involved in the sampling and preparation of the report; - certification of the report by the investigator; and • - the issue number and the names of issuing bodies of any licences, permits or authorities under which the fieldwork was carried out.

Appendix 2

Biodiversity Databases

Threatened Species, Population and Ecological Communities of NSW Catchments (www.threatenedspecies.environment.nsw.gov.au*)* is a web application which allows users to generate lists of threatened species known or predicted to occur within CMAs, sub-regions, and Local Government Areas. These lists can be cross-referenced and further refined against the vegetation classes that occur in the geographic areas and are associated with each species. Profiles of all threatened species and communities are provided. These include descriptions, photos, habitat, threats, suggested management actions and links to other information. The site also provides useful information on the vegetation formations and classes of NSW (as described in "Ocean shores to desert dunes: the native vegetation of New South Wales and the ACT" by Dr David Keith, published by the NSW Government. Maps and photos of each of the vegetation formations and classes are provided as are links to the web application "NSW Native Vegetation Map" (www.maps.environment.nsw.gov.au/stateveg).

The **Atlas of NSW Wildlife** is administered by the DEC and contains native flora and fauna records in NSW, both historical and current. Records are obtained from field surveys conducted by the DEC and other organisations, specimens and records of herbariums, private collections and museums, scientists, reports and journals, and the general public. To obtain data from this resource, contact the Data Exchange Officer at the DEC and order historical flora and/or fauna records per 1:100,000 map sheet. The Wildlife Atlas is available at http://wildlifeatlas.nationalparks.nsw.gov.au/ wildlifeatlas/watlas.jsp

BioNet is a system that allows for users to search either for records of specific species, or for all species across a specific area of NSW. The results of a search can then be viewed either in the form of a listing, or as an interactive map.
Website http://www.bionet.nsw.gov.au/BioNet.cfm?is_ie5up

CANRI includes the NSW Natural Resources Atlas and Data Directory, as well as websites tailored for coastal management, rivers, soils, environmental reporting and wildlife. It provides information on biodiversity, salinity, Landcare, vegetation landscape management, and regional planning. Website http://www.canri.nsw.gov.au

Australian Museum Fauna Database is Australia's largest comprehensive voucher specimen collection. To obtain database records contact Australian Museum Business Service's (AMBS) general office. Data is available for a fee, and records include location. Voucher collections from most taxonomic groups are contained at the Sydney Museum premises, and positive identifications can be made if specimens are preserved and sent to AMBS with notification. Voucher collections are maintained for all functional groups including aquatic and terrestrial fauna (vertebrates and invertebrates). Website http://www.ambs.com.au/contact/index.htm

Atlas of Australian Birds is a database produced by Birds Australia. It contains records of birds throughout Australia, including rare and threatened birds, which have been recorded by volunteers. The method for searching the database can either be by a specified area or incidental searches for individual species or groups. Maps of species distributions are also available. Website www.birdsaustralia.com.au

NSW data is administered by the Royal Botanic Gardens and contains records of botanical specimens, including rare and threatened plants throughout NSW. To order a search of an area, contact the Royal Botanic Gardens, Sydney. Website http://www.rbgsyd.nsw.gov.au

PlantNet is a taxonomic database administered by the Royal Botanic Gardens, Sydney. The database currently provides a comprehensive listing of indigenous plants, potentially dangerous weeds and information on rare and threatened plants in NSW. Each entry includes the scientific name of the plant with common and misapplied name/s and a distribution map. The database is being expanded to give diagnostic and possibly specimen records in the future. Website http://plantnet.rbgsyd.gov.au

FaunaNET is the Australian Museum's Website, which includes the Master Names List of NSW fauna (taxonomic database), has mapping capabilities using GIS Software, and contains interactive diagnostic keys (eg the Dung Beetles of NSW). Website http://www.faunanet.gov.au

EPBC Act Database is an on-line database managed by the Department of the Environment and Conservation (formerly Environment Australia). The database contains relevant information for the EPBC Act, including all of the current listings for threatened species and ecological communities, migratory species, Ramsar sites, world heritage areas, and nature conservation reserves. The database supplies records from predictive modelling rather than actual records and can be found at Website: http://www.deh.gov.au/erin/index.html

Botanical Databases are a series of databases managed by the Centre for Plant Biodiversity Research, the Australian National Botanic Gardens, and the Commonwealth Department of Environment and Heritage, including the Australian Plant Name Index database, Australia's Virtual Herbarium, the Common Names of Australian Plants database, and The National Plant Photographic Index.
Website http://www.anbg.gov.au/cpbr/databases/index.html

Other Department of the Environment and Heritage databases are available on-line through the Department of the Environment and Heritage website at http://www.deh.gov.au/erin/index.html . These may assist in both gathering and interpretation of biodiversity data. Examples of other on-line databases include the Australian Bird and Bat Banding Scheme.

Other Herbariums exist in various institutions around NSW. Examples of regional herbariums include Canberra (Southern Coast Tablelands), Queensland Herbarium (North Coast), and the University of New England (North Tablelands/Coast).

Local Government Databases. To request information on a project by project basis contact the local Council, eg. Lake Macquarie Council Wildlife Database.

Appendix 3

Identifying potential effects of the proposal on threatened species, populations or ecological communities, or their habitats

How is the proposal likely to affect the lifecycle of a threatened species and/or population?
a) displaces or disturbs threatened species and/or populations
b) disrupts the breeding cycle
c) disturbs the dormancy period
d) disrupts roosting behaviour
e) changes foraging behaviour
f) affects migration and dispersal ability
g) disrupts pollination cycle;
h) disturbs seedbanks;
i) disrupts recruitment (ie. germination and establishment of plants);
j) affects the interaction between threatened species and other species in the community (eg. pollinators, host species, mychorrizal associations).

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?
a) disturbs any permanent, semi-permanent or ephemeral water bodies;
b) degrades soil quality;
c) clears or modifies native vegetation;
d) introduces weeds, vermin or feral species or provides conditions for them to increase and/or spread;
e) removes or disturbs key habitat features such as trees with hollows, caves and rock crevices, foraging habitat;
f) affects natural revegetation and recolonisation of existing species following disturbance; and

Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

How is the proposal likely to affect current disturbance regimes?
a) modifies the intensity and frequency of fires;
b) modifies flooding flows.

How is the proposal likely to affect habitat connectivity?
a) creates a barrier to fauna movement;
b) removes remnant vegetation or wildlife corridors;
c) modifies remnant vegetation or wildlife corridors.

How is the proposal likely to affect critical habitat?
a) removes or modifies key habitat features;
b) affects natural revegetation or recolonisation of existing species following disturbance;
c) introduces weeds, vermin or feral species
d) generates or disposes of solid, liquid or gaseous waste;
e) uses pesticides, herbicides, other chemicals.

Appendix B: Detailed Methodology for Fauna Surveys

Methods

Barking owl (Ninox connivens) Survey: Call play back

Call playback was undertaken on three consecutive nights in the study area from the 29th to the 31st August 2005 between 2000 hours and 2200 hours each night of survey. The barking owl call was played for approximately 5 minutes using a tape deck connected to a loud speaker. The call was followed by a period of 10 minutes listening and 5 minutes spotlighting around the call play back site.

A total of 6 call play back sites were used over the 3 nights of survey. The location of these sites can be seen in Figure B1.

Opportunistic surveys for barking owl along the watercourses in the study area were undertaken during the aquatic habitat assessments. A total 12 sites were surveyed and additional creek side vegetation surveyed.

Common bent-wing bat (Miniopterus schreibersii) and eastern free-tail bat (Mormopterus nofolkensis) Survey: Anabat detection and Harp Trapping

Anabat detection

An Anabat detector equipped with ZCAIM recording device was used to record resident microchiroteran bat species on 3 consecutive nights in the study area. On each night of survey the Anabat was tuned to record from 1830 hours and until collection following morning between 0630 and 0700 hours. Anabat calls were downloaded and sent to Glenn Hoye of Fly By Night Bat Surveys Pty Ltd for identification. Anabat locations are presented in Figure B2. Certainty of bat identifications are recorded confident (C), probable (P) and possible (Po).

Harp trapping

Four harp traps were set on 3 consecutive nights during the survey period. Day time reconnaissance of the study area identified potential bat flyways suitable for harp trapping. Flyways used during survey were located in bushland patches along walking or driving tracks. Harp trap locations are presented in Figure B2.

Traps were set at 1830 hours each night and cleared at 0630 hours the following morning. Traps were taken down and catch bags removed during the day. Captured bats were identified using keys in Menkhorst & Knight 2001.

Cumberland Plain land snail (Meridolum corneovirens) Survey: Litter Search

Searches for Cumberland Plain land snails were undertaken concurrently during fauna habitat assessments, on 3 consecutive days in 2005. Searches were by hand in described habitat for the species (NPWS 2000); accumulations of leaf litter and debris such as logs and disposed boards. Land snail survey locations are presented in Figure 2B.

Searches for Cumberland Plain land snails were undertaken as part of the field surveys in 2007. Searches were by hand in described habitat for the species (NPWS 2000); accumulations of leaf litter and debris such as logs and disposed boards.

Eco Logical Australia Pty Ltd Ph - (02) 8536 8600
Ecological Assessment, GIS, Environmental Management and Planning Fax - (02) 9542 5622

Green and golden bell frog (Litoria aurea) Survey
Reconnaissance of the study area identified the occurrence of suitable habitat for green and golden bell frog. A number of reed-filled bodies of water were identified and targeted for survey. Call play back and stream side census techniques were used.

Stream side census was undertaken at each suitable habitat site by listening for green and golden bell frog calls for a period of 10 minutes. Call playback was then utilised at these sites to attract response from the species. The green and golden bell frog call was played for a period of 5 minutes followed by a period of 5 minutes listening. Green and golden bell frog survey locations are presented in Figure B2.

Grey-headed flying fox (Pteropus poliocephalus) Survey
The grey-headed flying fox feeds on flowering eucalypts and is likely to utilise bushland patches in the study area during flowering time. Reconnaissance of the study area revealed that eucalypts had not yet flowered; the flying fox would therefore be unlikely to utilise the area for feeding at the time of this study. However it was considered likely that the species would fly over the study area on route to flowering trees in the local area.

Spotlight transects were performed on 3 consecutive nights of survey in conjunction with call play back for barking owl and green and golden bell frog. Opportunistic spotlighting was also undertaken while driving around the study area. A total of 5 transects were completed during the survey period. The location of spotlight transects are presented in Figure B2.

Regent honeyeater (Xanthomyza phrygia) and swift parrot (Lathamus discolour) Survey
A total of 10 diurnal bird censes were conducted within the study area over 3 consecutive days, in the morning and afternoon. The regent honeyeater and swift parrot are known to feed in flowering eucalypts; bushland patches were targeted for each census. Each census was conducted for 20 minutes and covered an area of 1 hectare.

Morning censes were undertaken between 0700hrs and 1000hrs and afternoon surveys between 1600hrs and 1800hrs. All birds identified either by sight or call recognition were recorded. The locations of bird census are presented in Figure B2.

Squirrel glider (Petaurus nofolcensis) Survey
A total of 25 'B sized' Elliott traps were used to target squirrel gliders in the study area. Each trap was mounted approximately 3 metres above the ground on larger diameter trees that either contained hollow trunks or limbs, scratch marks or sap feeding sites.

All traps were baited with 5:5:1 mixture of peanut butter: rolled oats: honey. Leaf litter was added to each trap to provide captured animals with thermal insulation. Traps were set between 4.30pm and 5.30pm each day of trapping and then cleared the following morning between 6.30 am and 8am. Traps remained closed during the middle of the day. The trunk of trees used for mounting traps were sprayed using a mixture of honey and water as an attractant. Elliott trap locations are presented in Figure B2.

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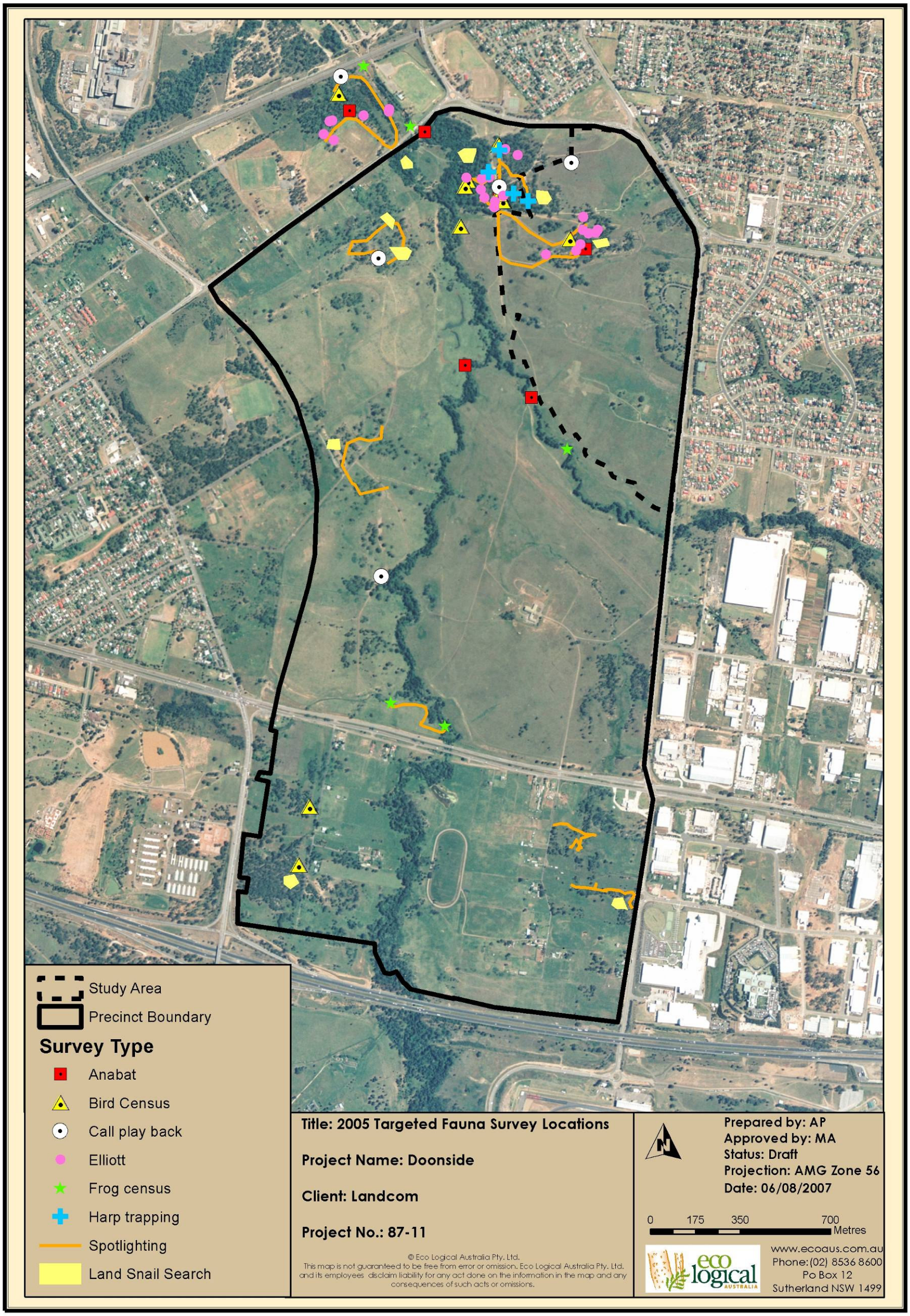
Figure B1: 2005 Target Fauna Survey



Appendix C: Draft EPBC Referral

Referral of proposed action

11.1 Project title	Doonside Residential Development

1. Contacts

1.1	*1.1.1*	*Referring party*	Person, agent or agency who is making the referral Mark Adams Planning Manager Ecological Australia Suite 604, Level 6, 267 Castlereagh St, Sydney (02) 9993 0566 marka@ecoaus.com.au
1.2	*1.1.2*	*Responsible party*	Person responsible for or who will carry out the proposed action. If same as 1.1, write 'as above' Pat Coleman Senior Development Manager Landcom PO Box 237 Parramatta NSW 2124 (02) 9842 8637 pcoleman@landcom.nsw.gov.au
1.3	*1.1.3*	*Proponent*	Person responsible for preparing assessment documentation, if approval is required. If same as 1.2, write 'as above' As Above on behalf of NSW Department of Planning

2. Summary of proposed action

NOTE: You must attach an A4 size map/plan(s) showing the location and approximate boundaries of the area in which the project is to occur. The summary below should encompass any alternative locations, timeframes or activities that are listed in Section 3.2.

2.1	*2.1.1*	*Short description*	The proposed residential development impacts on 4.57 hectares of Shale Plain Woodlands. These woodlands form part of the Cumberland Plain Woodland endangered ecological community listed under the EPBC Act.
2.2	*2.1.2*	*Latitude and longitude*	
2.3	*2.1.3*	*Locality*	The development is located western Sydney, within Blacktown City Council, in the suburb of Doonside, and adjacent to the Western Sydney Regional Parklands.
2.4	*2.1.4*	*Size of the development footprint or work area (hectares)*	The proposed residential development footprint is approximately 60ha, 85% of which is exotic grasslands.
2.5	*2.1.5*	*Street address of the site*	Corner of Doonside Road and Eastern Road, Doonside.
2.6	*2.1.6*	*Lot description*	
2.7	*2.1.7*	*Local Government Area and Council contact (if known)*	Blacktown City Council
2.8	*2.1.8*	*Project life*	Estimated start date for construction is within 5 years of project approval.

2.9	*2.1.9*	*Alternatives*	√	No
				Yes, complete section 3.2
2.10	*2.1.10*	*State assessment*		No
			√	Yes, complete Section 3.5
2.11	*2.1.11*	*Component of larger action*	√	No
				Yes, complete Section 3.6

	Latitude			Longitude		
location point	degrees	minutes	seconds	degrees	minutes	seconds

3 Detailed project description

NOTE: The proposal described here is the action(s) on which ALL subsequent decisions under the EPBC Act will be made, including decisions on significance, level of assessment (if needed) and approval (if needed). It is therefore important that the description is complete and includes all components and activities associated with the action, as well as any specific alternatives to be assessed. If certain related components are not intended to be included within the scope of the referral, this should be clearly explained in Section 3.6.

3.1 Description of proposal

Refer to Section 2 of the report '*Western Sydney Parklands, Bungarribee Precinct Project, Ecological Impact Assessment*'. Prepared for Landcom and Department of Planning, August 2007.

3.2 Alternative locations, time frames or activities that form part of the referred action

N/A

3.3 Previously considered alternatives and the 'do nothing' case

N/A

3.4 Context, planning framework and state/local government requirements

Refer to Section 2.4 of the report '*Western Sydney Parklands, Bungarribee Precinct Project, Ecological Impact Assessment*'. Prepared for Landcom and Department of Planning, August 2007.

3.5 Environmental impact assessments under Commonwealth, state or territory legislation

The Project is to be exhibited and assessed under Part 3A of the NSW *Environmental Planning and Assessment Act 1979*.

3.6 A staged development or component of a larger project

NOTE: The Minister for the Environment and Water Resources may not accept a referred action that is a component of a larger action and may request the person proposing to take the action to refer the larger action for consideration under the EPBC Act (Section 74A, EPBC Act).

If you wish to make a referral for a staged or component referral, read 'Fact Sheet 6 Staged Developments/Split Referrals' and contact the EPBC Act Referrals Section (1800 803 772).

N/A

4 Affected environment

NOTE: You must attach a map(s)/plan(s) clearly showing the location of the action in relation to any matters of national environmental significance

Please refer to **Figures 1-13** in the attached report '*Western Sydney Parklands, Bungarribee Precinct Project, Ecological Impact Assessment'*. Prepared for Landcom and Department of Planning, August 2007.

4.1 Matters of national environmental significance

4.1 (a) World Heritage Properties

Nil

4.1 (b) National Heritage Places

Nil

4.1 (c) Wetlands of International Significance (Ramsar)

Nil

4.1 (d) Listed threatened species and ecological communities

Cumberland Plain Woodlands Endangered Ecological Community.

4.1 (e) Listed migratory species

Nil

.1 (f) Nuclear actions

Nil

4.1 (g) Commonwealth marine areas

Nil

4.2 Important or unique aspects of the environment, if relevant

4.2 (a) Soil and vegetation characteristics

Please refer to **Section 4** of the report '*Western Sydney Parklands, Bungarribee Precinct Project, Ecological Impact Assessment'*. Prepared for Landcom and Department of Planning, August 2007.

4.2 (b) Water flows, including rivers, creeks and impoundments

Please refer to **Section 4.5** of the report '*Western Sydney Parklands, Bungarribee Precinct Project, Ecological Impact Assessment'*. Prepared for Landcom and Department of Planning, August 2007.

4.2 (c) Outstanding natural features, including caves

Please refer to **Section 4** of the report *`Western Sydney Parklands, Bungarribee Precinct Project, Ecological Impact Assessment'*. Prepared for Landcom and Department of Planning, August 2007.

4.2 (d) Gradient

The site is generally undulating and intersected with ephemeral creeks.

4.2 (e) Buildings or other infrastructure

Previous telecommunications towers and rural buildings including Bungarribee Homestead of state heritage significance.

4.2 (f) Marine areas

Nil

4.2 (g) Kinds of fauna

Please refer to **Section 4.3** of the report *`Western Sydney Parklands, Bungarribee Precinct Project, Ecological Impact Assessment'*. Prepared for Landcom and Department of Planning, August 2007.

4.2 (h) Current state of the environment

Please refer to **Section 4.6** of the report *`Western Sydney Parklands, Bungarribee Precinct Project, Ecological Impact Assessment'*. Prepared for Landcom and Department of Planning, August 2007.

4.2 (i) Commonwealth Heritage Places and places on the Register of the National Estate

Nil

4.2 (j) Known Indigenous heritage values

Yes, however is covered in separate reports addressing requirements under Part 3A of the *Environmental Planning and Assessment Act 1979* and the NSW *National Parks and Wildlife Act 1974*.

4.2 (k) Other important or unique values of the environment

4.2 (l) Tenure of the action area (eg freehold, leasehold)

NSW Crown Land owned by the NSW Department of Planning.

4.2 (m) Existing land uses

Previous Agricultural and telecommunication uses. The land is currently vacant.

4.2 (n) Proposed land uses

Residential.

5 Nature and extent of likely impacts

5.1 Likely impacts on matters of national environmental significance (NES)

5.1 (a) Likely impact on the world heritage values of a declared World Heritage property

Nil

5.1 (b) Likely impact on the heritage values of a listed National Heritage place

Nil

5.1 (c) Likely impact on the ecological character of a declared Ramsar wetland

Nil

5.1 (d) Likely impact on the members of a listed threatened species or ecological community,
or their habitat

Please refer to **Section 5** of the report *'Western Sydney Parklands, Bungarribee Precinct Project, Ecological Impact Assessment'*. Prepared for Landcom and Department of Planning, August 2007.

5.1 (e) Likely impact on the members of a listed migratory species or their habitat

Nil

5.1 (f) Likely impact on the environment in part of the Commonwealth marine area

Nil

5.2 Likely impacts for nuclear actions, actions affecting Commonwealth land or actions taken by the Commonwealth

Nil

6 Measures to avoid or reduce impacts

Please refer to **Sections 7, 8 and 9** of the report '*Western Sydney Parklands, Bungarribee Precinct Project, Ecological Impact Assessment'*. Prepared for Landcom and Department of Planning, August 2007.

7 Conclusion on the likelihood of significant impacts

NOTE: Under the EPBC Act, you must identify in the referral whether or not you believe significant impacts on the matters protected under the Act are likely. If you identify that significant impacts are likely, you must identify the relevant protected matters in section 7.2.

Do you THINK your proposed action is likely to have significant impacts?

	No, complete section 7.1
√	Yes, complete Section 7.2

7.1 Proposed action is NOT LIKELY to have significant impacts

Key reasons

7.2 Proposed action is LIKELY to have significant impacts

Matters likely to be impacted

	sections 12 and 15A (World Heritage)
	sections 15B and 15C (National Heritage places)
	sections 16 and 17B (Wetlands of international importance)
√	sections 18 and 18A (Listed threatened species and communities)
	sections 20 and 20A (Listed migratory species)
	sections 21 and 22A (Protection of the environment from nuclear actions)
	sections 23 and 24A (Marine environment)
	sections 26 and 27A (Protection of the environment from actions involving Commonwealth land)
	section 28 (Protection of the environment from Commonwealth actions)

Key reasons

Clearing of 4.5 hectares of Cumberland Plain Woodland and associated threatened species habitat.

8 Assessment approach under the EPBC Act

NOTE: If a decision is made that a proposal needs approval under the Act, the Minister will also decide the assessment approach needed to satisfy the objectives of the Act. While the information you have provided in this referral will be taken into account in making this decision, the final decision rests with the Minister.

Level of assessment

√	Bilateral Agreement applies
	Accredited assessment
	Assessment on referral information
	Preliminary information
	Public Environment Report
	Environmental Impact Statement
	Commission of Inquiry
	No comment/Not sure

Key reasons

The proposal is being exhibited and assessed under Part 3A of the NSW *Environmental Planning and Assessment Act 1979*.

9. Environmental history of the responsible party

NOTE: The EPBC Act Regulations provide for the environmental history of the party proposing to take the action to be taken into account when deciding the assessment approach for actions that need approval under the Act.

		Yes	No
9.1	Does the party taking the action have a satisfactory record of responsible environmental management. • If Yes, provide details See http://www.landcom.com.au/environment.aspx	√	
9.2	Is the party taking the action subject to any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources? • If Yes, provide details		√
9.3	For an action for which a person has applied for a permit under the EPBC Act, is the person making the application subject to any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources? • If Yes, provide details		√
9.4	If the party taking the action is a corporation, will the action be taken in accordance with the corporation's environmental policy and planning framework? • If Yes, provide details of environmental policy and planning framework See http://www.landcom.com.au/environment.aspx	√	

10 Information sources and attachments

10.1 References

Please refer to **Section 11** of the report '*Western Sydney Parklands, Bungarribee Precinct Project, Ecological Impact Assessment'*. Prepared for Landcom and Department of Planning, August 2007.

10.2 Reliability of information

Please refer to **Section 3** of the report '*Western Sydney Parklands, Bungarribee Precinct Project, Ecological Impact Assessment'*. Prepared for Landcom and Department of Planning, August 2007.

10.3 Attachments

You must attach	figures, maps or aerial photographs showing the project locality (section 2)	√
	figures, maps or aerial photographs showing the location of the project in respect to any matters of national environmental significance or important features of the environments (section 4)	√
If relevant, attach	copies of any state or local government approvals and consent conditions (section 3.4)	
	copies of any completed assessments to meet state or local government approvals and outcomes of public consultations, if available (section 3.5)	√
	copies of any flora and fauna investigations and surveys (section 4)	√
	technical reports relevant to the assessment of impacts on protected matters and that support the arguments and conclusions in the referral (section 4 and 5)	√
	report(s) on any public consultations undertaken, including with Indigenous Stakeholders (section 4)	

11 Signatures and declarations

NOTE: Providing false or misleading information is an offence punishable on conviction by imprisonment and fine (Section 489, EPBC Act).

2.2 Project title

11.1 *Party who prepared the referral*

I declare that the information contained in this form is, to my knowledge, true and not misleading. I request that the person named in 11.3 below (if any) be designated as the proponent for the action.

Signature

Date

Full name

11.2 *Party who is responsible for action*

I declare that the information contained in this form is, to my knowledge, true and not misleading.

Signature

Date

Full name

11.3 *Proponent (complete only if different from 11.2)*

I, being the person nominated in Section 1.3 of this referral form as the nominated proponent (or agent acting on behalf of), agree to be designated as the proponent for the action described above if it is decided that the action requires approval under Part 9 of the EPBC Act.

Signature

Date

Full Name

If the referring party is a small business (fewer than 20 employees), estimate the time, in hours and minutes, to complete this form (include your time reading the instructions, working on the questions and obtaining the information and time spent by all employees in collecting and providing this information).

Hours	Minutes

Appendix D: Species list for attempted recreation at Doonside

Includes species for both Shale Plain and Alluvial Woodlands

Acacia decurrens
Acacia falcata
Acacia fimbriata
Acacia implexa
Acacia parramattensis
Acacia ulicifolia
Ajuga asutralis
Alternanthera denticulata
Angophora floribunda
Angophora subvelutina
Aristida racemosa
Aristida vagans
Arthropodium milleflorum
Asperula conferta
Atriplex semibaccata
Austrodanthonia fulva
Austrodanthonia monticola
Austrodanthonia racemosa
Austrodanthonia tenuior
Bothriochloa macra
Brunoniella australis
Bulbine bulbosa
Bursaria spinosa
Calotis hispidula
Calotis lappulacea
Capillipedium parviflorum
Carex appressa
Casuarina glauca
Centella asiatica
Cheilanthes sieberi
Chloris truncata
Chloris ventricosa
Chrysocephalum apiculatum
Chrysocephalum semipapposum
Clematis aristata
Clematis glycinoides
Clerodendrum tomentosum
Commelina cyanea
Cymbopogon refractus
Daviesia genistifolia
Daviesia ulicifolia
Desmodium rhytidophyllum
Desmodium varians
Dianella caerulea
Dianella longifolia
Dianella revoluta
Dichelachne micrantha
Dichopogon fimbriatus
Dillwynia sieberi
Dodonaea viscosa ssp. cuneata
Echinopogon caespitosus
Echinopogon ovata
Einadia hastata
Einadia polygonoides
Einadia trigonos
Elymus scaber
Entolasia marginata
Eragrostis brownii
Eragrostis leptostachya
eucalyptus amplifolia
Eucalyptus baueriana
Eucalyptus eugenioides
Eucalyptus moluccana
Eucalyptus tereticornis
Glossygyne tannensis
Glycine sp.
Goodenia hederacea
Goodenia ovata
Grevillea juniperina
Hardenbergia violacea
Hypericum gramineum
Indigofera australis
Juncus usitatus
Lachnagrostis sp.
Lagenifera stipata
Laxmannia gracilis
Linum marginale
Lissanthe strigosa
Melaleuca linearifolia
Melaleuca styphelioides
Microlaena stipoides
Myoporum debile
Oplismenus aemulus
Oplismenus imbecillis
Ozothamnus diosmifolium
Paspalidium radiatum
Pelargonium australe
Persicaria decipiens
Plantago gaudichaudii
Plectranthus parviflorus
Poa labillardieri
Polygala japonica
Pratia purpurescens
Pseudognaphalium sp.
Rubus parvifolius
Sida corrugata
Sida sp.
Solenogyne bellioides var bellioides
Stackhousia viminea
Themeda australis
Tricoryne elatior
Vittadinia cuneata
Vittadinia pustulata
Wahlenbergia gracilis
Wahlenbergia stricta
Wurmbea dioica
Zornia dyctiocarpa