708 MAMRE ROAD, KEMPS CREEK

Flora and Fauna Assessment

For:

LOGOS PROPERTY

August 2010

Final Report

Cumberland Ecology
PO Box 2474, Carlingford Court 2118

Report No. 10039RP1

The preparation of this report has been in accordance with the brief provided by the Client and has relied upon the data and results collected at or under the times and conditions specified in the report. All findings, conclusions or recommendations contained within the report are based only on the aforementioned circumstances. The report has been prepared for use by the Client and no responsibility for its use by other parties is accepted by Cumberland Ecology

Approved by:	David Robertson
Position:	Project Director
Signed:	
Date:	*13 August, 2010*

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PURPOSE

LOGOS Property and PJEP Environmental Planning are preparing a Concept Plan and project application for the development of a 52 hectare site at Kemps Creek, NSW. The Concept Plan, referred to as 'LOGOS Estate', includes the development of Lot 1 DP104958.

Cumberland Ecology has been engaged by LOGOS Property to undertake a flora and fauna assessment for the proposed LOGOS Kemps Creek Logistics Project. This plan is considered with respect to potential impacts to ecological values of the subject site and the surrounding areas (hereafter referred to collectively as the "study area").

BACKGROUND

A proposal and concept masterplan has been prepared for the future redevelopment of the subject site. The masterplan design for the subject site is to provide a logistics campus. The development will include 9 buildings and car parks as well as the widening of Bakers Lane. Parts of the site will be landscaped. This includes landscape setback along the perimeter of the site and landscaping a strip through the middle of the site. In accordance with Section 75D of the EP&A Act, Ministerial Approval will be sought for carrying out the project under Part 3A of the Act.

The subject site is approximately 52 hectares in size and located within the Penrith LGA. It is located on the corner of Mamre Road and Bakers Lane, Kemps Creek adjacent to the Western Sydney Employment Area. The privately owned land occurs on a part of the Cumberland Plain in western Sydney. The Cumberland Plain has experienced extensive clearance of native vegetation for agriculture and urban and industrial development. Remnant and re-growth patches of woodland still occur as mosaics across the landscapes. These include threatened vegetation communities that are listed as critically endangered under the TSC Act and the EPBC Act. Such native woodland vegetation can also potentially support threatened and regionally significant flora and fauna species.

METHODS

The Atlas of NSW Wildlife (DECCW, 2010) and the EPBC Protected Matters search tool (DEWHA, 2010) were used to provide a list of threatened flora and fauna species in the locality of the subject site.

Flora surveys were undertaken on the subject site. Inspections were made of the vegetation on the subject site on 8th June 2010. Flora surveys consisted of completing 9 quadrats, 1 transect and a random meander through the remaining areas. Quadrat data was used to assess conformity with the EPBC Act, TSC Act and Tozer (2003). The value of Threatened Ecological Communities recorded on site was also considered with assessments described by the Growth Centres Commission (2007).

Fauna surveys included a targeted Cumberland Land Snail search, opportunistic fauna sightings and habitat assessments. Habitat assessments were carried out for specific habitat requirements of threatened fauna species known to occur in the locality of the study area based on database search results.

RESULTS

No threatened flora listed under the EPBC and TSC Acts were identified on the subject site or considered likely to occur.

Four vegetation communities were identified on the subject site which include;

- Grasslands – exotic pastures grasses and degraded derived native grasslands
- Degraded Cumberland Plain Woodland (EPBC and TSC Act listed);
- Stands of *Casuarina glauca*; and
- Wetland Vegetation.

Wildlife Atlas database searches identified the following state listed Vulnerable bats within a 10 km radius of the subject site:

- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*);
- Eastern Freetail-bat (*Mormopterus norfolkensis*);
- Grey-headed Flying-fox (*Pteropus poliocephalus);*
- Greater Broad-nosed Bat (*Scoteanax rueppellii*);
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*); and
- Large-footed Myotis (*Myotis macropus*);

The bats identified from database searches were all of low abundance. None of these bats were considered likely to utilise the subject site for roost or forage habitat because of the extent of clearing (approximately 97% cleared) and lack of suitable habitat.

No other threatened fauna species listed under the EPBC and TSC Acts were identified on the subject site.

IMPACTS OF THE PROPOSAL

A substantial amount of re-profiling will be required to accommodate the design of the buildings and as a result all vegetation on site is proposed for removal. The areas of vegetation proposed for removal include:

- Approximately 15 scattered hollow bearing trees;
- Three small patches of Cumberland Plain Woodland (totalling 1.12 ha) meeting Lower Long Term Management Viability (Growth Centres Commission 2007). No significant impact is likely to occur to Cumberland Plain Woodland community due to their degraded and non viable nature and small size;
    - Patches 1 (0.33 ha) and Patch 2 (0.08 ha) which conform to the state listing. These patches are highly degraded with approximately 50% weed cover in the ground stratum.
    - Patch 3 (0.71 ha) conforms to both the state and commonwealth CPW listings. This is also degraded with approximately 57% weed cover in the ground stratum.
- The entire area of grasslands which comprises of mainly exotic pastures (40.39 ha) and degraded derived native grassland (9.22 ha). No significant impact is likely to occur to derived native grasslands. The derived native grasslands have low native species diversity and does not resemble CPW without a canopy. Its unlikely to recover from its current state.
- Two small stands of *Casuarina glauca* (0.27 ha) will be removed from the subject site. The vegetation in this patch is in poor condition with an average of 90% weed cover in the ground stratum. No significant impact is likely to occur to this vegetation community as a result of the proposal due to its poor condition; and
- All dams will be drained and the associated wetland vegetation will be removed. No significant impact is likely to occur as a result of the proposal.

MITIGATION MEASURES

Impacts to vegetation are unavoidable as the entire site is proposed to be cleared, which therefore requires impacts to be minimised. Currently the site is quite hilly and re-profiling will need to make way for building pads.

The following measures will minimise and mitigate impacts from the development:

- Implementing an erosion and sediment control plan to ensure that run-off does not seep into the adjacent vegetation and alter the hydrology or biochemical status of the soil;
- Implementing a tree removal protocol which will include:
  - pre-clearance fauna surveys (by a qualified fauna ecologist) to check for any nesting or roosting fauna and move to adjacent habitat;
  - Removal of trees will occur progressively.
- Re-use tree hollows in landscaping setbacks for terrestrial habitat;

Compensation will consist of replanting landscape setbacks with native species of the Cumberland Plain Woodland community which once occurred naturally across the site. This area will cover approximately 4.48 ha. Approximately 0.87 ha of wetland habitat will be constructed in the forms of stormwater detention ponds. These ponds will be revegetated with local native wetland species.

Chapter 1

Introduction

1.1 Purpose

LOGOS Property and PJEP Environmental Planning are preparing a Concept Plan and project application for the development of a 52 hectare site at Kemps Creek, NSW. The Concept Plan, referred to as 'LOGOS Estate' (see **Appendix A**), would entail the development of Lot 1 DP104958.

Cumberland Ecology has been engaged by LOGOS Property to undertake a flora and fauna assessment for the LOGOS Kemps Creek Logistics Project. This report is considered with respect to potential impacts to ecological values of the subject site and the surrounding areas (hereafter referred to collectively as the "study area").

Threatened woodland communities and the ecological values associated with them form primary constraints when planning future developments in western Sydney. Within this report such values have been considered by:

- Mapping the nature, extent and quality of native vegetation and other fauna habitats across the subject site; and
- Assessing the conservation values of such flora and fauna habitats and the potential for long term conservation on site.

The objectives of the assessment include:

- To survey flora species and describe vegetation communities on the subject site Lot 1 DP 104958;
- To conduct opportunistic fauna observations and describe fauna habitats on the subject site;
- To assess the likelihood that threatened species of flora and fauna could occur on the subject site;
- To consider potential impacts of the LOGOS Kemps Creek Logistics Project on threatened flora, fauna and vegetation communities; and

- Where relevant, to recommend compensatory and mitigation measures to reduce the impacts of industrial development on flora and fauna.

1.2 Terms and abbreviations

This report uses the following terminology:

- **Activity** as defined in the EP&A Act;
- **DECCW** abbreviates Department of Environment and Climate Change and Water (NSW) (formerly Department of Environment, Conservation and Climate Change);
- **Development** as defined in the EP&A Act;
- **EP&A Act** abbreviates the *Environmental Planning and Assessment Act 1979*;
- **EPBC Act** abbreviates the *Environment Protection and Biodiversity Conservation Act 1999;*
- **LGA** abbreviates Local Government Area;
- **Locality** is the area within a 10 km radius of the subject site;
- **Proposal** is the development, activity or action proposed;
- **Study area** is the subject site and any additional areas that are likely to be affected by the proposal, either directly or indirectly.
- **Subject land** is the area within property Lot 1 DP 104958;
- **Subject site** means the area of the property upon which works are proposed. In this case the entire lot is being cleared. Therefore the subject site is the same as the subject land;
- **Threatened species** means those species listed as threatened under the EPBC Act, the TSC Act; and
- **TSC Act** abbreviates the *Threatened Species Conservation Act 1995.*

1.3 Background

1.3.1 The Subject Site (LOGOS Estate)

The subject site is approximately 52 hectares in size and located within the Penrith LGA. It is located on the corner of Mamre Road and Bakers Lane, Kemps Creek adjacent to the

Western Sydney Employment Area (**Figure 1.1**). The privately owned land occurs on a part of the Cumberland Plain in western Sydney. The Cumberland Plain has experienced extensive clearance of native vegetation for agriculture and urban and industrial development. Remnant and re-growth patches of woodland still occur as mosaics across the landscapes. These include threatened vegetation communities that are listed as critically endangered under the TSC Act and the EPBC Act. Such native woodland vegetation can also potentially support threatened and regionally significant flora and fauna species.

Due to a long history of land use since European settlement the subject site is largely cleared. The subject site consists of predominantly cattle pastures together with an existing dwelling, several farm dams and scattered remnant canopy trees. Native vegetation occurs as small scattered isolated patches throughout the property. The remaining lands have received modification with the construction of various sized dams and the clearing of vegetation for pastures.

1.3.2 Proposed Development

A proposal and concept masterplan (**Appendix A**) has been prepared for the future redevelopment of the subject site. The masterplan design for the subject site is to provide a logistics campus. The development will include 9 buildings and car parks as well as the widening of Bakers Lane. Parts of the site will be landscaped. This includes landscape setback along the perimeter of the site and landscaping a strip through the middle of the site. In accordance with Section 75D of the EP&A Act, Ministerial Approval will be sought for carrying out the project under Part 3A of the Act.

The proposal will result in the clearing of patches of native vegetation and scattered canopy trees, draining and filling of farm dams which are described in more detail within Chapter 4 of this report.

Coordinate System: MGA Zone 56 (GDA 94)

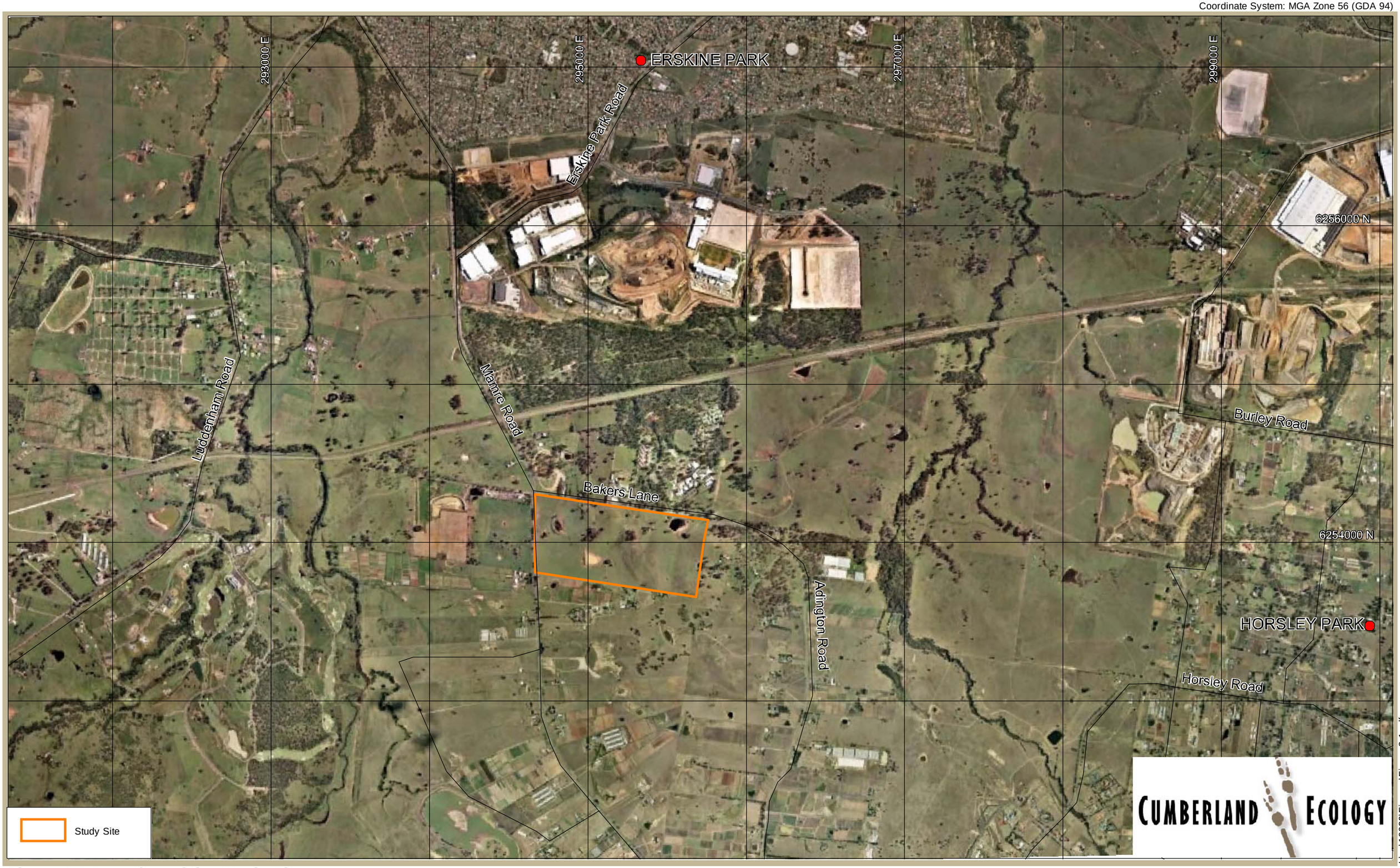

Figure 1.1 Location of the Study Site

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1.4 Relevant Legislation and Planning Considerations

Ecological assessments were made with due reference to:

- Threatened species legislation (the TSC Act and the EPBC Act);
- Local planning documents for Penrith City Councils (Penrith City Council 2006);
- The *Revised Biodiversity Management Plan Erskine Park Employment Area: 2007* (HLA-Envirosciences 2007); and
- The *Penrith Biodiversity Strategy* (Penrith City Council 2004).

These are considered in more detail below.

1.4.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act protects the environment, particularly matters of National Environmental Significance. It is managed by the Commonwealth Department of Environment, Water, Heritage and the Arts (DEWHA). There are eight matters of national environmental significance under the EPBC Act:

- World Heritage properties;
- National Heritage places;
- Wetlands of international importance (Ramsar Wetlands);
- Listed threatened species and ecological communities;
- Listed migratory species;
- The Commonwealth marine area; and
- Nuclear actions, including uranium mining.

Species listed under the EPBC Act are known to occur in the Penrith LGA, and may occur in the study area.

1.4.2 Threatened Species Conservation Act 1995

The TSC Act outlines the protection of threatened species, communities and critical habitat in New South Wales. Objectives of this Act include:

- To conserve biological diversity and promote ecologically sustainable development; and
- To encourage the conservation of threatened species, populations and ecological communities by the adoption of measures involving co-operative management.

The TSC Act also manages priority actions which set out the strategies to be adopted for promoting the recovery of each threatened species, population and ecological community, as well as key threatening processes which threaten native species.

A number of species listed under the TSC Act are known to occur in the Penrith LGA, and may occur in the study area.

1.4.3 Local Planning Documents

The local planning documents for Penrith City Council provide the protection of aquatic vegetation, fauna and ecology and natural water bodies and avoidance of adverse effects on flood-liable land.

Chapter 2

Methodology

2.1 Literature Review

The Atlas of NSW Wildlife (DECCW, 2010) and the EPBC Protected Matters search tool (DEWHA, 2010) were used to provide a list of threatened flora and fauna species in the locality of the subject site. As a reference a full list of flora species recorded in the locality is provided in **Table C.3** in **Appendix C**.

2.2 Flora Surveys

Flora surveys were undertaken on the subject site as described below. Inspections were made of the vegetation on the subject site on 8th June 2010. Flora surveys consisted of completing 9 quadrats, 1 transect and a random meander through the remaining areas.

2.2.1 Quadrat Surveys

Nine (20mx20m) quadrats were surveyed across the subject site. Quadrats were located in remnant patches of vegetation and grassy areas. This enabled a better representation of the site's varying floristics resulting from changes in microclimate and land use. Quadrat locations are illustrated in **Figure 2.1.** All vascular plant species were recorded in each quadrat. A cover abundance score was given to each species recorded in each quadrat according to a modified Braun-Blanquet method (Braun-Blanquet, 1927) as shown below::

- 1 = rare;
- 2 = occasional;
- 3 = common but less than 5% cover;
- 4 = very common but less than 5% cover;
- 5 = 5-25% cover;
- 6 = 26-50% cover; and

- 7 = 50-75% cover
- 8 = 76%-100% cover

The data collected from each of the quadrats was used to assist in describing the vegetation communities on the subject site

The potential conservation significance of plant communities and species was based on the EPBC Act, TSC Act Schedules and Tozer (2003) and the Conservation Plan for the Western Sydney Growth Centres (Growth Centres Commission, 2007). The potential significance was also considered within the context of the subject site and study area to obtain a value that more accurately reflects the likely contribution to conservation of the community or species generally.

The NSW Scientific Committee's final determination for the Critically Endangered Ecological Community (CEEC) Cumberland Plain Woodland (CPW) includes 'derived' native grasslands. In a derived grassland form either or both the upper-storey and mid-storey may be absent; however, the groundcover layer must be intact and retain its characteristic native biodiversity components (Threatened Species Scientific Committee , 2008). Originally, in order for a patch of vegetation to qualify as CPW under Tozer's (2003) approach, a quadrat is expected to contain 15 positive diagnostic species provided the total number of native species equals 28 or greater. Similarly, a list of characteristic species prepared by the NSW Scientific Committee is used as a guide to whether vegetation conforms to the state listing.

To assess the potential presence of CPW in a derived native grassland form, a modification of Tozer's (2003) approach was also used. To assess the presence of derived native grassland, tree and shrub species were not included in the above mentioned ratio of 15:28. Characteristic tree and shrub species listed in Tozer (2003) (which total 6 species) were removed from both the diagnostic species list and total number of native species This resulted in a ratio of 9:22 diagnostic to native groundcover species as a guide for assessing derived native grassland.

2.2.2 Targeted Threatened Flora Searches

No targeted threatened flora searches were warranted as no threatened flora species were considered likely to occur considering the extent of vegetation clearing and the presence of cattle. This is summarised in **Table 3.1** of **Chapter 3**.

2.2.3 Transect Survey

The Bakers Lane road reserve which borders the subject site was traversed from end to end. All species were recorded within the road reserve and are tabulated in **Appendix B Table B.1**.

2.2.4 Aquatic vegetation surveys

Aquatic vegetation in and around the water bodies (farm dams) on the subject site was also recorded and is provided in **Appendix B Table B.2.**

Coordinate System: MGA Zone 56 (GDA 94)

294600 E
295000 E
295400 E
295800 E
6254200 N
6253800 N
Grid North
BAKERS LANE
MAMRE ROAD
T1
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Q1
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Q6
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Q8
Q9
D1
D2
D3
D4
D5
D6
Site Boundary
Dams
Tree hollows
Quadrat locations
Transect Survey
CUMBERLAND ECOLOGY
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Figure 2.1 Flora survey, Tree hollow and Dam locations

2.3 Fauna Assessment

Due to the overall poor condition of the site and the time of year, fauna surveys were limited to opportunistic fauna sightings and habitat assessments.

Opportunistic sightings of fauna species were recorded during visits to the site on 8th June 2010. Targeted searches were carried out for the endangered Cumberland Plain Land Snail (*Meridolum corneovirens*) as described below in **Section 2.3.1**. General surveys for other fauna species and habitat assessments were carried out as described in **Section 2.3.2**.

2.3.1 Cumberland Plain Land Snail Searches

Targeted searches for the endangered (listed under the TSC Act) Cumberland Plain Land Snail (*Meridolum corneovirens*) were carried out in daylight hours during the site visit on the 8th, June 2010. These searches were restricted to areas of suitable habitat for the species, i.e. at the base of canopy trees characteristic of Cumberland Plain Woodland ecological community (*Eucalyptus tereticornis* and *Eucalyptus moluccana*).

2.3.2 Habitat Assessment

The nature and extent of fauna habitats on the subject site were assessed and areas where threatened fauna species could reside or forage were identified, including making a note of food tree species and hollow bearing trees. Site assessments included consideration of important indicators of habitat condition and complexity including the occurrence of microhabitats such as tree hollows, fallen logs, bush rock and wetland areas such as dams and soaks. An assessment of the structural complexity of vegetation, the age structure of the forest and the nature and extent of human disturbance throughout the study area was also undertaken into consideration. Structural features were considered and included the nature and extent of the understorey and ground stratum, extent of canopy and flowering characteristics.

Hollows were used as a general indication of habitat quality for arboreal fauna, and hollow dwelling birds and bats. Hollows observed during surveys were recorded (**Figure 2.1**).

2.4 Limitations

At the time of the flora survey weather conditions were dry and sunny. Although the survey was conducted in winter there was sufficient favourable plant growth and production of features required for identification of most plant species.

Due to the flora surveys relying on one inspection of the subject site, it was not possible to record all species present. Despite this, it is probable that the vast majority of species

have been recorded and that issues including conservation significance of the flora, condition and viability of remnant vegetation and likely impact on native vegetation have been satisfactorily assessed.

Chapter 3

Results

3.1 Flora Surveys

3.1.1 Vegetation Mapping

Previous native vegetation mapping by NSW NPWS (2002) of the Cumberland Plain identified two variations of Cumberland Plain Woodland on the subject site; Shale Hills Woodland and Shale Plains Woodland. The subject site contains three small isolated patches of Shale Hills Woodland and one small patch of Shale Plains Woodland all with a canopy cover of less than 10%. This community is listed as a CEEC under the TSC Act and EPBC Act. The NSW Scientific Committee's final determination (NSW Scientific Committee, 2009) of this community includes derived native grasslands (DNG) which are areas of intact grassland cleared of Cumberland Woodland canopy.

The mapping completed in 2002 has since been updated. Interestingly, the most recent vegetation mapping of the Cumberland Plain (NSW Scientific Committee & C. C. Simpson, 2008) did not map any vegetation on the subject site.

3.1.2 Vegetation Communities

Originally, Cumberland Plain Woodland (CPW) would have occurred across the site. The subject site has been historically cleared for farming and agricultural purposes. Currently the land contains small stands of *Casusrina glauca*, three patches of CPW, pasture grasses, scattered old growth paddock trees, and wetland vegetation surrounding the farm dams.

i. Grasslands

Areas of potential Derived Native Grassland (DNG) occur on the subject site (see **Figure 3.1**). These areas all exhibit low native species diversity and varied condition.

The areas of grassland which portrayed the highest quality and native species diversity were identified in quadrats 4 and 5 (refer to **Figure 2.1**) which were considerably drier and elevated in relation to the other exotic grassland plots. These areas consisted of approximately 50% weed cover namely, *Paspalum dilatatum* and *Briza subaristata.* An

assessment against the NSW final determination for CPW highlighted a total of 6 characteristic species occurring which consisted of the predominantly abundant *Themeda australis*. An assessment against the modified Tozer (2003) approach (described in **Section 2.2.1**) revealed 5 diagnostic species to a total of 6 native species. These areas were not considered DNG under the TSC Act therefore due to a lack of diversity and poor condition.

Other grassland areas were dominated by exotic pasture grasses with some plots recording as little as 2 and 3 native characteristic species. These areas generally recorded a presence of 6 or more weed species and a percentage of greater than 50% weed cover.

Native herbaceous species were uncommon within the grasslands and occurred more frequently in low abundance in the isolated patches of remnant woodland.

ii. Cumberland Plain Woodland

Three remnant patches of Cumberland Plain Woodland were recorded across the subject site. These isolated patches are highly degraded from continual cattle access and fragmented by pasture grasses (see **Figure 1.1** and **Photograph 3.1** below). All patches of CPW were missing a native shrub and small tree stratum except for the occasional *Lycium ferocissimum*. These patches of CPW looked to provide shelter for cattle and are likely used as cattle camps. As previously mentioned herbaceous groundcovers were more common within remnant CPW vegetation relative to the grasslands. Canopy trees were generally a monoculture of *Eucalyptus moluccana* or *Eucalyptus tereticornis*. *Eucalyptus tereticornis* is recruiting in and around Quadrat 2 and west of Dam 5 in lower lying wetter areas (**Figure 2.1**).

a. Patches 1 and 2

Patch 1 (quadrat 1) and Patch 2 (quadrat 2) were too small to be considered under the EPBC Act with an approximate size of 0.33 hectares for Patch 1 and 0.08 hectares for Patch 2.

These two patches recorded an average of 11 characteristic species under the NSW Scientific Committee's Final Determination for the community. With reference to Tozer (2003) the two quadrats averaged a ratio of 10 diagnostic species from a total of 15 native species. Groundcovers consisted of both grasses and herbaceous species. Approximately 50% weed cover was recorded in these two patches of CPW. These two patches, although small and degraded, conform to a low quality form of CPW under the TSC Act.

When considered against the assessment described by Growth Centres Commission (2007) Patches 1 and 2 meet classification as LMV due to their small size (< 4 ha), fragmented landscape and degree of surrounding threats.

b. Patch 3

Patch 3 (quadrat 9) measures approximately 0.71 ha and has a canopy cover of approximately 10%. Approximately 6 hollows, which are considered scarce on the Cumberland Plain, were recorded within the patch.

EPBC Act condition thresholds for patches of CPW with hollows allows for a 30% or greater perennial native understorey vegetation cover in patches >0.5 ha. The understorey vegetation was calculated at approximately 43% native cover. Therefore Patch 3 conforms to the EPBC Act definition of CPW.

Twelve characteristic species listed in the NSW Scientific Committee's Final Determination were recorded within quadrat 9. This patch of CPW meets the requirements for classification under the TSC Act.

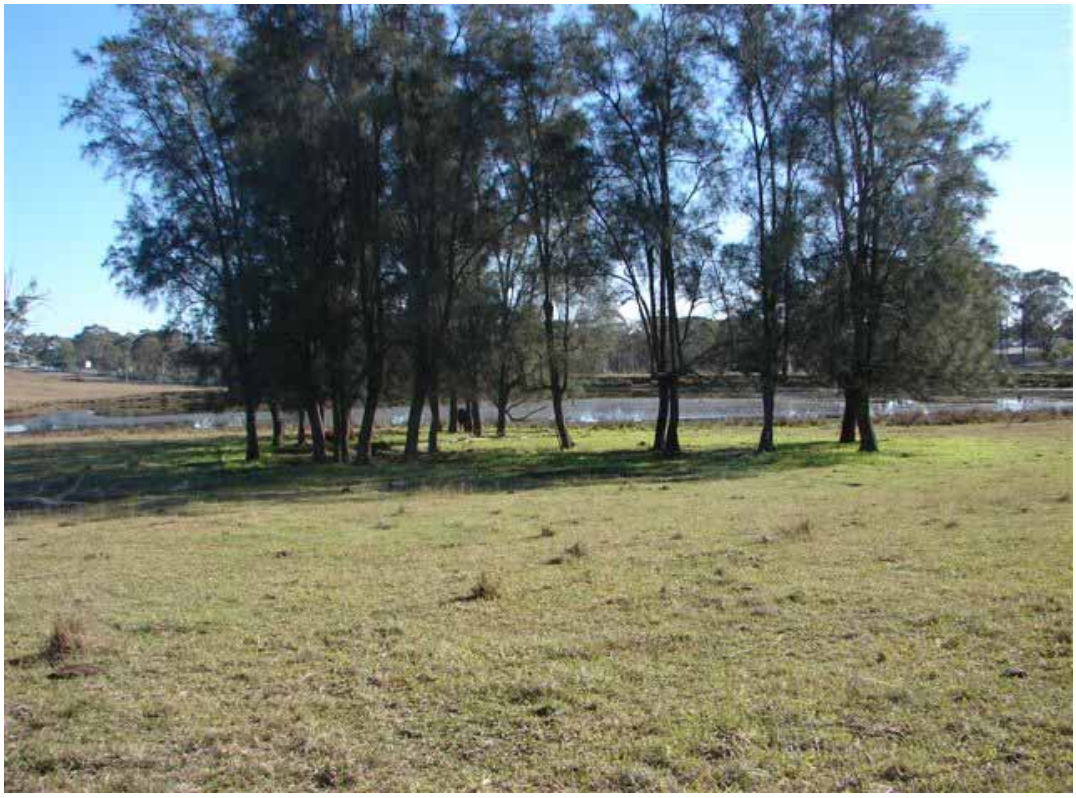
When considered against the assessment described by Growth Centres Commission (2007) Patch 3 meets classification under the LMV due to their small size (< 4 ha), fragmented landscape and degree of surrounding threats.

Appendix B, Table B.1 provides a list all species recorded within each quadrat and assessments against state and commonwealth legislation.

Photograph 3.1 **Patch 3 (Quadrat 9) Cumberland Plain Woodland (EPBC and TSC)**

iii. Casuarina glauca Stands

Two stands of *Casuarina glauca* (Swamp Oak) were identified on the subject site. These areas are heavily degraded from constant cattle access. The canopy consists solely of *Casuarina glauca*. There was no shrub or small tree stratum present. The ground covers were heavily dominated by exotic pasture grass species (>90%) including *Ehrharta erecta, Pennisetum clandestinum, Paspalum dilatatum* and *Malva parviflora.*



Photograph 3.2 **Patch of *Casuarina glauca* (Swamp Oak) on the subject site. Note the presence of cattle.**

iv. Wetland Vegetation

Six farm dams varying in size (**Figure 2.1)** are scattered throughout the subject site which provides habitat for a small number of aquatic vegetation.

Wetland species recorded in and around the farm dams on the property include: *Typha orientalis* (Cumbungi), *Eleocharis sphacelata, Marsilea mutica* (Nardoo), *Ludwigia*

peploides (Water Primrose), *Ottelia ovalifolia* (Swamp Lily), *Vallisneria gigantea* (Ribbonweed) and *Azolla pinnata* (Azolla) (refer to **Appendix B, Table B.2**).

Cattle access is evident throughout all farm dams which have resulted in extensive trampling and degradation of banks. The edges were dominated in *Cyndon dactylon* (Couch). Native species present in these areas included scattered occurrences of *Juncus usitatus* and *Paspalum distichum* (Water Couch).

3.1.3 Flora Species

A total of over 100 species were detected on the subject site, of which approximately 50% are native species (refer to **Appendix B, Table B.1**).

No threatened flora listed under the TSC and EPBC Acts were identified on the subject site during flora surveys. **Table 3.1** lists threatened flora species recorded in the locality of the subject site. It lists their habitat requirements (DECCW, 2010); (DEWHA, 2010) and the likelihood of each species occurring on the subject site.

Coordinate System: MGA Zone 56 (GDA 94)

294600 E
295000 E
295400 E
295800 E
Grid North
BAKERS LANE
6254200 N
6253800 N
MAMRE ROAD
D1
D2
D3
D4
D5
D6
Study Site
Farm Dams
Vegetation Communities
Cumberland Plain Woodland (EPBC)
Cumberland Plain Woodland (TSC)
Swamp Oak Stand
Degraded Derived Native Grassland
Exotic Pasture
CUMBERLAND ECOLOGY
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Figure 3.1 Vegetation Communities of the Study Site

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Table 3.1 LIKELIHOOD OF OCCURRENCE TABLES FOR THREATENED FLORA KNOWN TO OCCUR IN THE LOCALI

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Requirements	Likelihood of Occurrence on Subject site
Cumberland Plain Shale Woodland and Shale-Gravel Transition Forest	Cumberland Plain Shale Woodland	CE	CE	Occurs on soils derived from Wianamatta Shale, and throughout the driest part of the Sydney Basin. *Eucalyptus moluccana* and *E. tereticornis* are the dominant canopy trees, with *E. crebra*, *Corymbia maculata* and *E. eugenioides* occurring less frequently. The shrub layer is dominated by *Bursaria spinosa*, and it is common to find abundant grasses such as *Themeda australis* and *Microlaena stipoides var stipoides*	Patches occur on site.
Cynanchum elegans	White-flowered Wax Plant	E	E	Associated with a variety of vegetation types; flowers between August and May.	Unlikely to occur. Subject site is largely cleared. Site grazed by livestock
Marsdenia viridiflora subsp. viridiflora	Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	E		Recent records are from Prospect, Bankstown, Smithfield, Cabramatta Creek and St Marys. Previously known north from Razorback Range. Grows in vine thickets and open shale woodland	Unlikely to occur. Subject site is largely cleared. Site grazed by livestock
Dillwynia tenuifolia		V	V	It has a core distribution within the Cumberland Plain, where it	Unlikley to occur.

Table 3.1 LIKELIHOOD OF OCCURRENCE TABLES FOR THREATENED FLORA KNOWN TO OCCUR IN THE LOCALI

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Requirements	Likelihood of Occurrence on Subject site
				may be locally abundant within scrubby, dry heath areas within Castlereagh Ironbark Forest and Shale/Gravel Transition Forest on tertiary alluvium or laterised clays (DECC 2007). May also be common in the ecotone between these areas and Castlereagh Scribbly Gum Woodland (*ibid.*). Flowers sporadically from August to March	Subject site is largely cleared. Site grazed by livestock.
Dillwynia tenuifolia, Kemps Creek		E		It has a core distribution within the Cumberland Plain, where it may be locally abundant within scrubby, dry heath areas within Castlereagh Ironbark Forest and Shale/Gravel Transition Forest on tertiary alluvium or laterised clays (DECC 2007). May also be common in the ecotone between these areas and Castlereagh Scribbly Gum Woodland (*ibid.*). Flowers sporadically from August to March	Unlikley to occur. Subject site is largely cleared. Site grazed by livestock.
Pultenaea parviflora		E	V	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. May also be common in ecotone between these communities and Castlereagh Scribbly Gum Woodland (*ibid.*). *Eucalyptus fibrosa* is usually the dominant canopy species (*ibid.*). *E. globoidea, E. longifolia, E. parramattensis, E. sclerophylla and E. sideroxylon* may also be present or co-dominant, with *Melaleuca decora* frequently forming a secondary canopy layer (*ibid.*). Associated species may include *Allocasuarina*	Unlikley to occur. Subject site is largely cleared. Site grazed by livestock.

Table 3.1 LIKELIHOOD OF OCCURRENCE TABLES FOR THREATENED FLORA KNOWN TO OCCUR IN THE LOCALI

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Requirements	Likelihood of Occurrence on Subject site
				littoralis, Angophora bakeri, Aristida spp. Banksia spinulosa, Cryptandra spp., Daviesia ulicifolia, Entolasia stricta, Hakea sericea, Lissanthe strigosa, M. nodosa, Ozothamnus diosmifolius and *Themeda australis* (*ibid.*). Often found in association with other threatened species such as *Dillwynia tenuifolia, Dodonaea falcata, Grevillea juniperina, Micromyrtus minutiflora, Persoonia nutans* and *Styphelia laeta* (*ibid.*). Flowering may occur between August and November (*ibid.*).	
Acacia pubescens	Downy Wattle	V	V	Occurs on alluviums, shales and at the intergrade between shales and sandstones. Occur in open woodland and forest, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland.	Unlikely to occur. Subject site is largely cleared. Site grazed by livestock
Hypsela sessiliflora		E	Ex	Currently known from only two adjacent sites on a single private property at Erskine Park in the Penrith LGA. Previous sightings are all from western Sydney, at Homebush and at Agnes Banks. Known to grow in damp places, on the Cumberland Plain but has an extremely restricted distribution.	Unlikely to occur. Subject site is largely cleared. Site grazed by livestock
Eucalyptus benthamii	Camden White Gum	E	V	Occurs in wet open forest on well drained sandy alluvial soils along stream channels, small terraces and alluvial flats on valley floors	Unlikley to occur. Unsuitable habitat. Subject site is largely cleared. Site grazed by livestock.

Table 3.1 LIKELIHOOD OF OCCURRENCE TABLES FOR THREATENED FLORA KNOWN TO OCCUR IN THE LOCALI

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Requirements	Likelihood of Occurrence on Subject site
Grevillea juniperina subsp. juniperina	Juniper-leaved Grevillea V	V		Restricted to red sandy to clay soils – often lateritic on Wianamatta Shale and Tertiary alluvium in Cumberland Plain Woodland and Castlereagh Woodland	Unlikely to occur. Subject site is largely cleared. Site grazed by livestock
Grevillea parviflora subsp. parviflora	Small-flower Grevillea	V	V	Occurs on sandy clay loam soils, often with lateritic ironstone gravels. Soils are mostly derived from Tertiary sands or alluvium and from the Mittagong Formation with alternating bands of shale and fine-grained sandstones. Soil landscapes include Lucas Heights and Berkshire Park. Often occurs in open, slightly disturbed sites such as along tracks. Flowering has been recorded between July to December as well as April-May	Unlikley to occur. Unsuitable habitat. Subject site is largely cleared. Site grazed by livestock.
Persoonia nutans	Nodding Geebung	E	E	Associated with dry woodland, Castlereagh Scribbly Gum Woodland, Agnes Banks Woodland and sandy soils associated with tertiary alluvium, occasionally poorly drained. Endemic to the Western Sydney	Unlikely to occur. Subject site is largely cleared. Site grazed by livestock
Pomaderris brunnea	Brown Pomaderris	V	V	Associated with open forests in association with *Eucalyptus amplifolia, Angophora floribunda, Acacia parramattensis, Bursaria spinosa* and *Kunzea ambigua*. It is found on the Colo River, the Nepean R. floodplain at Menangle, in creeklines at Wirrumbirra Sanctuary (Bargo) and on the Hawkesbury River.. The distribution may extend into the southern section of Yengo	Unlikely to occur. Subject site is largely cleared. Site grazed by livestock

Table 3.1 LIKELIHOOD OF OCCURRENCE TABLES FOR THREATENED FLORA KNOWN TO OCCUR IN THE LOCALI

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Requirements	Likelihood of Occurrence on Subject site
				NP along major creeklines and floodplains	
Pimelea curviflora var. curviflora		V	V	Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands	Unlikely to occur. Subject site is largely cleared. Site grazed by livestock
Pimelea spicata	Spiked Rice-flower	E	E	In western Sydney, it occurs on an undulating topography of well structured clay soils, derived from Wianamatta shale. It is associated with Cumberland Plains Woodland (CPW), in open woodland and grassland often in moist depressions or near creek lines (*Ibid.*). Has been located in disturbed areas that would have previously supported CPW (*Ibid.*).	Unlikely to occur. Subject site is largely cleared. Site grazed by livestock

3.2 Fauna Surveys

Opportunistic sightings of fauna species were recorded during the site visit 8th June 2010. **Table B.2** in **Appendix B** lists fauna species identified on the subject site through opportunistic sightings, indirect evidence (e.g. scats) or targeted searches.

3.2.1 Cumberland Land Snail Searches

The Cumberland Plain Land Snail (*Meridolum corneovirens*) was not found on the subject site. No suitable habitat is considered to exist on the site for this species due to the high disturbance from cattle, lack of fallen bark or ground debris and lack of litter at the base of preferred canopy trees.

3.2.2 Habitat Assessment

The majority of the subject site is highly disturbed by activities associated with cattle grazing and forms mostly degraded grasslands with small patches of isolated remnant vegetation and exposed farm dams.

These landscapes provide limited habitat features and typically provide habitat for hardy native fauna. Fauna observed during the site investigation are provided in **Appendix B Table B.3**. Fauna habitat features on the subject site consist of small patches of low quality remnant woodland, scattered hollow bearing trees and farm dams.

The patches of CPW and stands of Swamp Oak provide very limited habitat values due to the lack of structural elements like fallen logs, leaf litter and absence of a shrub or small tree layer. However, a number of hollows were observed within the small patches of CPW (Patch 1, 2 and 3) and in scattered old growth paddock trees. These hollow bearing trees have been mapped (**Figure 2.1**). Approximately 15 canopy trees were recorded with hollows on the subject site (refer to **Photograph 3.3**). It is likely that the hollows provide habitat for more hardy species of possums, bats and birds as the land is largely cleared.

i. Threatened Bats

Surveys were conducted at a time of year when micro-bat detection is unlikely. These species become inactive throughout the colder winter months. Wildlife Atlas database search results recorded the following threatened bats from the locality:

- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*);
- Eastern Freetail-bat (*Mormopterus norfolkensis*);
- Grey-headed Flying-fox (*Pteropus poliocephalus);*

- Greater Broad-nosed Bat (*Scoteanax rueppellii*);
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*); and
- Large-footed Myotis (*Myotis macropus*);

ii. Eastern Bentwing-bat

The Eastern Bentwing-bat is listed as Vulnerable under the state TSC Act. Wildlife Atlas database searches identified 1 record of the Eastern Bentwing-bat in a 10km radius of the subject site. Roosting habitat does not occur on the subject site for the Eastern Bentwing-bat nor does suitable foraging habitat as the species hunts in forested areas and roosts in caves (DECC (NSW), 2005a).

iii. Eastern Freetail-bat

The Eastern Freetail-bat is listed as Vulnerable under the state TSC Act. Wildlife Atlas database searches identified 4 records of the Eastern Freetail-bat in a 10km radius of the subject site. These records were scattered throughout the locality and occur in more forested areas i.e. around Kemps Creek School. The species inhabits dry sclerophyll forest, woodland, swamp forests and mangrove forests (DEC (NSW), 2005b). Habitat of this description occurs on site as three small disconnected patches of degraded CPW totally 1.12 ha. It is unlikely that the species utilises the site as habitat.

iv. Grey-headed Flying-fox

The Grey-headed Flying-fox is listed as Vulnerable under the EPBC Act and TSC Act. Wildlife Atlas database searches identified 2 records within a 10km radius of the subject site. No roosting camps occur on site or in the locality. Limited foraging habitat occurs within the woodland remnants on the subject site - two native tree species were identified that produce blossoms and nectar:

- Grey Box (*Eucalyptus moluccana*); and
- Forest Red Gum (*Eucalyptus tereticornis*).

These species have a large home range and travel great distances in search of food; upwards of 50km. It unlikely the species relies on the subject site as forage habitat due to the extent of clearing and lack of forage.

v. Greater Broad-nosed Bat

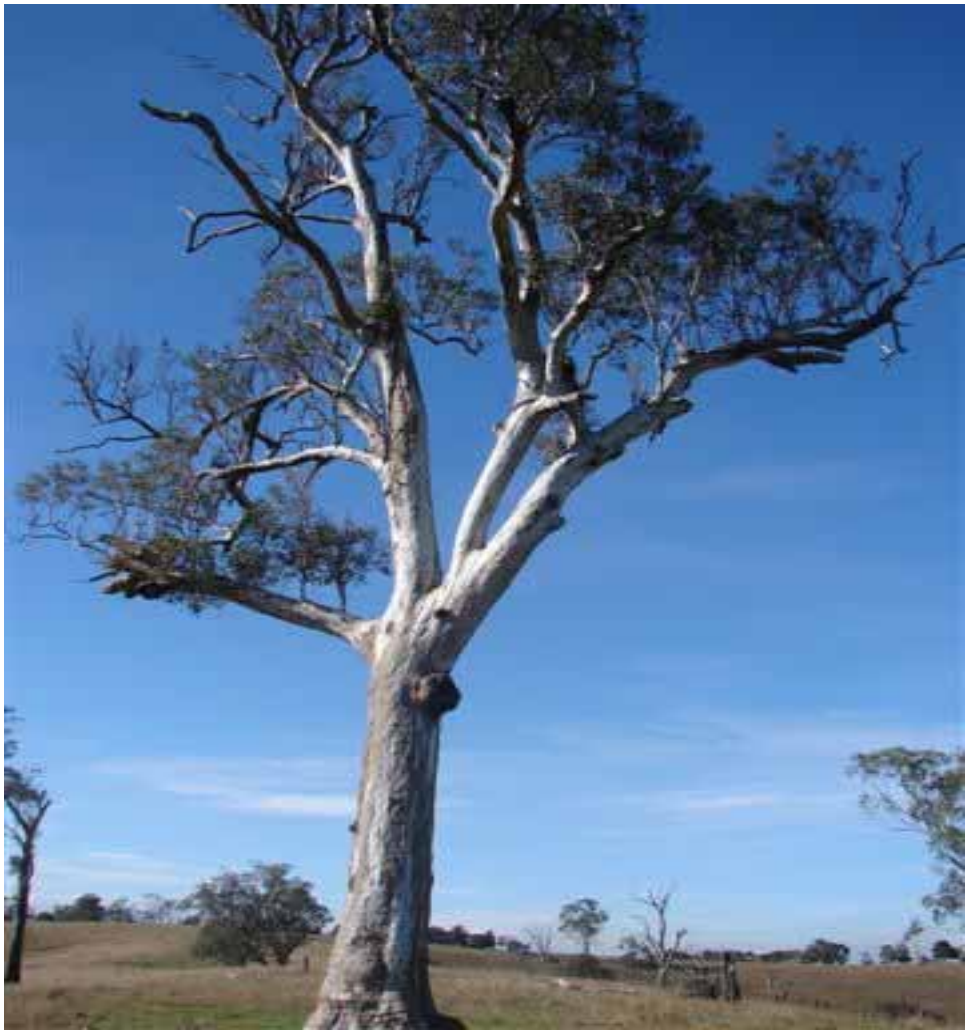
The Greater Broad-nosed Bat is listed under the TSC Act as Vulnerable. Wildlife Atlas database searches identified 1 record within a 10km radius of the subject site. The species is found in woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest (DEC (NSW), 2005c). These habitats exist as 3 isolated patches of degraded CPW totalling 1.12 ha. It forages directly along creeks and river corridors (DEC (NSW), 2005c) which do not occur on the site. It is unlikely that the species utilises the subject site for habitat due to the extent of clearing and absence of preferred foraging habitat.

vi. Eastern False Pipistrelle

The Eastern False Pipistrelle is listed as Vulnerable under the TSC Act. Wildlife Atlas database searches identified 1 record within a 10km radius of the subject site. The species prefers high rainfall forests (DEC (NSW), 2005a) which do not occur on site. It is unlikely this species utilises the site as habitat.

vii. Large-footed Myotis

The Large-footed Myotis is listed as Vulnerable under the TSC Act. This species prefers caves but is known to roost in tree hollows (DEC (NSW), 2005c). The Large-footed Myotis forages for invertebrates and small fish by raking their feet across water bodies (DEC (NSW), 2005c). which are present on site. However, Wildlife Atlas database searches identified 1 record within a 10km radius of the subject site. It is unlikely that the species utilises the subject site as habitat due to the extent of clearing and low number of records in the area.



Photograph 3.3 **Large hollow bearing tree (Tree 5) (*Eucalyptus tereticornis*) on subject site**

viii. Threatened Birds

Results from database searches listed various threatened woodland birds that have been located in the locality of the subject site (**Table 3.2**). However, a lack of vegetation across the site provides limited habitat for small woodland birds. These species rely on well timbered landscapes for food supply and cover whilst foraging. During site investigations a number of hardy bird species (Rainbow Lorikeets and Galahs) were recorded utilising hollows on the site. These species are aggressive competitors for nest sites and can out-compete native species of similar size.

There is the potential for large birds of prey to utilise the site as part of a larger foraging area. This is evident by the presence of an Australian Hobby (*Falco longipennis*) recorded in one of the stags on site. No large bird of prey nests were recorded during site investigations.

The absence of owl records from the locality suggests unsuitable habitat. Typically forest owls hunt in forests and well timbered areas where an abundance of prey (arboreal and terrestrial mammals) is present.

Dam 3 recorded the greatest diversity of aquatic birds which included; White Egret *(Ardea alba*), Darter (*Anhinga melanogaster*), Woodland Duck (*Chenonetta jubata*), Black Swan (*Cygnus atratus*) and Royal Spoonbill (*Platalea regia*) (refer to **Appendix B Table B.3**).

ix. Threatened Amphibians

Potentially suitable habitat for Green and Golden Bell Frogs and other amphibians occurs on the subject site in and around the un-shaded dams, particularly in areas containing reeds, bullrushes (*Typha* spp.) or spikerushes (*Elaeocharis* spp.). However, a lack of records in the locality suggests a low likelihood of the species occurring on the subject site.

x. Threatened Mammals

The Spotted-tailed Quoll (*Dasyurus maculatus*) and Long-nosed Potoroo (*Potorous tridactylus tridactylus)* are not considered likely to occur in the study area due to a lack of continuity between vegetation patches (DECC (NSW), 2005b, DEC (NSW), 2005d) on site and in the surrounding area.

The Vulnerable Yellow-bellied Glider (*Petaurus australis)* and the Squirrel Gilder (*Petaurus norfolcensis*) generally prefer tall mature eucalypt forests and woodlands. The Yellow-bellied Glider occurs in areas with high rainfall and nutrient rich soils (DEC (NSW), 2005f) while the Squirrel Glider is found in mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest with a shrub or acacia mid storey (DEC (NSW), 2005e). This habitat does not exist on the subject site.

The following table (**Table 3.1**) provides a summary of the likelihood of occurrence of threatened fauna recorded from the locality on the subject site and is based on the availability of suitable habitat.

Table 3.2 LIKELIHOOD OF OCCURRENCE TABLES FOR THREATENED FAUNA KNOWN TO OCCUR IN THE LOCALITY

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Requirements	Likelihood of Occurrence on Subject site
Amphibians					
Heleioporus australiacus	Giant Burrowing Frog	V	V	The vegetation is typically woodland, open woodland and heath and may be associated with 'hanging swamp' seepage lines and where small pools form from the collected water. Largely associated with sandstone	Unlikely to occur. Site is largely cleared. Site grazed by livestock
Litoria aurea	Green and Golden Bell Frog	E	V	Large permanent freshwater wetlands, with dense stands of reeds	Unlikely to occur. Lack of historical records. Suitable habitat present.
Litoria raniformis	Growling Grass Frog		V	This species is found mostly amongst emergent vegetation, including *Typha sp.* (bullrush), *Phragmites sp.* (reeds) and *Eleocharis sp.* (sedges), in or at the edges of still or slow-flowing water bodies such as lagoons, swamps, lakes, ponds and farm dams.	Unlikely to occur. Site grazed by livestock
Mixophyes iteratus	Giant Barred Frog	E	E	Found on forested slopes of the escarpment and adjacent ranges in riparian vegetation, subtropical and dry rainforest, wet sclerophyll forests and swamp sclerophyll. This species is associated with flowing streams with high water quality, though habitats may contain weed species. This species is not known from riparian vegetation disturbed by humans. During breeding, eggs are kicked up onto an overhanging bank or the streams edge	Unlikely to occur. Subject site is largely cleared of vegetation.
Invertebrates					
Meridolum corneovirens	Cumberland Plain Land Snail	E		Primarily inhabits Cumberland Plain Woodland. This community is a grassy, open woodland with occasional dense patches of shrubs.	Limited suitable habitat present.. Not detected

Table 3.2 LIKELIHOOD OF OCCURRENCE TABLES FOR THREATENED FAUNA KNOWN TO OCCUR IN THE LOCALITY

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Requirements	Likelihood of Occurrence on Subject site
					during targeted search.
Reptiles					
Hoplocephalus bungaroides	Broad-headed Snake	E	V	Occur under large exfoliating slabs of sandstone and rock crevices in areas of undisturbed bushland, usually on tops of cliffs. Commonly found in rock on rock situations in this context also includes crevices in cliff faces	Unlikely to occur. No suitable habitat.
Birds					
Daphoenositta chrysoptera	Varied Sittella	V		It inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and *Acacia* woodland	Unlikely to occur. Subject site is largely cleared of vegetation.
Haliaeetus leucogaster	White-bellied Sea-Eagle		M	Rivers, large dams. Roost and nest on large platforms built in large Eucalypts	Unlikely to occur. No large nests recorded on subject site.
Hieraaetus morphnoides	Little Eagle	V		The Little Eagle occupies habitats rich in prey within open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used. For nest sites it requires a tall living tree within a remnant patch, where pairs build a large stick nest in winter and lay in early spring. Young fledge in early summer. It eats birds, reptiles and mammals, occasionally adding large insects and carrion	Unlikely to occur. Subject site is largely cleared of vegetation.
Hirundapus caudacutus	White-throated Needletail		M	Recorded most often above wooded areas. Forages over large areas	Unlikely to occur. Subject site is largely cleared of vegetation

Table 3.2 LIKELIHOOD OF OCCURRENCE TABLES FOR THREATENED FAUNA KNOWN TO OCCUR IN THE LOCALITY

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Requirements	Likelihood of Occurrence on Subject site
Lathamus discolor	Swift Parrot	E	E	Forests, woodlands, plantations, banksias, street trees and gardens on the mainland	Unlikely to occur. Insufficient food trees on subject site
Merops ornatus	Rainbow Bee-eater		M	Open woodlands with sandy, loamy soils, dunes, cliffs, mangroves golf courses	Unlikely to occur. Subject site is largely cleared of vegetation.
Monarcha melanopsis	Black-faced Monarch		M	Rainforests, eucalypt woodlands, coastal shrubs, damp gullies in rainforest, eucalypt forest and more open woodland when migrating	Unlikely to occur. Subject site is largely cleared.
Myiagra cyanoleuca	Satin Flycatcher		M	Heavily vegetated gullies in forests, and taller woodlands of coastal south-east Australia. Also occurs in various sites during migration including farms and parks	Unlikely to occur. Subject site is largely cleared.
Rhipidura rufifrons	Rufous Fantail		M	Undergrowth of rainforests/wetter eucalypt forests/gullies. Also occurs in various random sites during migration including farms and parks	Unlikely to occur. Subject site is largely cleared.
Rostratula benghalensis australis	Painted Snipe (Australian subspecies)	E	E	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds (ibid.). Breeding is often in response to local conditions; generally occurs from September to December. Roosts during the day in dense vegetation. Forages nocturnally on mud-flats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter	Unlikely to occur. Subject site is largely cleared. Site grazed by livestock
Xanthomyza phrygia	Regent Honeyeater	E	E, M	Dry open forests, woodlands, especially red ironbark, yellow box,	Unlikely to occur. Subject

Table 3.2 LIKELIHOOD OF OCCURRENCE TABLES FOR THREATENED FAUNA KNOWN TO OCCUR IN THE LOCALITY

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Requirements	Likelihood of Occurrence on Subject site
				yellow gum	site is largely cleared.
Mammals					
Chalinolobus dwyeri	Large-eared Pied Bat, Large Pied Bat	V		Roosts in caves, mines. Uncommon but observed in wet and dry eucalypt forests	Unlikely to occur. Subject site is largely cleared. No caves for roost site.
Dasyurus maculatus	Spotted-tailed Quoll	V	E	Occurs in wide variety of habitats in large remnants. Dens in tree hollows, hollow logs or rock crevices	Unlikely to occur. Subject site is largely cleared.
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V		Usually roosts in tree hollows in the higher rainfall forests within its range	Unlikely to occur. Tree hollows present. Subject site is largely cleared.
Mormopterus norfolkensis	Eastern Freetail-bat	V		Inhabits dry and wet sclerophyll forests, coastal woodland. Roosts in tree hollows and buildings. Have been found roosting under the bark of trees	Tree hollows present. Subject site is largely cleared. Unlikely to occur. Lack of records.
Potorous tridactylus tridactylus	Long-nosed Potoroo		V	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	Unlikely to occur. Subject site is largely cleared. Locality largely cleared.
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Roosts in large camps and disperses nightly up to 20km to feed in flowering eucalypts	Unlikely to occur. No suitable roost habitat. Limited foraging habitat
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V		Forages above the canopy and eats mostly moths. Roosts in caves, old mines, road culverts	Unlikely to occur. No suitable roost habitat. Limited foraging habitat.

Table 3.2 LIKELIHOOD OF OCCURRENCE TABLES FOR THREATENED FAUNA KNOWN TO OCCUR IN THE LOCALITY

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Requirements	Likelihood of Occurrence on Subject site
Myotis macropus	Southern Myotis	V		Known from a range of habitats close to water from lakes, small creeks to large lakes and mangrove lined estuaries	Unlikely to occur lack of records in locality. Tree hollows present. Subject site is largely cleared.
Scoteanax rueppellii	Greater Broad-nosed Bat	V		Usually in tall wet forest, extending into drier forest along gullies. Forages along forest edges. Roosts in tree hollows	Unlikely to occur lack of records. Tree hollows present. Limited foraging habitat.

Chapter 4

Impacts of the Proposal

This Chapter addresses potential impacts of the proposed development on vegetation communities, flora and fauna, and fauna habitats in the study area.

4.1 Impacts to Vegetation Communities

A substantial amount of re-profiling will be required to accommodate the design of the buildings and as a result all vegetation on site is proposed for removal. The areas of vegetation proposed for removal include:

- Approximately 15 scattered hollow bearing trees;
- Three small patches of Cumberland Plain Woodland. Patches 1 and 2 conform to the state listing. Patch 3 conforms to both the state and commonwealth listing;
- The entire area of grassland which comprises mainly exotic pastures and degraded derived native grassland.
- Two small stands of *Casuarina glauca* will be removed from the subject site. The vegetation in this patch is in poor condition with on average 90% of the ground cover being comprised of exotic species; and
- All dams will be drained and the associated wetland vegetation will be removed.

A summary of the vegetation removal that will occur as part of the proposal is shown in **Table 4.1**.

Table 4.1 VEGETATION AREAS TO BE REMOVED, RETAINED AND REVEGETATED ON THE SUBJECT SITES AS PART OF THE PROPOSED LOGOS ESTATE CONCEPT PLAN.

Vegetation Community	Existing Area (ha)	Area to be Removed (ha)	Area to be Retained (ha)	Area to be Revegetated (ha)
Cumberland Plain Woodland	1.12	1.12	0	4.48
Exotic Grassland	40.39	40.39	0	0
Degraded DNG	9.22	9.22	0	0
Stands of Swamp Oak	0.27	0.27	0	0
Wetland Vegetation / Dam	1.00	1.00	0	0.87
Total (ha)	**52.00**	**52.00**	**0**	**5.35**
Total (%)	**100**	**100**	**0**	

Table 4.1 shows that the entire site is proposed to be cleared. The site is made up of mainly grasslands which are weedy (>50% weed cover). Of the entire site, 1.12 hectares of CPW will be removed. The two small stands of *Casuarina glauca* equalling 0.27 hectares are also proposed to be removed together with the farm dams equalling approximately 1 hectare. The remaining areas consist of 40.39ha of pastures grasses and 9.22 ha of degraded DNG which is not considered to conform to the state listing of CPW DNG.

4.1.1 Cumberland Plain Woodland

The proposal will result in the removal of three small patches of Cumberland Plain Woodland (approx. 1.12 ha). The action requires a substantial amount of re-profiling to level the land which will degrade the soil quality. The patches of CPW are likely to provide limited habitat to fauna due to their small size and fragmented nature, lack of structure and degraded nature. Five tree hollows will be removed which were recorded within the three patches of CPW. Pressures from cattle grazing have resulted in a lack of native species recruitment and diversity. There is no shrub layer apart from the occasional African Boxthorn and the groundcovers contain an array of exotic species.

In one localised wetter area (CPW Patch 2) recruitment of *Eucalyptus tereticornis* was observed. It is unlikely that these trees will improve this patch as impacts from cattle (grazing, compaction and trampling) and edge effects will remain to favour exotic species. Furthermore, the established weedy groundcover will limit native species recruitment especially groundcovers. It is likely that if the patches of CPW are left in their current state they would slowly deteriorate.

The patches of Cumberland Plain Woodland to be removed by the proposal are isolated, fragmented, edge-affected and generally non viable. The patches are unlikely to be relied on as a stronghold or play a critical role in the recovery of the critically endangered ecological community. In addition, when considering the patches of CPW against the assessment described by Growth Centres Commission (2007) the patches on the subject site meet a LMV. Therefore no significant impact is likely to occur to Critically Endangered Cumberland Plain Woodland Community.

4.1.2 Grasslands

The proposal will result in the removal of 48.97 hectares of grasslands. This consists of 40.39ha of exotic dominated grasslands and 8.58ha of degraded DNG. The degraded DNG have approximately 50% weed cover and are unlikely to improve in the future. The grasslands provide limited conservation value due to their overall poor condition and lack of native species diversity. Therefore no significant impact is likely to occur to the grasslands as a result of the proposal.

4.1.3 Casuarina glauca Stands

The proposal will result in the removal of 0.27 hectares of Swamp Oak. This vegetation community on site exists as two small monocultures of *Casaurina glauca.* Continual cattle access has caused significant degradation of these stands. A weed cover of over 90% was recorded in the groundcover stratum. These stands provided limited conservation value due to their poor condition and small size. No significant impact is likely to occur to the stands of Swamp Oak as a result of the proposal.

4.1.4 Wetland Vegetation

The proposal will result in the removal of 1 hectare of farm dam and associated wetland habitat. The wetland vegetation is scattered, minimal and provides limited conservation value. Therefore no significant impact is likely to occur as a result of the proposal.

4.2 Impacts on Flora Species on the Subject site

No threatened flora species were identified on the subject site and none are predicted to occur. Hence no negative impact is expected as a result of the proposal.

4.3 Impacts on Fauna Species on the Subject Site

4.3.1 Cumberland Plain Land Snail

Potentially suitable habitat for this species exists on the subject site only owing to the presence of CPW trees. However they have not been detected and factors contributing to their absence may include the presence of cattle and the lack of leaf litter from grazing and trampling by cattle. Therefore no significant impact is expected to occur to the Cumberland Plain Land Snail as a result of the proposed development.

4.3.2 Amphibians

No threatened frog species were considered likely to occur or identified on the subject site during site investigations. Therefore no significant impact is expected to occur to the threatened frogs as a result of the proposed development.

The Common Eastern Froglet was heard calling from various dams throughout the subject site. It is likely that this common frog species will lose habitat as a result of the proposal. However, this species is very common and occurs throughout south-eastern Australia.

4.3.3 Birds

Several threatened bird species have been recorded in the locality; however no threatened bird species were identified or considered likely to occur on the subject site. Consequently, no significant impact is expected to occur to threatened birds as a result of the proposal.

A lack of vegetation across the site provides limited habitat for small woodland birds. These species rely on flora diversity for food supply and vegetation structure for cover whilst foraging. The subject site is likely to provide partial foraging habitat for birds of prey. No significant impact is likely to occur as no large nests were observed. These species have a large home range and would not rely on the site as forage habitat but would be a small part of a large matrix of habitats. Furthermore there are similar environments available in the wider location which will compensate for the removal of vegetation on the subject site.

A number of hollows were recorded on site. These hollows were observed providing nesting habitat for hardy native species like the Rainbow Lorikeet and Galah. It is likely that these native birds will be displaced as they were recorded utilising tree hollows on subject site as nest sites.

4.3.4 Bats

Generally, within the locality the lands are extensively cleared. Remnant vegetation occurs as narrow bands along creek lines, as isolated patches in paddocks or as scattered reserves. A general lack of Wildlife Atlas records suggests unsuitable habitat exists in the locality.

Typically, the bats identified from databases searches prefer well timbered forests and woodlands. Approximately 97% of the site is cleared. Remnant vegetation on the subject site occurs as 3 isolated patches of degraded CPW and 2 stands of *Casuarina glauca*. During habitat assessment a number of hollow bearing trees were recorded on site which could provide roost habitat however the scarcity of records in the locality suggests these species do not occur in the area and are unlikely to utilise the site. Therefore no significant impact is likely to occur to threatened bats as a result of the proposal.

4.3.5 Other Mammals

There is potential for urban adapted arboreal mammals like Ringtail Possum and Brushtail Possum to utilise hollows recorded on the subject site as nest sites. If these species do occur within the subject site there is a possibility that the proposal will result in the removal of habitat.

No other threatened mammals were identified or considered likely to occur on the subject site and hence no significant impact is expected as a result of this proposal.

Chapter 5

Mitigation Measures

5.1 Mitigation Measures

Considerations for reducing the ecological impacts of the proposal cover the following hierarchical principles:

- *Avoid:* to the extent possible the proposal should be designed to avoid ecological impacts;
- *Minimise*: where impacts cannot be avoided they should be minimised;
- *Mitigate:* once impacts have been avoided or minimised where possible, additional mitigation measures should be put in place to ameliorate the ecological impacts of the proposal
- *Compensate:* following the implementation of mitigation measures, the residual impacts should be compensated for.

General impact mitigation and avoidance strategies are discussed below. This is followed by specific recommendations for mitigating impacts before and during construction.

5.2 Measures to Avoid Impacts

The impacts to vegetation will be unavoidable. A substantial amount of re-profiling will be required to accommodate for the design of the buildings and as a result all vegetation on site is proposed for removal.

5.3 Measures to Minimise Impacts

The layout of the proposal will result in the removal of all vegetation. The site is quite hilly and requires a substantial amount of re-profiling to make way for building pads.

5.4 Measures to Mitigate Impacts

Appropriate soil and water control measures will be implemented during earthworks and construction of buildings and will be removed at the completion of works. This will ensure that run-off does not seep into adjacent vegetation and alter the hydrology or biochemical status of the soil. Impacts on adjacent landscapes will be monitored so that management activities can be adapted as appropriate.

Other measures to mitigate impacts from the development include:

- Implementing a tree removal protocol which will include:
  - Pre-clearance fauna surveys (by a qualified fauna ecologist) to check for any nesting or roosting fauna and move to adjacent habitat;
  - Removal of trees will occur progressively.
- Re-use tree hollows in landscaping setbacks for terrestrial habitat.

5.5 Measures to Provide Compensation for Impacts

Revegetation of Cumberland Plain Woodland will occur within landscaping setbacks. These setbacks will total an area of 4.48 ha which will increase the extent of Cumberland Plain Woodland currently on the subject site by approximately four times. These setbacks will also include stormwater detention ponds which will provide 0.87 ha of habitat for aquatic flora and fauna.

Chapter 6

Conclusion

The proposal will result in the removal of all vegetation on the subject site. This will consist of:

- Two small stands of severely degraded *Casuarina glauca* equalling 0.27 ha;
- A mixture of pasture grasses and degraded DNG equally 48.97 ha;
- Three patches of Cumberland Plain Woodland which conform to the TSC Act (1.12 ha). Patch 3 conforms to both EPBC Act and TSC Act; and
- Vegetated farm dams.

No significant impact on these communities is expected as a result of the proposal due to their small sizes and poor condition.

No threatened flora species were identified on the subject site, and hence will not be impacted by the proposal.

No threatened fauna species were recorded on the subject site or considered likely to occur; hence no significant impact is likely to occur.

Approximately 15 hollow bearing trees were recorded on the subject sites which are proposed to be removed.

Soil and water control measures will be implemented during earthworks and construction of buildings and will be removed at the completion of works. A tree removal protocol will be implemented which will include preclearance surveys conducted by qualified fauna ecologist. In addition, tree hollows will be re-used in landscaping to provide habitat terrestrial fauna. Approximately 4.48 ha of CPW and 0.87 ha of wetland habitat will be reconstructed in landscaping setbacks.

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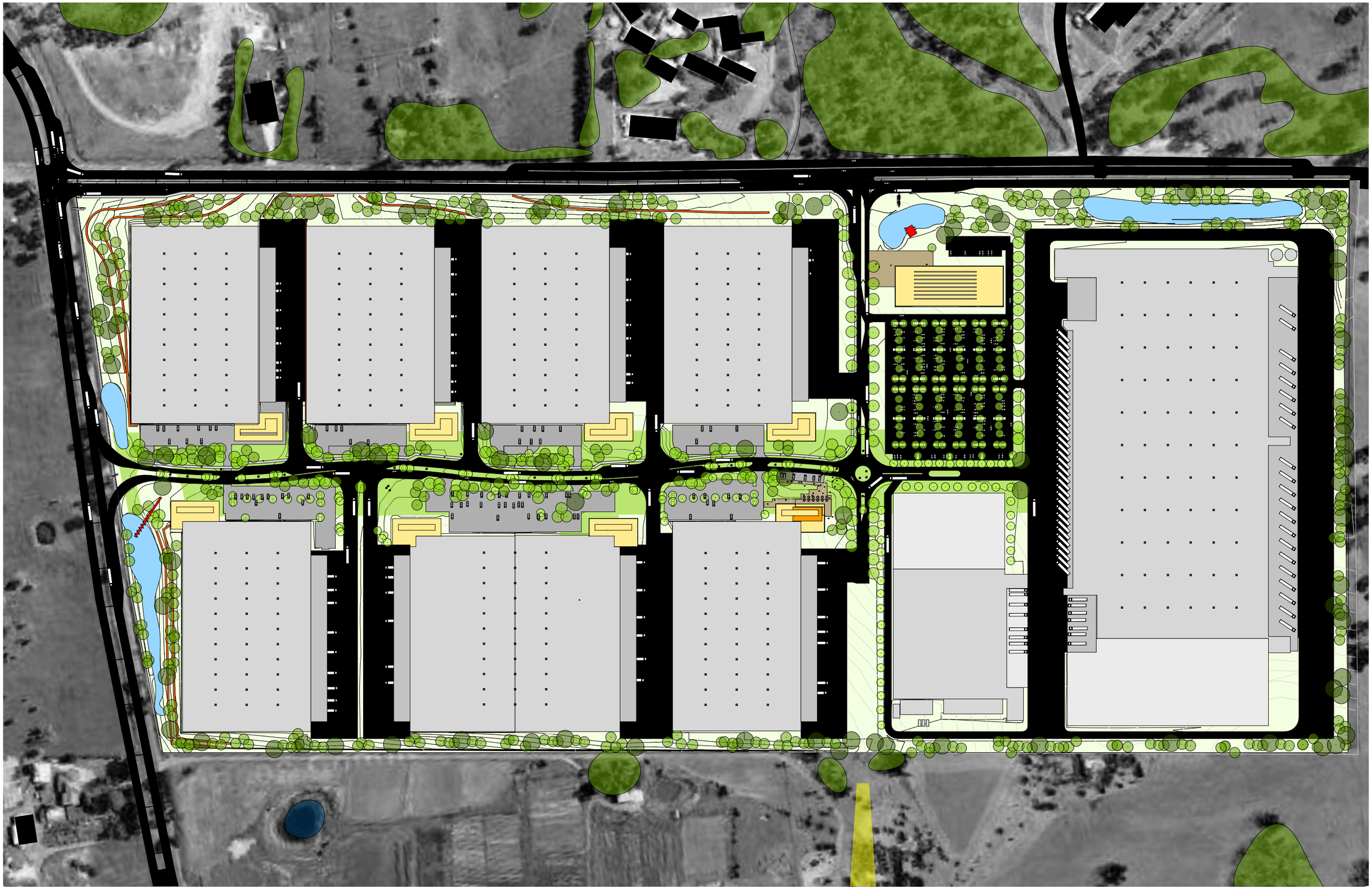
Appendix A

Concept Plan for LOGOS Estate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Appendix B

Flora and Fauna Species recorded on the Site

B.1 Flora Species List

Table B.1 TERRESTRIAL FLORA SPECIES RECORDED ON SITE

Family	Scientific Name	Common Name	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Transect
Trees												
Bignoniaceae	**Jacaranda mimosifolia*	Jacaranda										x
Casuarinaceae	*Casuarina glauca*	Swamp Oak						6				
Lauraceae	**Cinnamomum camphora*	Camphor Laurel										x
Myrtaceae	*Eucalyptus moluccana*	Grey Box	5								5	x
	E. tereticornis	Forest Red Gum		5				1				
Oleaceae	**Olea europaea subsp. cuspidata*	African Olive										x
Ulmaceae	**Ulmus procera*											x
Shrubs												
Fabaceae	*Pultenaea microphylla*											x
Myrtaceae	*Eucalyptus tereticornis*	Forest Red Gum		2								
Pittosporaceae	*Bursaria spinosa*	Blackthorn										x
Protaceae	**Grevillea robusta*	Silky Oak										x
Solanaceae	**Lycium ferocissimum*	African boxthorn	adj					adj			5	
Herbs - Dicots												

Table B.1 TERRESTRIAL FLORA SPECIES RECORDED ON SITE

Family	Scientific Name	Common Name	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Transect
Acanthaceae	*Brunoniella australis*										3	
Amaranthaceae	**Amaranthus sp.*							1				
Anthericaceae	*Arthropodium milleflorum*	Pale Vanilla-lily										x
Apiaceae	**Feoniculum vulgare*	Fennel										x
Asteraceae	**Bidens pilosa*	Farmers Friends										x
	**B. subalternans*											
	**Cirsium vulgare*	Spear Thistle		1		2	2					x
	Cotula australis	Common Cotula	2									
	Cymbonotus lawsonianus	Bears-ear		2								
	**Hypocahaeris radicata*	Flatweed	1					1	2	3	3	x
	**Senecio madagascariensis*	Fireweed	2	3	3	1				2	3	x
	**Sonchus oleraceus*	Sow Thistle										x
	**Taraxacum officinale*	Dandelion									1	
Brassicaceae	**Lepidium sp*									1	1	
Cactaceae	**Opuntia srticta*	Pickly Pear										x
Caryophyllaceae	**Paronychia brasiliana*		3								1	
Campanulaceae	*Wahlenbergia communis*	Tufted Bluebell										x
Chenopodiaceae	*Atriplex semibaccata*	Creeping saltbush	1									x
	Einadia polygonoides		1								1	
Commelinaceae	*Commelina cyanea*										1	
Convolvulaceae	*Dichondra repens*	Kidney Plant	4	3		2	1			1	4	x

Table B.1 TERRESTRIAL FLORA SPECIES RECORDED ON SITE

Family	Scientific Name	Common Name	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Transect
Euphorbiaceae	*Chamaesyce sp*	Caustic Weed										x
Fabaceae	*Desmodium varians*	Tick Trefoil									1	
	**Trifolium repens*	White Clover	1									x
Geraniaceae	*Geranium solanderi*	Native Geranium		1								x
Lamiaceae	*Mentha satureioides*	Creeping Mint										x
Malvaceae	**Malva parviflora*	Small-flowered Mallow	2					5				
	**Modiola caroliniana*		2	1							1	x
	Sida corrugata	Corrugated Sida									2	
	**Sida rhombifolia*	Paddys Lucerne	4	3			2	2		1	3	
	Sida spinosa		3	1							1	x
Myoporaceae	*Eremophila debile*	Winter Apple									2	
Myrsinaceae	**Anagallis arvensis*	Scalet Pimpernel				1						x
Oxalidaceae	*Oxalis perennans*		1								3	
	Oxalis sp.											x
Plantaginaceae	**Plantago lanceolata*	Lambs Tongue	4	3		1		1	1	1	4	x
Polygonaceae	**Polygonum aviculare*	Wire weed						1				
	**Rumex sp.*											x
Rubiaceae	*Asperula conferta*	Common Bedstraw									1	x
	**Richardia stellaria*										2	
Solanaceae	**Solanum americanum*	Glossy Nightshade										x
	**S. nigrum*	Blacjberry Nightshade						1				

Table B.1 TERRESTRIAL FLORA SPECIES RECORDED ON SITE

Family	Scientific Name	Common Name	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Transect
	S. prinophyllum		1									
Urticaceae	**Urtica urens*	Small Nettle						2				
Verbenaceae	**Verbena officinalis*	Common Verbena										x
	**Verbena bonariensis*	Purpletop										x
Herbs - Monocots												
Cyperaceae	**Cyperus brevifolus*								1			
	Cyperus gracilis		1	2				1				
	Fimbristylis dichotoma								1			
Lomandraceae	*Lomandra filiformis*	Wattle Matrush								2		
Phormiaceae	*Dianella longifolia*											x
Poaceae	*Aristida ramosa*	a Three-awned Grass		4	2	5	3			2		x
	A. vagans	a Three-awned Grass										x
	**Axonopus affinis*	Carpet Grass			4				3	5		
	Bothriochloa macra	Redgrass	1	2						1		x
	**Briza subaristata*				5	5	5		5	3		
	**Bromus catharticus*	Prairer Grass						2			1	x
	**Chloris gayana*	Rhodes Grass										x
	C. ventricosa	Plump Windmill Grass	5	4			2			2	5	
	C. truncata	Windmilll Grass	1	1								

Table B.1 TERRESTRIAL FLORA SPECIES RECORDED ON SITE

Family	Scientific Name	Common Name	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Transect
	Cymbopogon refractus	Barb-wire Grass										x
	**Cynodon dactylon*	Couch Grass	2		2	2	3	2	3	3	1	x
	Danthonia sp	a Wallaby Grass	5	2							3	
	Dichanthium sericeum	Queensland Bluegrass										x
	Dichelachne sp.									2		
	**Ehrharta erecta*	Panic Veldtgrass						4				
	Eleusine indica	Crowsfoot Grass						1				
	**Eragrostis curvula*	African Lovegrass								1		x
	Eragrostis leptostachya	Paddock Lovegrass	2	3		2	2		2		3	
	Microlaena stipoides	Weeping Meadow-grass									6	x
	Panicum effusum											x
	**Paspalum dilatatum*	Paspalum	2	5	6	5	6	3	5	5	3	x
	**Pennisetum clandestinum*	Kikuyu						5				x
	**Phalaris aquatica*	Phalaris										x
	**Setaria gracilis*	Slender Pigeon Grass	3	2	3		3		2	2	2	x
	Sporobolus creber	Rats Tail Grass	2	4	2	2	1			5		
	Sporobolus elongatus								5			
	**S. indica var capensis*	Parramatta Grass						2				x
	Themeda australia	Kangaroo Grass			2	5	6					x
Vines												

Table B.1 TERRESTRIAL FLORA SPECIES RECORDED ON SITE

Family	Scientific Name	Common Name	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Transect
Apocynaceae	**Araujia sericifera*	Moth Vine										x
Bignoniaceae	**Macfadyena unguis-cati*	Cat's Claw Creeper										x
Fabaceae	*Glycine clandestina*											x
	Glycine microphylla			1								
	Glycine tabacina		1			2					2	x
	Hardenbergia violacea	False Sarsparilla										x
	Vicia sp.											x
Solanaceae	**Solanum seaforthianum*	Climbing Nightshade						2				
Tozer (2003)			11/16	10/14	3/3	5/6	5/6	2/4	1/2	5/7	10/16	
TSC characteristic species count			12	10	3	6	6	2	2	6	13	
% weed cover			50	50	95	55	55	99	66	70	57	

Table B.2 AQUATIC FLORA SPECEIS RECORDED ON SITE

Family	Scientific Name	Common Name	Dam 1	Dam 2	Dam 3	Dam 4	Dam 5	Dam 6
Herbs - Monocots								
Juncaceae	*Juncus usitatus*				x	x		
Poeceae	**Cyncodon dactylon*		x	x	x	x		
	Paspalum distichum	Water Couch						x
Herbs - Ferns								
Azollaceae	*Azolla pinnata*	Azolla	x					
Macrophytes								
Cyperaceae	*Eleocharis sphacelata*		x			x		x
Marsileaceae	*Marsilea mutica*	Nardoo			x			
Onagraceae	*Ludwigia peploides*	Water Primrose	x		x			x
Hydrocharitaceae	*Ottelia ovalifolia*	Swamp Lily						x
	Vallisneria gigantea	Ribbonweed			x			x
Typhaceae	*Typha sp.*	Typha		x				

B.2 Fauna Species List

Table B.3 OPPORTUNSITIC FAUNA SPECEIS RECORDED ON SITE

Scientific name	Common Name	Area Sighted	Evidence
Amphibians			
Crinia signifera	Common Eastern Froglet	Dam 2, 3, 5, 6	call
Fish			
**Gambusia holbrooki*	Gambusia	Dam 5	sighted
Aves			
Ardea alba	White Egret	Dam 3	sighted
Ardea ibis	Cattle Egret	Between quadrat 4 and 5	sighted
Acridotheres tristis	Indian Myna	Throughout site	sighted
Anhinga melanogaster	Darter	Dam 3	sighted
Chenonetta jubata	Woodland Duck	Dam 3	sighted
Cygnus atratus	Black Swan	Dam 3	sighted
Gallinula temebrosa	Moorhen	Dam 3	sighted
Grallina cyanoleuca	Magpie-lark	Throughout site	sighted
Gymnorhina tibicen	Australian Magpie	Throughout site	sighted
Falco hypoleucos	Australian Hobby	Tree 6	sighted
Malurus cyaneus	Superb Fairy-wren	Quadrat 9	sighted
Manorina melanocephala	Noisy Miner	Throughout site	sighted
Ocyphaps lophotes	Crested Pigeon	Throughout site	sighted
Platalea regia	Royal Spponbill	Dam 3	sighted
Rhipidura leucophrys	Willy Wagtail	Throughout site	sighted
Trichoglossus haematodus	Rainbow Lorikeet	Throughout site	sighted
Mammals			
**Bos taurus*	European Cattle	Throughout site	sighted
Reptiles			
Pseudonaja textilis	Eastern Brown Snake	Transect	sighted
Lampropholis guichenoti	Garden Skink	Quadrat 9	sighted

Appendix C

Fauna Species recorded in the Penrith LGA

C.1 Fauna Species Recorded in the Penrith LGA

Group	Scientific Name	Common Name	Legal Status	Penrith LGA Count
Amphibia				
Hylidae	*Litoria aurea*	Green and Golden Bell Frog	E1	9
	Litoria caerulea	Green Tree Frog	P	23
	Litoria dentata	Keferstein's Tree Frog	P	12
	Litoria fallax	Eastern Dwarf Tree Frog	P	37
	Litoria latopalmata	Broad-palmed Frog	P	16
	Litoria lesueuri	Lesueur's Frog	P	1
	Litoria peronii	Peron's Tree Frog	P	30
	Litoria phyllochroa	Green Stream Frog	P	3
	Litoria tyleri	Tyler's Tree Frog	P	1
	Litoria verreauxii	Verreaux's Tree Frog	P	47
Myobatrachidae	*Crinia signifera*	Common Eastern Froglet	P	142
	Limnodynastes dumerilii	Bullfrog	P	3
	Limnodynastes ornatus	Ornate Burrowing Frog	P	1
	Limnodynastes peronii	Striped Marsh Frog	P	33
	Limnodynastes tasmaniensis	Spotted Marsh Frog	P	37
	Pseudophryne bibronii	Bibron's Toadlet	P	3
	Uperoleia laevigata	Smooth Toadlet	P	11
Aves				

Group	Scientific Name	Common Name	Legal Status	Penrith LGA Count
Acanthizidae	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill	P	30
	Acanthiza lineata	Striated Thornbill	P	54
	Acanthiza nana	Yellow Thornbill	P	111
	Acanthiza pusilla	Brown Thornbill	P	50
	Acanthiza reguloides	Buff-rumped Thornbill	P	49
	Gerygone fusca	Western Gerygone	P	1
	Gerygone mouki	Brown Gerygone	P	11
	Gerygone olivacea	White-throated Gerygone	P	31
	Origma solitaria	Rockwarbler	P	3
	Pyrrholaemus sagittatus	Speckled Warbler	V	12
	Sericornis frontalis	White-browed Scrubwren	P	27
	Sericornis magnirostris	Large-billed Scrubwren	P	1
	Smicrornis brevirostris	Weebill	P	106
Accipitridae	*Accipiter cirrocephalus*	Collared Sparrowhawk	P	2
	Accipiter fasciatus	Brown Goshawk	P	17
	Accipiter novaehollandiae	Grey Goshawk	P	3
	Aquila audax	Wedge-tailed Eagle	P	8
	Circus approximans	Swamp Harrier	P	3
	Circus assimilis	Spotted Harrier	P	1
	Elanus axillaris	Black-shouldered Kite	P	11
	Haliaeetus leucogaster	White-bellied Sea-Eagle	P	5

Group	Scientific Name	Common Name	Legal Status	Penrith LGA Count
	Haliastur sphenurus	Whistling Kite	P	1
	Hieraaetus morphnoides	Little Eagle	P	2
	Lophoictinia isura	Square-tailed Kite	V	3
Aegothelidae	*Aegotheles cristatus*	Australian Owlet-nightjar	P	16
Alaudidae	*Alauda arvensis*	Eurasian Skylark	U	1
	Mirafra javanica	Horsfield's Bushlark	P	2
Alcedinidae	*Alcedo azurea*	Azure Kingfisher	P	7
Anatidae	*Anas castanea*	Chestnut Teal	P	4
	Anas gracilis	Grey Teal	P	9
	Anas platyrhynchos	Mallard	U	1
	Anas rhynchotis	Australasian Shoveler	P	1
	Anas superciliosa	Pacific Black Duck	P	47
	Aythya australis	Hardhead	P	3
	Chenonetta jubata	Australian Wood Duck	P	42
	Cygnus atratus	Black Swan	P	5
	Stictonetta naevosa	Freckled Duck	V	2
Anhingidae	*Anhinga melanogaster*	Darter	P	5
Apodidae	*Apus pacificus*	Fork-tailed Swift	P	3
	Hirundapus caudacutus	White-throated Needletail	P	3
Ardeidae	*Ardea alba*	Great Egret	P	4
	Ardea ibis	Cattle Egret	P	16

Group	Scientific Name	Common Name	Legal Status	Penrith LGA Count
	Ardea intermedia	Intermediate Egret	P	3
	Ardea pacifica	White-necked Heron	P	6
	Botaurus poiciloptilus	Australasian Bittern	V	1
	Butorides striatus	Striated Heron	P	1
	Egretta garzetta	Little Egret	P	4
	Egretta novaehollandiae	White-faced Heron	P	31
	Ixobrychus flavicollis	Black Bittern	V	1
	Ixobrychus minutus	Little Bittern	P	2
	Nycticorax caledonicus	Nankeen Night Heron	P	3
Artamidae	*Artamus cyanopterus*	Dusky Woodswallow	P	16
	Artamus personatus	Masked Woodswallow	P	2
	Artamus superciliosus	White-browed Woodswallow	P	6
	Cracticus nigrogularis	Pied Butcherbird	P	3
	Cracticus torquatus	Grey Butcherbird	P	118
	Gymnorhina tibicen	Australian Magpie	P	110
	Strepera graculina	Pied Currawong	P	76
Burhinidae	*Burhinus grallarius*	Bush Stone-curlew	E1	2
Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo	P	63
	Cacatua sanguinea	Little Corella	P	5
	Cacatua tenuirostris	Long-billed Corella	P	4
	Callocephalon fimbriatum	Gang-gang Cockatoo	V	4

Group	Scientific Name	Common Name	Legal Status	Penrith LGA Count
	Calyptorhynchus funereus	Yellow-tailed Black-Cockatoo	P	32
	Calyptorhynchus lathami	Glossy Black-Cockatoo	V	6
	Eolophus roseicapillus	Galah	P	43
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	P	98
	Coracina papuensis	White-bellied Cuckoo-shrike	P	2
	Coracina tenuirostris	Cicadabird	P	3
	Lalage tricolor	White-winged Triller	P	4
Casuariidae	*Dromaius novaehollandiae*	Emu	P	1
Centropodidae	*Centropus phasianinus*	Pheasant Coucal	P	3
Charadriidae	*Elseyornis melanops*	Black-fronted Dotterel	P	8
	Erythrogonys cinctus	Red-kneed Dotterel	P	1
	Vanellus miles	Masked Lapwing	P	45
	Vanellus tricolor	Banded Lapwing	P	3
Ciconiidae	*Ephippiorhynchus asiaticus*	Black-necked Stork	E1	4
Climacteridae	*Cormobates leucophaeus*	White-throated Treecreeper	P	45
Columbidae	*Columba livia*	Rock Dove	U	8
	Geopelia humeralis	Bar-shouldered Dove	P	8
	Geopelia placida	Peaceful Dove	P	36
	Leucosarcia melanoleuca	Wonga Pigeon	P	4
	Ocyphaps lophotes	Crested Pigeon	P	38
	Phaps chalcoptera	Common Bronzewing	P	17

Group	Scientific Name	Common Name	Legal Status	Penrith LGA Count
	Streptopelia chinensis	Spotted Turtle-Dove	U	63
Coraciidae	*Eurystomus orientalis*	Dollarbird	P	9
Corcoracidae	*Corcorax melanorhamphos*	White-winged Chough	P	34
Corvidae	*Corvus coronoides*	Australian Raven	P	174
Cuculidae	*Cacomantis flabelliformis*	Fan-tailed Cuckoo	P	11
	Chalcites basalis	Horsfield's Bronze-Cuckoo	P	11
	Chalcites lucidus	Shining Bronze-Cuckoo	P	17
	Cuculus pallidus	Pallid Cuckoo	P	11
	Eudynamys orientalis	Pacific Koel	P	1
	Scythrops novaehollandiae	Channel-billed Cuckoo	P	3
Dicaeidae	*Dicaeum hirundinaceum*	Mistletoebird	P	28
Dicruridae	*Dicrurus bracteatus*	Spangled Drongo	P	1
	Grallina cyanoleuca	Magpie-lark	P	137
	Myiagra cyanoleuca	Satin Flycatcher	P	3
	Myiagra inquieta	Restless Flycatcher	P	16
	Myiagra rubecula	Leaden Flycatcher	P	5
	Rhipidura albiscapa	Grey Fantail	P	142
	Rhipidura leucophrys	Willie Wagtail	P	80
	Rhipidura rufifrons	Rufous Fantail	P	7
Estrildidae	*Lonchura castaneothorax*	Chestnut-breasted Mannikin	P	3
	Lonchura punctulata	Nutmeg Mannikin	U	3

Group	Scientific Name	Common Name	Legal Status	Penrith LGA Count
	Neochmia modesta	Plum-headed Finch	P	1
	Neochmia temporalis	Red-browed Finch	P	99
	Stagonopleura guttata	Diamond Firetail	V	2
	Taeniopygia bichenovii	Double-barred Finch	P	47
	Taeniopygia guttata	Zebra Finch	P	3
Eupetidae	*Cinclosoma punctatum*	Spotted Quail-thrush	P	1
	Psophodes olivaceus	Eastern Whipbird	P	46
Falconidae	*Falco berigora*	Brown Falcon	P	7
	Falco cenchroides	Nankeen Kestrel	P	10
	Falco longipennis	Australian Hobby	P	7
	Falco peregrinus	Peregrine Falcon	P	1
Fringillidae	*Carduelis carduelis*	European Goldfinch	U	1
	Carduelis chloris	European Greenfinch	U	1
Halcyonidae	*Dacelo novaeguineae*	Laughing Kookaburra	P	77
	Todiramphus sanctus	Sacred Kingfisher	P	21
Hirundinidae	*Cheramoeca leucosternus*	White-backed Swallow	P	6
	Hirundo neoxena	Welcome Swallow	P	51
	Petrochelidon ariel	Fairy Martin	P	1
	Petrochelidon nigricans	Tree Martin	P	10
Laridae	*Larus novaehollandiae*	Silver Gull	P	1
Maluridae	*Malurus cyaneus*	Superb Fairy-wren	P	152

Group	Scientific Name	Common Name	Legal Status	Penrith LGA Count
	Malurus lamberti	Variegated Fairy-wren	P	18
Meliphagidae	*Acanthorhynchus tenuirostris*	Eastern Spinebill	P	67
	Anthochaera carunculata	Red Wattlebird	P	40
	Anthochaera chrysoptera	Little Wattlebird	P	21
	Entomyzon cyanotis	Blue-faced Honeyeater	P	1
	Grantiella picta	Painted Honeyeater	V	1
	Lichenostomus chrysops	Yellow-faced Honeyeater	P	96
	Lichenostomus fuscus	Fuscous Honeyeater	P	20
	Lichenostomus leucotis	White-eared Honeyeater	P	56
	Lichenostomus melanops	Yellow-tufted Honeyeater	P	5
	Lichenostomus penicillatus	White-plumed Honeyeater	P	35
	Manorina melanocephala	Noisy Miner	P	167
	Manorina melanophrys	Bell Miner	P	62
	Meliphaga lewinii	Lewin's Honeyeater	P	14
	Melithreptus brevirostris	Brown-headed Honeyeater	P	29
	Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V	3
	Melithreptus lunatus	White-naped Honeyeater	P	24
	Myzomela sanguinolenta	Scarlet Honeyeater	P	9
	Philemon citreogularis	Little Friarbird	P	1
	Philemon corniculatus	Noisy Friarbird	P	36
	Phylidonyris nigra	White-cheeked Honeyeater	P	29

Group	Scientific Name	Common Name	Legal Status	Penrith LGA Count
	Phylidonyris novaehollandiae	New Holland Honeyeater	P	7
	Plectorhyncha lanceolata	Striped Honeyeater	P	1
	Xanthomyza phrygia	Regent Honeyeater	E1	5
Menuridae	*Menura novaehollandiae*	Superb Lyrebird	P	3
Meropidae	*Merops ornatus*	Rainbow Bee-eater	P	5
Motacillidae	*Anthus australis*	Australian Pipit	P	6
Muscicapidae	*Turdus merula*	Eurasian Blackbird	U	10
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella	P	34
Oriolidae	*Oriolus sagittatus*	Olive-backed Oriole	P	38
Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush	P	120
	Falcunculus frontatus	Eastern Shrike-tit	P	30
	Pachycephala pectoralis	Golden Whistler	P	107
	Pachycephala rufiventris	Rufous Whistler	P	74
Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote	P	140
	Pardalotus striatus	Striated Pardalote	P	74
Passeridae	*Passer domesticus*	House Sparrow	U	14
Pelecanidae	*Pelecanus conspicillatus*	Australian Pelican	P	7
Petroicidae	*Eopsaltria australis*	Eastern Yellow Robin	P	84
	Melanodryas cucullata	Hooded Robin	V	1
	Microeca fascinans	Jacky Winter	P	13
	Petroica boodang	Scarlet Robin	P	12

Group	Scientific Name	Common Name	Legal Status	Penrith LGA Count
	Petroica goodenovii	Red-capped Robin	P	4
	Petroica phoenicea	Flame Robin	P	5
	Petroica rosea	Rose Robin	P	27
Phalacrocoracidae	*Phalacrocorax carbo*	Great Cormorant	P	3
	Phalacrocorax melanoleucos	Little Pied Cormorant	P	16
	Phalacrocorax sulcirostris	Little Black Cormorant	P	9
	Phalacrocorax varius	Pied Cormorant	P	8
Phasianidae	*Coturnix pectoralis*	Stubble Quail	P	2
	Coturnix sp.	Unidentified Quail	P	1
	Coturnix ypsilophora	Brown Quail	P	11
Podargidae	*Podargus strigoides*	Tawny Frogmouth	P	44
Podicipedidae	*Podiceps cristatus*	Great Crested Grebe	P	6
	Poliocephalus poliocephalus	Hoary-headed Grebe	P	5
	Tachybaptus novaehollandiae	Australasian Grebe	P	12
Psittacidae	*Alisterus scapularis*	Australian King-Parrot	P	21
	Barnardius zonarius semitorquatus	Twenty Eight Parrot	P	1
	Glossopsitta concinna	Musk Lorikeet	P	1
	Glossopsitta pusilla	Little Lorikeet	P	3
	Lathamus discolor	Swift Parrot	E1	27
	Platycercus adscitus eximius	Eastern Rosella	P	89
	Platycercus elegans	Crimson Rosella	P	38

Group	Scientific Name	Common Name	Legal Status	Penrith LGA Count
	Psephotus haematonotus	Red-rumped Parrot	P	51
	Trichoglossus haematodus	Rainbow Lorikeet	P	43
Ptilonorhynchidae	*Chlamydera maculata*	Spotted Bowerbird	P	1
	Ptilonorhynchus violaceus	Satin Bowerbird	P	16
Pycnonotidae	*Pycnonotus jocosus*	Red-whiskered Bulbul	U	35
Rallidae	*Fulica atra*	Eurasian Coot	P	7
	Gallinula tenebrosa	Dusky Moorhen	P	25
	Gallirallus philippensis	Buff-banded Rail	P	2
	Porphyrio porphyrio	Purple Swamphen	P	20
	Porzana pusilla	Baillon's Crake	P	2
	Porzana tabuensis	Spotless Crake	P	1
Recurvirostridae	*Himantopus himantopus*	Black-winged Stilt	P	3
Scolopacidae	*Actitis hypoleucos*	Common Sandpiper	P	2
	Gallinago hardwickii	Latham's Snipe	P	1
	Limosa limosa	Black-tailed Godwit	V	1
	Tringa glareola	Wood Sandpiper	P	2
	Tringa nebularia	Common Greenshank	P	1
Strigidae	*Ninox boobook*	Southern Boobook	P	13
	Ninox connivens	Barking Owl	V	3
Sturnidae	*Acridotheres tristis*	Common Myna	U	95
	Sturnus vulgaris	Common Starling	U	57

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Sylviidae	*Acrocephalus australis*	Australian Reed-Warbler	P	3
	Cisticola exilis	Golden-headed Cisticola	P	10
	Megalurus gramineus	Little Grassbird	P	5
Threskiornithidae	*Platalea flavipes*	Yellow-billed Spoonbill	P	4
	Platalea regia	Royal Spoonbill	P	5
	Plegadis falcinellus	Glossy Ibis	P	1
	Threskiornis molucca	Australian White Ibis	P	8
	Threskiornis spinicollis	Straw-necked Ibis	P	5
Turnicidae	*Turnix varia*	Painted Button-quail	P	9
Tytonidae	*Tyto alba*	Barn Owl	P	8
	Tyto novaehollandiae	Masked Owl	V	13
Zosteropidae	*Zosterops lateralis*	Silvereye	P	88
Gastropoda				
Camaenidae	*Meridolum corneovirens*	Cumberland Plain Land Snail	E1	118
Helicidae	*Helix aspersa*	Brown gardensnail	U	5
Mammalia				
Bovidae	*Bos taurus*	European cattle	U	11
	Capra hircus	Goat	U	7
	Ovis aries	Sheep	U	1
Burramyidae	*Cercartetus nanus*	Eastern Pygmy-possum	V	1
Canidae	*Canis lupus*	Dingo, domestic dog	U	34

Group	Scientific Name	Common Name	Legal Status	Penrith LGA Count
	Canis lupus familiaris	Dog	U	47
	Vulpes vulpes	Fox	U	146
Dasyuridae	*Antechinus stuartii*	Brown Antechinus	P	2
	Dasyurus maculatus	Spotted-tailed Quoll	V	3
	**Dasyurus viverrinus*	Eastern Quoll	E1	
	**Phascogale tapoatafa*	Brush-tailed Phascogale	V	
	Sminthopsis murina	Common Dunnart	P	1
Equidae	*Equus caballus*	Horse	U	13
Felidae	*Felis catus*	Cat	U	27
Leporidae	*Lepus capensis*	Brown Hare	U	22
	Oryctolagus cuniculus	Rabbit	U	144
Macropodidae	*Macropod sp.*	unidentified macropod	P	5
	Macropus giganteus	Eastern Grey Kangaroo	P	102
	Macropus robustus	Common Wallaroo	P	18
	**Petrogale penicillata*	Brush-tailed Rock-wallaby	E1	
	Wallabia bicolor	Swamp Wallaby	P	84
Molossidae	*Mormopterus norfolkensis*	Eastern Freetail-bat	V	17
	Mormopterus planiceps	Little Mastiff-bat	P	2
	Mormopterus sp 1	undescribed mastiff-bat	P	40
	Tadarida australis	White-striped Freetail-bat	P	28
Muridae	*Mus musculus*	House Mouse	U	228

Group	Scientific Name	Common Name	Legal Status	Penrith LGA Count
	Rattus fuscipes	Bush Rat	P	3
	Rattus rattus	Black Rat	U	42
	Rattus sp.	rat	P	13
Ornithorhynchidae	*Ornithorhynchus anatinus*	Platypus	P	3
Peramelidae	*Isoodon/Perameles sp.*	unidentified Bandicoot	P	3
	Perameles nasuta	Long-nosed Bandicoot	P	5
Petauridae	*Petaurus australis*	Yellow-bellied Glider	V	1
	Petaurus breviceps	Sugar Glider	P	54
	Petaurus norfolcensis	Squirrel Glider	V	3
Phalangeridae	*Trichosurus sp.*	brushtail possum	P	55
	Trichosurus vulpecula	Common Brushtail Possum	P	84
Phascolarctidae	*Phascolarctos cinereus*	Koala	V	5
Pseudocheiridae	*Pseudocheirus peregrinus*	Common Ringtail Possum	P	37
Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	V	33
Suidae	*Sus scrofa*	Pig	U	5
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna	P	15
Vespertilionidae	*Chalinolobus dwyeri*	Large-eared Pied Bat	V	4
	Chalinolobus gouldii	Gould's Wattled Bat	P	80
	Chalinolobus morio	Chocolate Wattled Bat	P	71
	Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	4
	Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	13

Group	Scientific Name	Common Name	Legal Status	Penrith LGA Count
	Myotis adversus	Large-footed Myotis	V	10
	Nyctophilus geoffroyi	Lesser Long-eared Bat	P	80
	Nyctophilus gouldi	Gould's Long-eared Bat	P	14
	Nyctophilus sp.	long-eared bat	P	6
	Scoteanax rueppellii	Greater Broad-nosed Bat	V	11
	Scotorepens orion	Eastern Broad-nosed Bat	P	51
	Vespadelus darlingtoni	Large Forest Bat	P	9
	Vespadelus regulus	Southern Forest Bat	P	18
	Vespadelus vulturnus	Little Forest Bat	P	125
Vombatidae	*Vombatus ursinus*	Common Wombat	P	10
Reptilia				
Agamidae	*Amphibolurus muricatus*	Jacky Lashtail	P	23
	Physignathus lesueurii	Eastern Water Dragon	P	10
	Pogona barbata	Eastern Bearded Dragon	P	11
Chelidae	*Chelodina longicollis*	Eastern Snake-necked Turtle	P	14
Colubridae	*Dendrelaphis punctulatus*	Green Tree Snake	P	2
Elapidae	*Demansia psammophis*	Yellow-faced Whipsnake	P	5
	Furina diadema	Red-naped Snake	P	10
	Parasuta dwyeri	Variable Black-naped Snake	P	1
	Parasuta spectabilis	Spectacled Hooded Snake	P	1
	Pseudechis porphyriacus	Red-bellied Black Snake	P	33

Group	Scientific Name	Common Name	Legal Status	Penrith LGA Count
	Pseudonaja textilis	Eastern Brown Snake	P	11
Gekkonidae	*Diplodactylus vittatus*	Eastern Stone Gecko	P	13
Pygopodidae	*Pygopus lepidopodus*	Southern Scaly-foot	P	6
Scincidae	*Cryptoblepharus virgatus*	Cream-striped Shinning-skink	P	17
	Ctenotus robustus	Robust Ctenotus	P	28
	Ctenotus taeniolatus	Copper-tailed Ctenotus	P	21
	Egernia whitii	White's Rock-skink	P	3
	Eulamprus quoyii	Eastern Water-skink	P	28
	Eulamprus tenuis	Bar-sided Forest-skink	P	1
	Lampropholis delicata	Dark-flecked Garden Sunskink	P	80
	Lampropholis guichenoti	Pale-flecked Garden Sunskink	P	76
	Lampropholis sp.	unidentified grass skink	P	10
	Lygisaurus foliorum	Tree-base Litter-skink	P	3
	Saproscincus mustelinus	Weasel Shadeskink	P	3
	Tiliqua scincoides	Common Bluetongue	P	31
Typhlopidae	*Ramphotyphlops nigrescens*	Blackish Blind Snake	P	4
Varanidae	*Varanus sp.*	Unidentified Goanna	P	1
	Varanus varius	Lace Monitor	P	13

Notes: E1=endangered species; V=vulnerable species; P=protected species; U=unprotected species