Flora and Fauna Assessment and accompanying letter

Cumberland Ecology

Attachment B

JBA | 13070

ST. MARYS DUNHEVED PRECINCT

Flora and Fauna Assessment for a Development Application to Fill Dunheved Precinct

For:

DELFIN LEND LEASE

January 2007

Final Report

Cumberland Ecology
PO Box 2474, Carlingford Court 2118

Report No. 4019RP4

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:	David Robertson
Date:	*31 January, 2007*

Table Of Contents

Table Of Contents

Table Of Appendices

List of Figures

Executive Summary

PURPOSE AND OBJECTIVES

The purpose of this report is to provide a Flora and Fauna Impact Assessment on the likelihood of impacts arising from the proposed subdivision, filling and construction of roads and infrastructure of the north and South Dunheved Precincts of the St Marys Property (SMP) (referred to hereafter as the "subject site").

The objectives of this flora and fauna assessment are:

- To describe vegetation communities within the subject site;
- To describe fauna habitats within the subject site;
- To assess the likelihood that threatened flora and fauna listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and the Commonwealth *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act) could occur within the subject site; and
- To formally assess the impacts of the proposed development on threatened species and communities in terms of Section 5A of the *Environmental Planning and Assessment Act 1979* (the seven part test) and determine the need for a Species Impact Statement (SIS);

SURVEY METHODS

The surveys that were conducted for flora and fauna in 2004 for the Biodiversity Assessment were used to determine the species that occur on the subject site. A site inspection was conducted in 2006 to confirm that the conditions of flora and fauna habitats had not substantially altered since the previous surveys.

RESULTS

Vegetation

Three endangered ecological communities occur in the study area: River-flat Eucalypt Forest (RFEF), Shale-gravel Transition Forest (SGTF) and Cumberland Plain Woodland

(CPW). These generally occur as scattered indigenous tree cover or have experienced past disturbance and have canopy gaps. One exception is a patch of RFEF with the canopy intact, however, this and all patches of native woodland on the subject site have a high edge to area ratio and are vulnerable to edge effects such as weed invasion. The remainder of the subject site comprises exotic grassland..

Two threatened plant species, *Pultenaea parviflora* and *Grevillea juniperina* subsp. *juniperina*, have been detected in relatively low numbers on the subject site compared with the very large numbers in the Regional Park. A regionally significant flora species, Blue Box (*Eucalyptus baueriana*) has also been detected in the north of the subject site.

Fauna Habitats

The subject site provides degraded woodland/forest, wetland and exotic grassland habitats. These are likely to be used by common fauna species that have adapted to disturbed environments but may also be used by a number of threatened fauna species that have been detected on the SMP including

IMPACTS

A small number of threatened flora species; *Pultenaea parviflora* and *Grevillea juniperina* subsp. *juniperina* will be removed by the proposed works. The patches of CPW and SGTF and small strips of RFEF within Dunheved Precinct will be removed by the proposal. However, these species occur around the margin of the precinct and any areas of CPW and RFEF or threatened plants that may be removed by these proposed works are of minimal conservation value due to the degraded state of the habitat.

The removal of such vegetation is not likely to constitute a significant impact in terms of the assessment of significance as the proposed works will not threaten the viability of local occurrences of the species and the community due to their extensive occurrences in the Regional Park.

Precautionary assessments of significance have been completed for the threatened bat species considered to have the potential to utilise identified buildings for roosting habitat based on their known occurrence on the SMP:

- Eastern Bentwing Bat (*Miniopterus schriebersii oceanensis*);
- Greater Broad-nosed Bat (*Scoteanax rueppellii*); and
- Eastern Freetail Bat (*Mormopterus norfolkensis*).
- These assessments indicate that no significant impacts on the aforementioned species are likely to occur as a result of the removal of this marginal potential habitat, providing that a fauna protection protocol is followed.

Indirect impacts may also result from the proposed development such as increased water and nutrient runoff leading to increased weed invasion and disturbance to the aquatic habitats of South and Ropes Creeks. These impacts will be mitigated through the implementation of the Soil and Water management Strategy.

CONCLUSIONS AND RECOMMENDATIONS

The works will result in clearance of native vegetation, including the endangered ecological communities CPW SGTF and RFEF, and threatened plants *Pultenaea parviflora,* and *Grevillea juniperina* subsp. *juniperina*. This vegetation constitutes known habitat for the Cumberland Land Snail and foraging habitat for threatened bat species known from the site. However, this does not constitute a significant impact due to the conservation of this vegetation within the Regional Park.

The development of the Dunheved Precincts is to proceed as contemplated by SREP 30, the EPS and the adopted North and South Dunheved Precinct Plan. The foremost mitigation measure for the proposed development of the Dunheved Precincts and the broader SMP is the establishment of the 900 hectare Regional Park, which will conserve extensive, viable tracts of forest and woodland. The impacts of vegetation clearance will be balanced by the creation and maintenance of the 900 ha Regional Park, in which habitats for all threatened flora and fauna are known to occur. The clearing of vegetation and associated works for the proposed development is unlikely to have a significant impact upon threatened species, communities and habitat of conservation significance.

Chapter 1

Introduction

1.1 Purpose

Cumberland Ecology has been commissioned by Delfin Lend Lease to provide a Flora and Fauna Impact Assessment of the potential impacts arising from the proposed development in the North and South Dunheved Precincts of the St Marys Property (SMP) on Part Lot 2, DP 1079444 in the Penrith and Blacktown Local Government Area (referred to hereafter as the "subject site"). The proposed development includes:

- filling of land above the 1 in 100 year flood line;
- Subdivision and associated works;
- construction of roads and drainage infrastructure;
- rehabilitation of the riparian corridors on the site;
- landscaping for both the North and South Dunheved Precincts ; and
- removal of the approach embankment to the old munitions bridge over South Creek, located to the west of the Dunheved Precinct. This will involve excavation.

This report provides the assessments required under Section 5A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) of the potential significance of the proposed land use alterations upon threatened flora and fauna.

The objectives of this flora and fauna assessment include:

- To describe vegetation communities within the affected areas;
- To describe fauna habitats within the affected areas;
- To assess the likelihood that threatened flora and fauna could occur within the affected areas;
- To formally assess the impacts of the proposed development in terms of Section 5A of the EP&A Act (the 7-part test) and determine the need for a Species Impact Statement (SIS); and
- To provide recommendations (where required) in regards to impact mitigation.

1.2 Terminology

This report uses the following terminology:

- **Development** as defined in the EP&A Act;
- **Subject site** means the area in North and South Dunheved Precincts, referred to as the Dunheved Precinct;
- **Study area** is the subject site and any additional areas that are likely to be affected by the proposal, either directly or indirectly, which include open space to the west along South Creek, the Regional Park bordering the precinct on three sides and the sewage treatment plant (STP) and proximate sections of the original Ropes Creek channel and diverted concrete channel;
- **Locality** is the area within a 5km radius of the subject site;
- **Region** is defined as the Cumberland Plain of western Sydney;
- **Bioregion** is defined as the Sydney Basin Bioregion, and
- **Subject species** means those threatened species, populations and ecological communities that are known to occur, or considered likely to occur in the study area.

1.3 Background

1.3.1 Dunheved Precincts

Development in this area will be predominantly for the purposes of employment only. The Dunheved Precincts will contain a variety of building types and uses. Although divided by the Local Government Boundary (LGA) of Penrith and Blacktown, the site will be planned and treated as one area. The Precincts are surrounded on three sides by Regional Park. The St Marys Sewage Treatment Plant (STP) is located adjacent to the South Dunheved Precincts on the south-eastern side.

Development will necessitate the construction of a new access road along a pre-agreed route. This route, entering on the northern-western boundary, is a designated entry under SREP 30. The area is relatively clear of trees and has undergone extensive clearing and modification. All other construction will be contained within Dunheved Precincts and will entail building the necessary facilities for an employment precinct. The building type will be appropriate for light industries employing in the order of 600 people (noxious or hazardous industries will not be permitted). The needs of the local employees will be served by ancillary retail in the form of food and beverage outlets.

C:\GIS\Dunheved st marys DR\2007 31/1/07

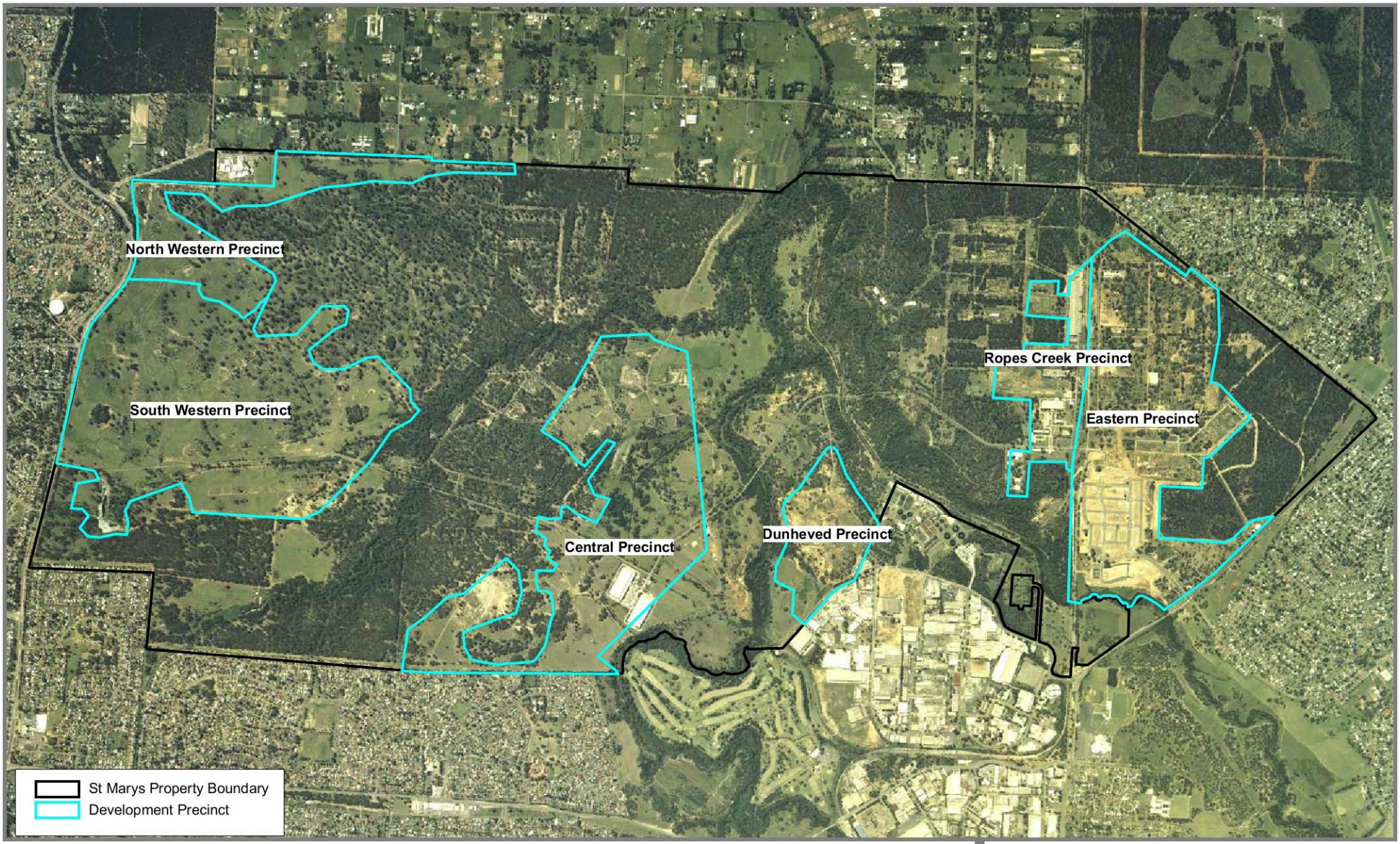

Figure 1.1 Aerial of the St Marys Property and Development Precincts

Cumberland Ecology

1.3.2 Register of National Estate

The majority of the area of the proposed Regional Park is listed under the Australian Heritage Commission Register of National Estate. The vegetation within this area is referred to in the listing as an important remnant of the vegetation communities that were once widespread on the Cumberland Plain and include Cumberland Plain Woodland and Castlereagh Woodland. The Register of National Estate description also makes reference to significant flora and fauna, including threatened plants and examples of the Cumberland Plain Woodland bird assemblage. The developments proposed for the Dunheved Precincts will adjoin National Estate land along the eastern boundary. The majority of the Regional Park immediately adjoining Dunheved Precincts is not listed on the AHC Register of National Estate.

Chapter 2

Methods

2.1 Current study

2.1.1 Flora and Fauna Literature and database review

Literature covering flora and fauna of the SMP and other relevant literature were reviewed for information that was relevant to the subject site. Recent studies from the area were reviewed to obtain background information and reference material. Threatened species, populations and ecological community records from within the locality, covering a 10 km radius, were obtained from the Atlas of NSW Wildlife (DEC (NSW) 2005)

2.2 Previous studies utilised in this assessment

2.2.1 North and South Dunheved Biodiversity Assessment

The area surveyed for the North and South Dunheved Biodiversity Assessment is equivalent to the study area for this proposal. Hence the surveys completed for the Biodiversity Assessment have been utilised in the production of this impact assessment. A site inspection was conducted in August 2006 to confirm that flora and fauna conditions had not altered since the 2004 surveys. No additional flora survey was required for this assessment.

The methods used during 2004 vegetation mapping and targeted threatened flora species surveys are described below:

2.2.2 Flora surveys

i. Vegetation Communities

The vegetation of the SMP has been mapped on a number of occasions, but most recently by NSW NPWS (NSW NPWS 2002b). The NPWS vegetation map shows the types of plant communities and the extent of canopy disturbance, as mapped from aerial

photographs with minimal ground survey. For the purposes of providing accurate vegetation maps in this report, the NPWS vegetation map units have been verified by field survey by Cumberland Ecology.

ii. Threatened Species

The distribution of threatened plant species within the study area was mapped by the following procedures:

- ground-truthing and up-dating previous mapping (Gunninah 1997);
- mapping of clumps of threatened plants where previous data was not available;
- targeted searches for threatened species, conducted in April 2004; and
- collection of additional data on the relative abundance (% cover) of each species within the Dunheved Precincts development area.

2.2.3 Fauna surveys

There is substantial knowledge of the types of fauna that occur at the SMP (Kinhill 1995, Gunninah 1997, Gunninah 1991, Gunninah 1994, Gunninah 1995, Gunninah 1996). ERM also conducted fauna surveys within the Eastern Precinct of the property in 2001. The availability of this data from previous surveys and the knowledge of the highly disturbed nature of habitats within the Dunheved Precincts dictated that the fauna surveys for the Biodiversity Assessment were on a relatively small scale. They were designed to verify pre-existing data and to address minor gaps in existing information such as surveying for the Cumberland Land Snail that was not listed at the time of Gunninah surveys. Targeted searches were consequently made in the Dunheved Precincts for threatened bat and frog species in April 2004, for the Cumberland Land Snail in June 2004 and for bird species in August 2004. The locations of these surveys are shown in Figure 2.1.

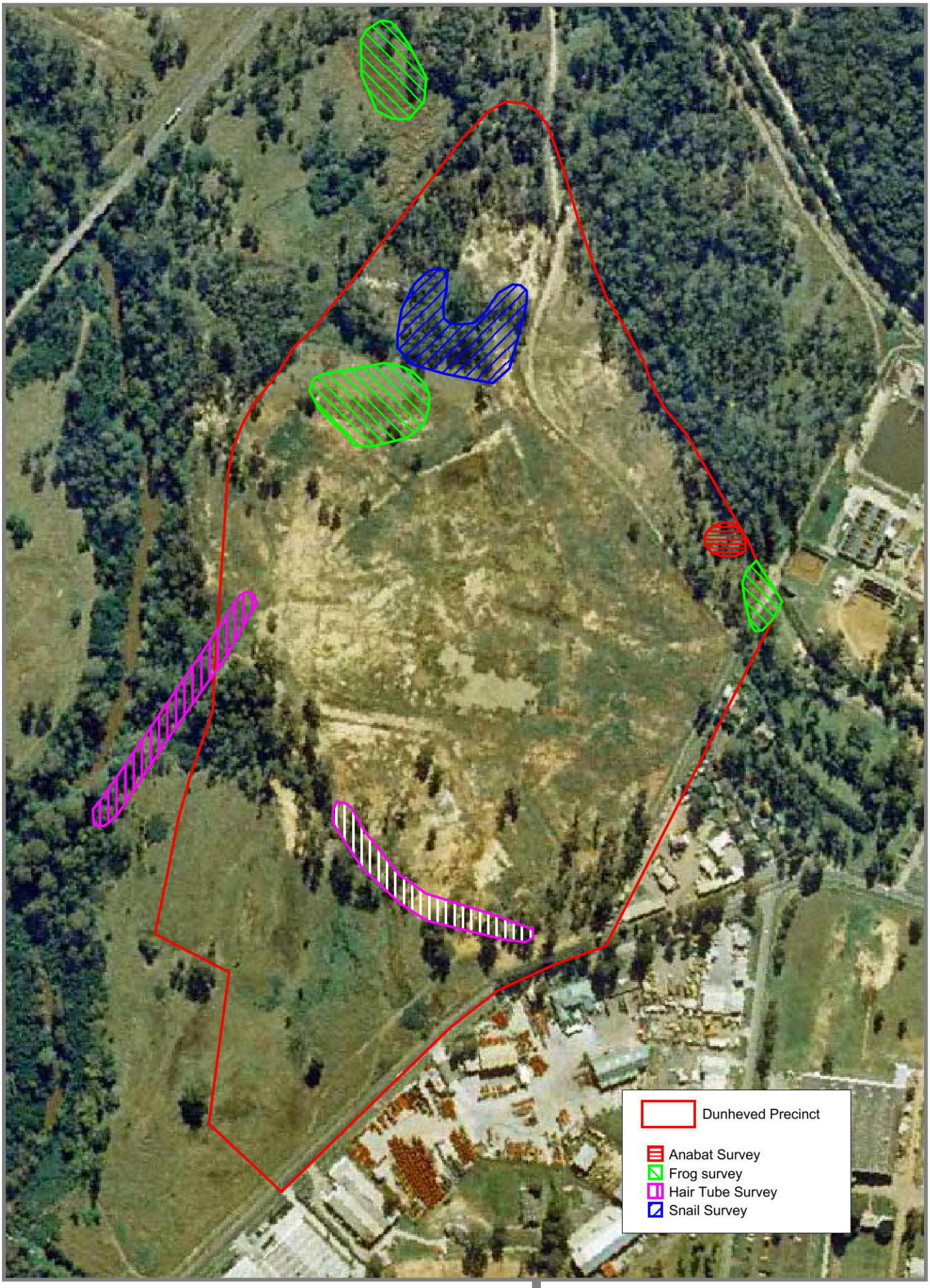

Figure 2.1 Survey Locations

Cumberland Ecology

i. Habitat Assessment

A habitat assessment and general site assessment was conducted by ecologist Vanessa Bain in August 2006, to identify potential areas where threatened fauna species could reside or forage.

Vegetation surveys from the 2004 surveys and previous surveys were used to identify and assess the distribution of habitat types on the subject site and within the study area. The diversity of microhabitat used by native fauna was also assessed in the subject site and study area. The following habitat characteristics were documented:

- the presence of nesting/shelter sites such as tree hollows, hollows logs, decorticating bark and rocks;
- the presence of koala feed trees in the study area;
- cover abundance of ground, shrub and canopy layers and flowering characteristics of shrubs and trees; and
- rocks and basking sites for reptiles.

Habitat usage by fauna was documented through analysis of tracks, scats, diggings and other traces. Traces of subject species were the focus of these surveys. Surveys were conducted opportunistically during the entire survey period and included:

- searches for owl and koala pellets and other scats;
- searches for raptor nests;
- searches for tracks and diggings;
- inspection of road kills; and
- searches for other indicators such as scratches on trees and runways.

Due to the disturbed nature of the subject site and extensive fauna data which is available for the Dunheved Precinct, no trapping or other labour intensive types of survey was warranted. Threatened species that are potentially affected from the proposed development were identified from other fauna surveys of the SMP, as identified in the Biodiversity Assessment (Cumberland Ecology 2005a).

Chapter 3

Results

3.1 General Species Diversity

Species diversity in Dunheved Precinct itself is relatively low due to the limited available habitat for native flora and fauna. Soil remediation and other disturbance have resulted in low species diversity in the ground cover, and past clearing has limited the forested areas to the margins of the site. Notwithstanding this, hardy native species and a small number of threatened flora and fauna species utilise the available habitats on the subject site, as described below.

3.2 Vegetation Communities

The vegetation of the Dunheved Precinct includes regrowth woodland mainly in degraded condition with scattered indigenous tree cover, and exotic grassland. Endangered Ecological Communities (EECs) occurring in the precinct have been assessed in previous studies and include:

- River Flat Eucalypt Forest (this EEC listing includes and replaces the listing for Sydney Coastal River-flat Forest, as referred to in previous reports);
- Cumberland Plain Woodland; and
- Shale Gravel Transition Forest.

These EECs occur in patches across Dunheved Precinct (Figures 3.1). These patches are separated by existing buildings and remediated areas, which show varying degrees of woodland regeneration. Some patches are bare, with exposed soil and predominately exotic grassland, while other patches have dense shrubland and minimal trees. Although these communities are generally present within the study area, the affected areas within the subject site are disturbed and predominantly comprised of occasional trees, grass and a sparse shrubby understorey.

3.2.1 River Flat Eucalypt Forest

River Flat Eucalypt Forest occurs along the banks and flats of the original Ropes Creek channel in the form of Alluvial Woodland. Only small areas of this predominantly degraded

vegetation type occur within the Dunheved Precincts along the eastern fringes around the STP outflow, along South Creek and an isolated patch is located along the drainage line through the Precincts.

In the study area, River Flat Eucalypt Forest is generally dominated by Forest Red Gum (*Eucalyptus tereticornis*), Cabbage Gum (*E. amplifolia*) and Rough-barked Apple (*Angophora floribunda*). Pockets of She-oak (*Casuarina glauca*) Woodland also occur.

The structure and composition of the River Flat Eucalypt Forest is variable. Both native and exotic tall shrubs and trees occur throughout this community. Along the banks of South Creek and the outflow from the STP outside the Dunheved Precincts boundary, it is dominated by Forest Red Gum (*E. tereticornis)* with other common (sometimes co-dominant) species including Snow-in-summer (*Melaleuca linariifolia*), Cabbage Gum (*E. amplifolia*), Blue Box (*E. baueriana*) and Rough-barked Apple (*Angophora floribunda*). The Blue Box occurs predominantly in the north-western corner of the precinct. The understorey varies from cleared grasslands to native shrubs to dense weed infestations.

3.2.2 Cumberland Plain Woodland

The form of Cumberland Plain Woodland present on the SMP is known as Shale Plains Woodland. Cumberland Plain Woodland occurs in the north of the Dunheved Precincts and occurs in highly degraded patches to the north-west of the precinct and along the drainage line. It is dominated by Grey Box (*Eucalyptus moluccana*) with Forest Red Gum (*E. tereticornis*), Rough-barked Apple (*Angophora floribunda*) and Swamp Oak (*Casuarina glauca*). The trees are generally relatively young and appear to be regrowth dating from the 1940s and afterwards. They are generally too young to provide hollows for hollow-dwelling fauna species. The understorey is largely sparse or absent. The sparse shrub layer includes juvenile *Acacia parramattensis, Angophora floribunda* and *Dillwynia sieberi*. The ground layer is dominated by exotic grasses including *Cynodon dactylon* (Couch), *Eragrostis curvula* (African Lovegrass), and native grasses *Aristida vagans* and *Microlaena stipoides* (Weeping Grass).

3.2.3 Shale/Gravel Transition Forest

Shale-Gravel Transition Forest (SGTF) occurs mainly in the north of the Cumberland Plain, on gravel deposits over shale soils. SGTF has a dominant canopy species of Broad-leaved Ironbark (*Eucalyptus fibrosa*) but Grey Box (*E. moluccana*) and Forest Red Gum (*E. tereticornis*) may also occur. Only small patches of SGTF occur within the Dunheved Precincts, on the south-eastern edge of the site. The community is highly degraded and lacks most of the characteristic understorey species.

3.2.4 Exotic Grassland

Exotic grassland dominated by Couch (*Cynodon dactylon*) and other exotic grasses and herbs occurs in both the northern and southern sections and throughout the cleared areas of the Dunheved Precinct.

The approach embankment to South Creek contains exotic grassland and clumps of dense noxious weeds such as Blackberry and Lantana, particularly in the region of the creek. This area is highly disturbed, with evidence of past soil excavation.

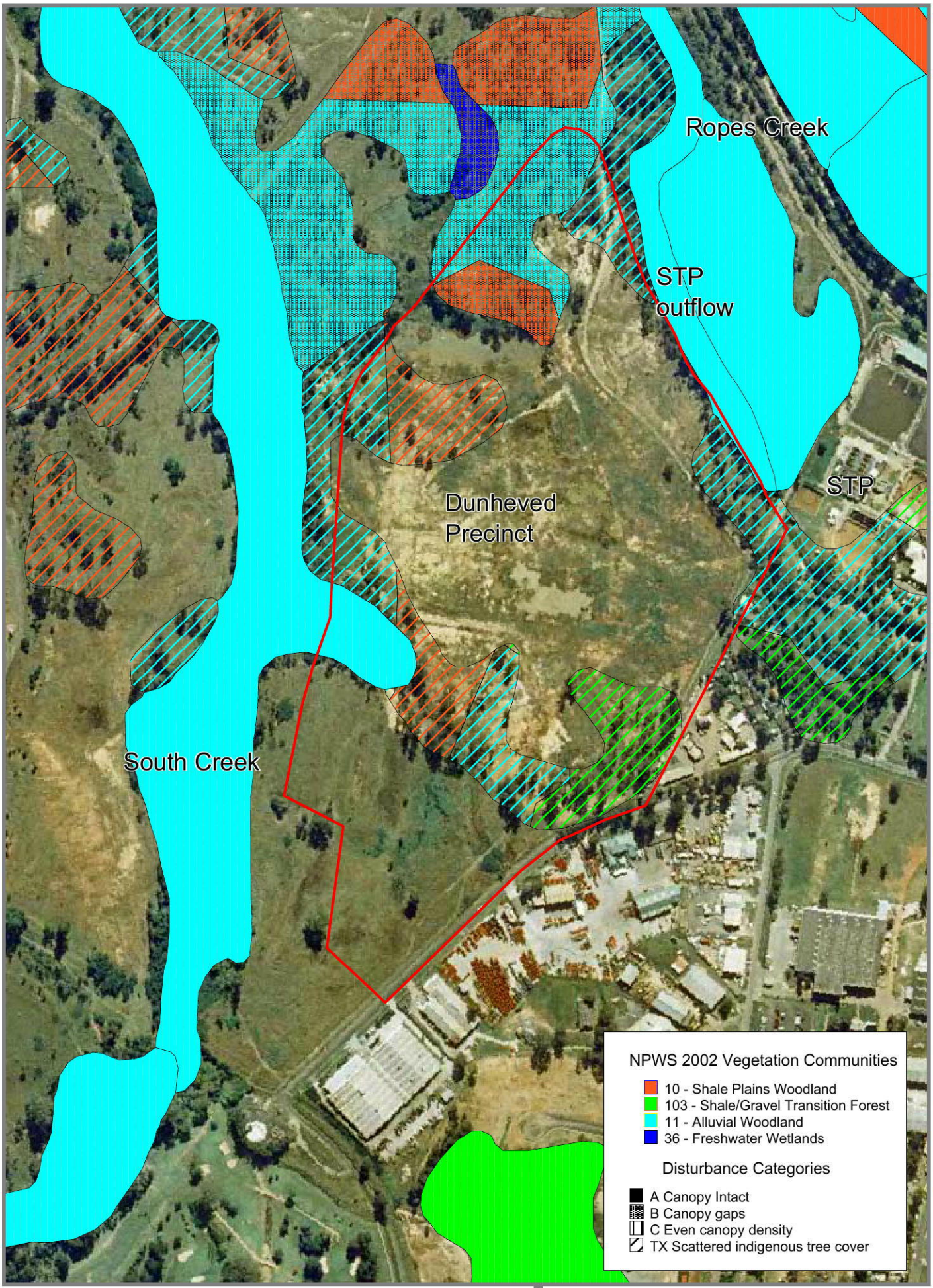

Figure 3.1 Threatened Communities and Development Plan

Cumberland Ecology

3.3 Flora Species

The surveys conducted on the subject site revealed a low diversity of flora species, many of which are exotic. See Appendix A for the species that have been detected, as well as those detected in other parts of the SMP, and Blacktown and Penrith LGAs that indicate other species that may occur there but were not detected during the surveys.

3.3.1 Regionally Significant and Threatened Flora

Some individuals each of Blue Box (regionally significant), *Pultenaea parviflora* and *Grevillea juniperina* subsp. *juniperina* may be affected by the proposed development. The habitat use of each species is discussed below.

i. Grevillea juniperina subsp. juniperina

Grevillea juniperina subsp. *juniperina* is a dense shrub, 0.5-1.5m tall, found only in Western Sydney (Robinson 1991). The distribution is bounded by St Mary's, Londonderry and Prospect. It occurs on red sandy to clay soils in Cumberland Plain Woodland and Castlereagh Woodland. It is found in localised and small populations.

Several *G. juniperina* subsp. *juniperina* plants occur on the subject site. This species was found predominantly in the Cumberland Plain Woodland in the northern tip of Dunheved but plants were also found along the eastern edge.

ii. Pultenaea parviflora

Pultenaea parviflora is a small shrub to 1m which is endemic to the Cumberland Plain. It occurs in the Windsor – Penrith – Dean Park area, with outlying populations at Kemps Creek and Wilberforce. It is conserved within Scheyville National Park, Windsor Downs Nature Reserve and Castlereagh Nature Reserve. It occurs in dry heath areas within Castlereagh Ironbark Forest on Tertiary alluvium and laterised clays.

Only one individual plant of this species was recorded on site, along the eastern edge of the development area.

iii. Blue Box

Blue Box is a regionally significant tree species (NSW NPWS 1997) once common on the alluvium of the Georges River between Liverpool and Milperra (James et al. 1999). It is a slow growing tree that reaches about 20m high. A significant portion of the Blue Box distribution is within Western Sydney (NSW NPWS 1997). This species has also been recorded in Menai, Camden and Fairfield.

A few individual mature trees and some saplings occur on the north-western edge of the subject site boundary. Mostly this patch of Blue Box occurs outside the development area along South Creek. Blue Box is part of the floristic composition of the Sydney Coastal River Flat Forest, an endangered ecological community. This community occurs along the creeks and drainage lines within the SMP.

3.4 Fauna Species

Extensive fauna surveys have been conducted on the SMP, including the current study area, during a number of extensive studies over the last 10 years. Previous studies and database records are considered adequate to provide a list of fauna species which potentially occur on the SMP (see Appendix A).

3.4.1 Fauna Habitats

Habitats of value to native fauna are generally associated with the regrowth woodland and the creek lines across the study area. These habitats will be almost entirely conserved within the Regional Park. Disturbed habitats generally support populations of native and exotic species that are common in urban/rural environments. The three fauna habitats that occur in the study area are:

- Woodland habitats;
- Disturbed habitats; and
- Wetland habitats.

3.4.2 Woodland Habitats

Woodland habitats occur throughout most of the Regional Park and provide sheltering, foraging, nesting and breeding habitat for most fauna that occur within the study area. These habitats are extensive within the SMP and facilitate fauna movement within the property and between external areas of habitat. These habitats will be protected in the long term within the Regional Park.

Within the woodland communities, flowering eucalypts, paperbarks and smaller shrubs provide foraging resources for nectivorous mammals and birds. The Sugar Glider (*Petaurus breviceps*) will feed on nectar and pollen when available (Suckling 1995) and the Common Ring-tail Possum (*Pseudocheirus peregrinus*) will also feed on flowers (McKay and Ong 1995). Birds such as honeyeaters, would also feed on the nectar resources. Several bat species may also forage over the canopy (Churchill 1998).

The density of the shrub layer is variable and can virtually be absent in some areas where a dense paperbark canopy prevents sunlight penetration. Other areas support a grassy

understorey with a few, scattered shrubs and an open low shrub layer with or without a tall paperbark shrub layer can also occur. Many of the low shrub species exhibit a relatively dense habit and/or contain spines (eg Blackthorn *Bursaria spinosa*) that afford protection to some of the smaller woodland birds such as fairy-wrens and finches.

Given the regrowth nature of the woodlands within the study area, there are very few hollow-bearing trees, and therefore very little in the way of nesting habitat for hollow-dependent fauna. Some hollow-dependent species, including Sulphur-crested Cockatoos, Galahs and Brushtail Possums, occur on the St Marys Property. However, evidence suggests it is likely that only small numbers of these species reside/breed on the property. Most of the mature, hollow-bearing trees on the Dunheved Precincts occur along the creeks where there has been less clearing and modification.

3.4.3 Disturbed Habitats

Disturbed grassland habitats occur throughout most of the Dunheved Precincts and in sections of the proposed Regional Park. These areas are of the least value to native fauna, with the exception of the kangaroos. Species that commonly occur in these habitats are generally abundant in urban and agricultural areas where the native vegetation has been significantly modified or removed, or they are species that typically favour foraging on grassland. Such species include the Australian Raven (*Corvus coronoides*), Crested Pigeon (*Geophaps lophotes*), Galah (*Cacatua roseicapilla*) and Eastern Grey Kangaroo (*Macropus giganteus*).

3.4.4 Wetland Habitats

Wetland habitats within the subject site are limited and occur only where previous works have involved excavation of areas of soil, leaving shallow depressions that form ephemeral water bodies. Wetland habitats offer foraging and roosting/sheltering resources for wetland birds, reptiles, bats and amphibians. Several small artificial wetlands also occur in parts of the Regional Park. The habitats in these wetlands are characterised by dense beds of Cumbungi (*Typha orientalis*) and *Elaeocharis* sp. with little open water habitat. They do not support significant populations of wetland birds, though some wetland bird species do utilise the habitats to some extent. The wetland/riparian habitat along Ropes Creek is also limited as the majority of the creek is now contained within a concrete canal. Regardless of these limitations, reed beds and streamside vegetation are present the study area and are likely to provide resources for some species, particularly those common in artificial environments.

Within the subject site there is at least one artificial wetland, an ephemeral water body created from past excavations. This shallow wetland dries out in winter but would provide marginal wetland habitat during the wetter months. This habitat is surrounded by beds of Cumbungi and *Elaeocharis* sp and would provide seasonal habitat for birds, frogs and bats. South Creek adjacent to the subject site would provide substantial habitat for birds,

frogs and bats that occur within the study area. Although highly disturbed and polluted, South Creek may also act as an important habitat corridor for these species.

3.5 Threatened fauna species

In spite of the disturbance, some threatened fauna species have potential habitat on the subject site:

- Bats;
- Birds;
- Reptiles and Amphibians; and
- Invertebrates.

3.5.1 Bat species

Previous Anabat surveys conducted within riparian habitats and open woodland/forest habitats in the western precinct in 2002 identified 12 bat species, including the threatened Eastern Freetail-bat and the Eastern Bent-wing Bat (ERM 2003). These species are also likely to utilise habitats in the study area. The Anabat surveys for this assessment were conducted on the sewage outflow near the Dunheved Precincts Boundary and on Ropes Creek in the Eastern Precinct and detected 5 or 6 species. A call from Dunheved Precincts was the first probable record of the threatened Large-footed Myotis for the study area. The results of the 2001 and 2004 survey periods are shown in Appendix E.

3.5.2 Bird Species

The bird species recorded at the SMP include species that are common to disturbed and artificial habitats, woodland species and wetland species. Within the study area, disturbed habitats and woodland habitats are present but wetland habitats are very limited. Therefore, wetland birds are generally absent from the study area.

Within the disturbed grasslands and open woodland, common bird species include the Australian Magpie-lark (*Grallina cyanoleuca*), Australian Raven (*Corvus coronoides*) and the Noisy Miner (*Manorina melanocephala*). These species are known to persist in urban and rural environments and can outcompete smaller forest birds at the interface with woodland habitats. Emus (*Dromaius novaehollandiae*) are also present at the site within the disturbed grassland and open woodland areas.

Forest species that are generally absent from the open grassland and urban environment include Eastern Spinebill (*Acanthorphynchus tenuirostris*), Eastern Shrike-tit (*Falcunculus frontatus*) and Eastern Yellow Robin (*Eopsaltria australis*).

Most of the species detected on the Dunheved Precincts during the 2004 surveys were species common to disturbed and open areas. Noisy Miners had colonised the area, and the Australia Raven and Pied Currawong were found throughout the subject site. Eastern Rosellas and Rainbow Lorikeets, that are also successful in disturbed and urban habitats, were also present in high numbers. Only a few species of small bush birds that prefer denser more protected habitats were detected, the Superb Fairy Wren, Spotted Pardalote and the Striated Pardalote, and only a few individuals inhabited the area. Where there is less habitat modification and no Noisy Miners it is possible to detect a great number of small Australian bush birds. On another part of the SMP in a less disturbed habitat, surveys conducted by Cumberland Ecology in the south-western part of the Regional Park found over 30 species of bush birds, including the Eastern Spinebill, Eastern Shrike-tit and the Eastern Yellow Robin.

3.5.3 Reptiles and Amphibian species

Reptiles that have been recorded at the SMP and are known to occur, or are likely to occur, within the study area include the Red-bellied Black-snake (*Pseudechis porphyriacus*), Eastern Brown Snake (*Pseudonaja textilis*), Bearded Dragon (*Amphibolurus barbatus*) and the Delicate Garden Skink (*Lampropholis delicata*). These species are generally common to open grassland/open woodland habitats.

A range of frogs have been recorded at the SMP, some of which are likely to occur within the study area. However, given the lack of suitable breeding habitat for most species of frogs, only populations of common and widespread frog species are expected to occur.

Previous surveys at the SMP have identified frog species that can often be found in disturbed or artificial environments such as farm dams. These species include the Common Eastern Froglet (*Crinia signifera*), Striped Marsh Frog (*Limnodynastes peronii*) and Verreaux's Tree Frog (*Litoria verreauxii*). Targeted surveys within the western portion of the SMP were conducted in 2001 for the Green and Golden Bell Frog (*Litoria aurea*). This species however, was not detected.

During the 2004 survey Dunheved species of frogs were detected, *Crinia signifera* and *Limnodynastes peronii*. Targeted searches were conducted for Green and Golden Bell Frogs but none were detected within the Dunheved Precincts. Other common species are also likely to occur within suitable habitat in the study area.

3.5.4 Invertebrate species

The shells of the Cumberland Land Snail were found in patches of Cumberland Plain Woodland in the northern part of Dunheved Section. In total, thirteen individual shells were recorded. Twenty-five percent of the trees searched had snail remains amongst the soil and leaf litter at the base of the trunk. The shells of the Cumberland Land Snail were found in patches of Cumberland Plain Woodland in the northern part of Dunheved Section.

In total, thirteen individual shells were recorded. Twenty-five percent of the trees searched had snail remains near the base of the trunk.

Chapter 4

Impact Assessment

4.1 Impacts of the Proposal

The proposed development occurs within a highly degraded area, primarily exotic grassland that has experienced high levels of disturbance to the original soil and vegetation structure. Development is proposed for the entire subject site and will involve the removal of all native vegetation on the subject site. Indirect impacts may also result from the proposed development such as increased water and nutrient runoff leading to increased weed invasion and disturbance to the aquatic habitats of South and Ropes Creeks.

4.1.1 Impacts on vegetation communities

Three vegetation communities that occur on the subject site have been identified as endangered ecological communities: CPW, RFEF and SGTF. Assessments of significance were conducted for these communities and found that the proposed development would not have a significant impact on the local occurrence of the communities. The main reasons for this are:

- The communities generally occur in a degraded state on the subject site, usually as patches of indigenous tree cover;
- The patches are relatively small and do not connect to other habitat areas; and
- Much larger areas of the communities will be conserved within the Regional Park, including large areas with intact canopy.

Table 4.1 summarises the area of each community to be cleared by the proposal and compares them with areas in the Regional Park.

The removal of vegetation and earthworks at the approach embankment to South Creek, will not remove an area of EEC. The removal of associated noxious weeds in this area will be of benefit to the degraded RFEF surrounding South Creek.

Table 4.1 AREAS OF EACH VEGETATION COMMUNITY WITHIN THE DUNHEVED PRECINCTS AND THE REGIONAL PARK

Community	Dunheved (ha)	Regional Park (ha)
Cumberland Plain Woodland	2.6	419.1
Shale-gravel Transition Forest	1.5	51.8
River-flat Eucalypt Forest	5.3	217.7

4.1.2 Impacts on threatened flora species

Assessments of significance were conducted for the threatened species *Grevillea juniperina* subsp. *juniperina* and *Pultenaea parviflora*. Although these species are not likely to persist on the subject site once work begins on the proposed development, the large representation of these species within the Regional Park (hundreds of thousands for *G. juniperina* and tens of thousands for *P. parviflora*) would allow local populations of each species to persist. Therefore the proposed development will not have a significant impact on these species.

4.1.3 Impacts on fauna species

The development of the subject site would result in the loss of grassland habitat for the kangaroo and emu populations of the SMP. However, this has been addressed by the Macrofauna Management Plan (MFMP) (Cumberland Ecology 2006) which was endorsed by DEC and implemented in 2006. The objectives of the MFMP are to reduce the population, through fertility control, of macrofauna to a sustainable level for containment in the 900 ha Regional Park, while protecting the endangered woodland communities present.

The removal of the existing woodland, forest and wetland areas from the subject site will result in the removal of potential habitat for Speckled Warbler, Diamond Firetail, Black Bittern, Koala, Microchiropteran bats, Grey-headed Flying-fox, Green and Golden Bell Frog and known habitat for the Cumberland Land Snail. Assessments of significance were conducted for these species and found that the proposed development was not likely to have a significant impact on local populations of the species for any or a combination of the following reasons:

- The species had not been detected on the subject site;
- The habitat on the subject site was in poor condition and not likely to be used by the species;
- The species was mobile and likely to only use the subject site as part of a larger foraging range; and

- The Regional Park provided large areas of habitat in good condition.

4.2 Mitigation Measures

Mitigation measures to minimise the impacts of the proposed development have been developed during the precinct planning process. These mitigation measures have been designed to ensure that species, communities or habitats of conservation significance are not compromised and will not be significantly affected by the proposed development. The foremost mitigation is the establishment of the 900 hectare Regional Park, which will conserve extensive, viable tracts of forest and woodland. It will also conserve habitats of threatened and significant species.

Other mitigation measures relevant to the subject site include:

- Retention and enhancement of a Riparian Corridor along South Creek and its tributary running through the South Dunheved Precinct;
- Weed management across the SMP and specifically in the Dunheved Precincts (Cumberland Ecology 2005c);
- Domestic and feral animal management across the SMP and specifically in the Dunheved Precincts (Cumberland Ecology 2005b);
- Management of Macrofauna (Eastern Grey Kangaroos, Red Kangaroos and Emus) (Cumberland Ecology 2006);
- Tree retention where possible, particularly near to the creek and STP outflow;
- Water cycle management to maintain or improve quality of water within creek systems in the SMP. Drainage basins will be constructed in the Precinct to treat stormwater while providing habitat for a range of fauna;
- Use of local provenance plant species in revegetation work on the SMP; and
- Native seed collection and storage by qualified botanists, to be replanted as part of the landscaping. Previous collection has been undertaken by Greening Australia under an existing licence, a current licence for this collection is awaiting endorsement by DEC.

Provision has been made to maintain habitat linkages across the wider study area adjacent to the subject site and to provide some potential linkages from the central to the eastern areas of the Regional Park.

4.2.1 Native Fauna Rehabilitation and Protection-

During the construction phase, if trees and other vegetation need to be cleared, native fauna rehabilitation and protection will be considered. The aim of this protocol is to provide for the protection and humane removal of any native fauna disturbed by the clearance operation.

The majority of trees in the study area lack tree hollows and for this reason, it is not anticipated that much wildlife will be disturbed by the minimal clearance operation. Animals such as birds are expected to move away from the areas to be cleared and are not expected to need human assistance to move to safe areas. However, there is still some low potential for a variety of less mobile native fauna to be impacted by the clearance and need to be moved to safe areas.

Provisions have been made to protect such immobile native fauna by the following means:

- All persons working on the site will be briefed about the possible fauna present at the time of construction, and what procedures should been undertaken in the event of an animal being injured or disturbed;
- A qualified animal rescue person will be on call at all times during clearing;
- Immediately prior to clearing a brief pre-clearance survey will be made for immobile animals that could be killed or injured by the felling of trees. The inspection will be made by a suitably qualified person;
- If any such animals are detected within trees, the trees will not be cleared until the animals have moved from the trees of their own volition;
- Animals disturbed or dislodged during the clearance but not injured will be assisted to move to vegetation close by within the Regional Park; and
- If animals are inadvertently injured during the vegetation clearance the wildlife carer will be responsible for taking appropriate steps to humanely treat the animal.

Chapter 5

Conclusions and Recommendations

The proposed development within the Dunheved Precincts will result in the clearance of all patches of disturbed CPW, RFEF and SGTF which includes some threatened flora species, particularly:

- *Grevillea juniperina* ssp. *juniperina; and*
- *Pultenaea parviflora.*

The vegetation to be cleared also houses foraging habitat to some threatened species, especially species of microchiropteran bats.

This report has assessed the likely impacts of the proposed filling, subdivision and construction of associated infrastructure and new access roads for Dunheved Industrial Precinct.

It will also entail clearing of some threatened plants (*Grevillea juniperina* subsp. *juniperina* and *Pultenaea parviflora*) and will remove foraging habitat for some native woodland fauna. Macrofauna, including kangaroos and emus, will be managed throughout the development areas as specified in the approved Macrofauna Management Plan. No threatened birds, frogs or arboreal or ground-dwelling mammals were detected on subject site. Field surveys recorded the threatened Cumberland Land Snail and two species of threatened bats within or close to the boundaries of the Dunheved Precincts.

The development of the Dunheved Precincts is to proceed as contemplated by SREP 30, the EPS and the adopted North and South Dunheved Precinct Plan. The foremost mitigation measure for the proposed development of the Dunheved Precincts and the broader SMP is the establishment of the 900 hectare Regional Park, which will conserve extensive, viable tracts of forest and woodland. The impacts of vegetation clearance will be balanced by the creation and maintenance of the 900 ha Regional Park, in which habitats for all threatened flora and fauna are known to occur. The clearing of vegetation and associated works for the proposed development is unlikely to have a significant impact upon threatened species, communities and habitat of conservation significance.

Indirect impacts of the development caused by potential increased levels of weed invasion or colonisation by feral animals is unlikely to significantly affect threatened species or adjacent areas of native vegetation within the Regional Park. Nevertheless, strategies and plans have been prepared to mitigate these impacts; Dunheved 'Weed Management Plan'

(Cumberland Ecology 2005c), 'Fire Management Strategy' and 'Feral and Domestic Animal Management Strategy' (Cumberland Ecology 2005b).

Potential impacts should be substantially mitigated by the measures proposed as part of the development of the Dunheved Precincts including:

- Retention where possible of stands of trees and vegetation within riparian zones and open space areas;
- Where possible design infrastructure to instil a sense of ownership of the Regional Park by employees;
- Weed control;
- Use of clean fill;
- Habitat regeneration where possible;
- Control of feral and over-abundant native animals through planning during construction phase;
- Control of domestic animal access; and
- Create artificial habitat for frogs, birds and bats from stormwater detention basins.

The development of the Dunheved Precincts is not predicted to have a significant impact upon any threatened flora or fauna species on the subject site, study area and the Regional Park in the long-term.

References

1. Benson, D. and Howell, J. (1990) **Taken for Granted - The Bushland of Sydney and its Suburbs** Kangaroo Press, NSW.

2. Churchill, S. (1998) **Australian Bats** Reed New Holland, Sydney.

3. Cumberland Ecology (2005a) **St Marys North and South Dunheved Precincts Plan: Biodiversity Assessment** Cumberland Ecology, Sydney.

4. Cumberland Ecology (2005b) **St Marys North and South Dunheved Precincts Plan: Feral and Domestic Animal Management Strategy** Cumberland Ecology, Sydney.

5. Cumberland Ecology (2005c) **St Marys North and South Dunheved Precincts Plan: Weed Management Plan** Cumberland Ecology, Sydney.

6. Cumberland Ecology (2006) **St Marys Macrofauna Management Plan 2006/2007** For Maryland Development Company. Cumberland Ecology, Epping.

7. DEC (NSW) (2005) **Atlas of NSW Wildlife** http://wildlifeatlas.nationalparks.nsw.gov.au/wildlifeatlas/watlas.jsp

8. ERM (2003) **St Marys Eastern Precinct Plan: Biodiversity Assessment** Environmental Resources Management Australia, Sydney.

9. Gunninah (1991) **Australian Defence Industries (ADI) Site, St Marys, Fauna Survey** Gunninah Environmental Consultants, Sydney.

10. Gunninah (1994) **Australian Defence Industries St Marys Facility Western Sydney Environmental Review** Gunninah Environmental Consultants, Sydney.

11. Gunninah (1995) **Australian Defence Industries St Marys Planning Study: Flora and Fauna Issues** Gunninah Environmental Consultants, Sydney.

12. Gunninah (1996) **Australian Defence Industries St Marys Facility - Vegetation Communities** Gunninah Environmental Consultants, Sydney.

13. Gunninah (1997) **ADI Site St Marys. Biological Assessment Report. Volume 1-3: Responses to Issues Raised by the Section 22 Committee** Gunninah Environmental Consultants, Sydney.

14. James, T., McDougall, L., and Benson, D. (1999) **Rare Bushland Plants of Western Sydney** Royal Botanic Gardens, Sydney.

15. Kinhill (1995) **Australian Defence Industries Site - St Marys, Regional Environment Study Technical report Number 4: Characteristics of the Site** Kinhill Engineers Pty Ltd, Sydney.

16. Marchant, S. and Higgins, P. (1990) **Handbook of Australian, New Zealand and Antarctic Birds. Volume 1 Ratites to Ducks: Part B Australian Pelican to Ducks** Oxford University Press, Melbourne.

17. McKay, G.M. and Ong, P. (1995) **Common Ringtail Possum *Pseudocheirus peregrinus*** in *The Australian Museum Complete Book of Australian Mammals*. ed. Strahan, R. Reed Books, Sydney.

18. NSW NPWS (1997) **Native Flora of Western Sydney, Urban Bushland Biodiversity Survey** NSW National Parks and Wildlife Service, Hurstville.

19. NSW NPWS (2001a) **Endangered Ecological Community Information: Cumberland Plain Woodland** NSW National Parks and Wildlife Service, Hurstville.

20. NSW NPWS (2001b) **Threat Abatement Plan for Predation by the Red Fox (*Vulpes vulpes*)** NSW National Parks and Wildlife Service, Hurstville.

21. NSW NPWS (2002a) **Endangered Ecological Community Information: Shale-Gravel Transition Forest** NSW National Parks and Wildlife Service, Hurstville.

22. NSW NPWS (2002b) **Native Vegetation Maps of the Cumberland Plain Western Sydney** NSW National Parks and Wildlife Service, Sydney.

23. NSW Scientific Committee (2000) ***Grevillea juniperina* R. BR. subsp*. juniperina* (a shrub) - vulnerable species listing** NSW National Parks and Wildlife Service, Hurstville.

24. NSW Scientific Committee (2004a) **Predation by the plague minnow (*Gambusia holbrooki*) - key threatening process declaration** Department of Environment & Conservation (NSW), Hurstville.

25. NSW Scientific Committee (2004b) **River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions - endangered ecological community listing** Department of Environment and Conservation (NSW), Hurstville.

26. Robinson, L. (1991) **Field Guide to the Native Plants of Sydney** Kangaroo Press, Roseville, Sydney.

27. Suckling, G.C. (1995) **Sugar Glider *Petaurus breviceps*** in *The Australian Museum Complete Book of Australian Mammals*. ed. Strahan, R. Reed Books, Sydney.

Appendix A

Flora and Fauna Species Lists

Table A.1 FLORA SPECIES LIST FOR PENRITH AND BLACKTOWN LGAS (1), EASTERN PRECINCT (2) AND DUNHEVED PRECINCT (3)

	Scientific Name	Common Name	NSW Status	EPBC Status	NPWS Count[1]	ERM/CE[2]	Grassland[3]	Wood-land[3]
Acanthaceae	*Brunoniella australis*	Blue Trumpet	U		7	X		
Adiantaceae	*Cheilanthes sieberi*		U		9	X		X
	Cheilanthes sieberi subsp. sieberi		U		4	X		
	Pellaea falcata	Sickle Fern	RS		1	X		X
Agavaceae	*Agave americana*	Century Plant	U		3	X		
Alismataceae	*Alisma plantago-aquatica*	Water Plantain	U		2	X		X
Amaranthaceae	*Alternanthera denticulata*	Lesser Joyweed	U		5	X	X	
	Amaranthus spp.		U		2	X	X	
	Nyssanthes sp.		U		0			adjacent
Apiaceae	*Centella asiatica*	Pennywort	U		11	X		X
	Cyclospermum leptophyllum	Slender Celery	U		3	X	X	
	Foeniculum vulgare	Fennel	U		7	X		

Table A.1 FLORA SPECIES LIST FOR PENRITH AND BLACKTOWN LGAS (1), EASTERN PRECINCT (2) AND DUNHEVED PRECINCT (3)

	Scientific Name	Common Name	NSW Status	EPBC Status	NPWS Count[1]	ERM/CE[2]	Grassland[3]	Wood-land[3]
	Hydrocotyle peduncularis		U		1	X		
Apocynaceae	*Parsonsia straminea*	Common Silkpod	U		6	X		
	**Vinca major*		U		0		X	
Araurcariaceae	**Araucaria cunninghamii*		U		0		X	
Asclepiadaceae	*Araujia sericifera*	Moth Vine	U		15	X		X
	Gomphocarpus fruticosus	Narrow-leaved Cotton Bush	U		6	X		
Asparagaceae	*Asparagus asparagoides*		U		0	X		X
	Asparagus plumosus		U		0		X	
	Myrsiphyllum asparagoides	Florist's Smilax	U		10	X		
	Protasparagus densiflorus		U		0	X		
Asteraceae	*Ageratina adenophora*	Crofton Weed	U		5	X		
	Aster subulatus	Wild Aster	U		3	X	X	
	Bidens pilosa	Cobbler's Pegs	U		18	X		X
	Bidens sp.		U		0		X	

Table A.1 FLORA SPECIES LIST FOR PENRITH AND BLACKTOWN LGAS (1), EASTERN PRECINCT (2) AND DUNHEVED PRECINCT (3)

	Scientific Name	Common Name	NSW Status	EPBC Status	NPWS Count[1]	ERM/CE[2]	Grassland[3]	Wood-land[3]
	Calotis cuneata		U		0	X		
	Calotis cuneifolia	Purple Burr-Daisy	U		1	X		
	Calotis lappulacea	Yellow Burr-daisy	U		4	X		
	Cassinia aculeata	Dolly Bush	U		2		X	
	Cassinia arcuata	Sifton Bush	U		0	X		
	Cassinia				0		?	
	Cirsium sp.		U		0		X	X
	Cirsium vulgare	Spear Thistle	U		23	X	X	
	Conzya albida		U		0	X		
	Conyza bonariensis	Flaxleaf Fleabane	U		9	X		
	Conyza spp.		U		1	X		
	Epaltes australis	Spreading Nut-heads	U		0	X	X	
	Euchiton spp.		U		1		X	
	Gnaphalium sp.		U		0		X	
	Hypochaeris glabra	Smooth Catsear	U		1	X	X	
	Hypochaeris radicata	Catsear	U		13	X	X	X

Table A.1 FLORA SPECIES LIST FOR PENRITH AND BLACKTOWN LGAS (1), EASTERN PRECINCT (2) AND DUNHEVED PRECINCT (3)

	Scientific Name	Common Name	NSW Status	EPBC Status	NPWS Count[1]	ERM/CE[2]	Grassland[3]	Wood-land[3]
	Olearia microphylla		U		3	X		
	Ozothamnus diosmifolius	White Dogwood	U		33	X	X	X
	Senecio madagascariensis	Fireweed	U		20	X	X	X
	Senecio pterophorus		U		5	X		X
	Senecio quadridentatus	Cotton Fireweed	U		1	X		
	Sonchus oleraceus	Common Sowthistle	U		13	X		
	Tagetes minuta	Stinking Roger	U		2	X		
	Taraxacum officinale	Dandelion	U		18	X		
	Vittadinia spp.		U		1		X	
	Xanthium sp.		U		0			X
Boraginaceae	*Echium plantagineum*	Patterson's Curse	U		2	X		
	**Heliotropium amplexicaule*		U		0		X	
Cactaceae	*Opuntia sp.*		U		0			X
	Opuntia stricta		U		2	X		

Table A.1 FLORA SPECIES LIST FOR PENRITH AND BLACKTOWN LGAS (1), EASTERN PRECINCT (2) AND DUNHEVED PRECINCT (3)

	Scientific Name	Common Name	NSW Status	EPBC Status	NPWS Count[1]	ERM/CE[2]	Grassland[3]	Wood-land[3]
Campanulaceae	*Wahlenbergia gracilis*	Sprawling or Australian Bluebell	U		7	X		
Caryophyllaceae	**Spergularia sp.*		U		0		X	
Casuarinaceae	*Allocasuarina glareicola*		E1	E	12			
	Allocasuarina littoralis	Black Sheoak	U		3	X		
	Casuarina glauca	Swamp Oak	U		7	X	X	X
Chenopodiaceae	*Atriplex semibaccata*	Creeping Saltbush	U		2	X		
	Chenopodium sp.		U		0		X	
	Einadia hastata	Berry Saltbush	U		12	X	X	X
	Einadia nutans	Climbing Saltbush	U		2	X		
	Einadia nutans subsp. linifolia		U		4		X	
	Einadia trigonos	Fishweed	U		7		X	X
Clusiaceae	*Hypericum gramineum*	Small St John's Wort	U		9	X		X

Table A.1 FLORA SPECIES LIST FOR PENRITH AND BLACKTOWN LGAS (1), EASTERN PRECINCT (2) AND DUNHEVED PRECINCT (3)

	Scientific Name	Common Name	NSW Status	EPBC Status	NPWS Count[1]	ERM/CE[2]	Grassland[3]	Wood-land[3]
Commelinaceae	*Commelina cyanea*	Native Wandering Jew	U		7		X	
	Tradescantia fluminensis	Wandering Jew	U		6			adjacent
Convolvulaceae	*Dichondra repens*	Kidney Weed	U		13	X	X	
	Ipomoea purpurea	Common Morning Glory	U		0	X		
	Polymeria calycina		RS		9		X	
Cupressaceae	*Callitris rhomboidea*	Port Jackson Pine	U		0	X		
Cyperaceae	*Carex appressa*		U		2	X		X
	Cyperus eragrostis	Umbrella Sedge	U		13	X	X	
	Cyperus spp.		U		1		X	
	Eleocharis sphacelata	Tall Spike Rush	U		5	X		
	Fimbristylis dichotoma		U		6		X	
	Lepidosperma laterale		U		4	X		
	Hibbertia diffusa		U		3	X		X
Epacridaceae	*Astroloma humifusum*	Native Cranberry	U		3	X	X	X

Table A.1 FLORA SPECIES LIST FOR PENRITH AND BLACKTOWN LGAS (1), EASTERN PRECINCT (2) AND DUNHEVED PRECINCT (3)

	Scientific Name	Common Name	NSW Status	EPBC Status	NPWS Count[1]	ERM/CE[2]	Grassland[3]	Wood-land[3]
	Epacris purpurascens var. purpurascens		V		1			
	Leucopogon juniperinus		U		4	X		
	Lissanthe strigosa	Peach Heath	U		3	X		
	Styphelia laeta		U		3	X		
Euphorbiaceae	*Chamaesyce spp.*		U		0	X		
	Euphorbia peplus	Petty Spurge	U		2	X		
	Euphorbia sp.		U		0		X	
	Phyllanthus hirtellus		U		3	X		
	Phyllanthus virgatus		U		9	X		
	Poranthera microphylla		U		4	X		
Fabaceae (Faboideae)	*Daviesia ulicifolia*	Gorse Bitter Pea	U		10	X		
	Desmodium brachypodum	Large Tick-trefoil	U		1			X
	Desmodium varians	Slender Tick-trefoil	U		4	X		X

Table A.1 FLORA SPECIES LIST FOR PENRITH AND BLACKTOWN LGAS (1), EASTERN PRECINCT (2) AND DUNHEVED PRECINCT (3)

	Scientific Name	Common Name	NSW Status	EPBC Status	NPWS Count[1]	ERM/CE[2]	Grassland[3]	Wood-land[3]
	Dillwynia sieberi		U		7	X	X	
	Dillwynia tenuifolia		V	V	69	X		
	Glycine tabacina		U		10	X	X	X
	Gompholobium spp.				0	X		
	Hardenbergia violacea	False Sarsaparilla	U		8	X	X	
	Jacksonia scoparia	Dogwood	U		2	X		
	Pultenaea microphylla		U		11	X		
	Pultenaea parviflora		E1	V	50	X	X	
Fabaceae (Mimosoideae)	*Acacia baileyana*	Cootamundra Wattle	U		1	X		
	Acacia brownii	Heath Wattle	U		2	X		
	Acacia bynoeana	Bynoe's Wattle	E1	V	5			
	Acacia elongata	Swamp Wattle	U		2	X		
	Acacia falcata		U		7	X		X
	Acacia floribunda	White Sally	U		2	X	X	

Table A.1 FLORA SPECIES LIST FOR PENRITH AND BLACKTOWN LGAS (1), EASTERN PRECINCT (2) AND DUNHEVED PRECINCT (3)

	Scientific Name	Common Name	NSW Status	EPBC Status	NPWS Count[1]	ERM/CE[2]	Grassland[3]	Wood-land[3]
	Acacia implexa	Hickory Wattle	U		3	X		
	Acacia longifolia		U		2	X		
	Acacia paradoxa	Kangaroo Thorn	U		0	X		
	Acacia parramattensis	Parramatta Wattle	U		14	X	X	X
	Acacia parvipinnula	Silver-stemmed Wattle	U		2	X		
	Acacia podalyriifolia	Queensland Silver Wattle	U		0	X		
	Acacia pubescens	Downy Wattle	V	V	2			
	Acacia ulicifolia	Prickly Moses	U		1	X		
Gentianaceae	*Centaurium erythraea*	Common Centaury	U		1	X		
	Centaurium tenuiflorum		U		2	X		
Goodeniaceae	*Goodenia hederacea*		U		7	X		
	Goodenia paniculata		U		1	X		
Iridaceae	**Northoscordum borbonicum*		U		0		X	

Table A.1 FLORA SPECIES LIST FOR PENRITH AND BLACKTOWN LGAS (1), EASTERN PRECINCT (2) AND DUNHEVED PRECINCT (3)

	Scientific Name	Common Name	NSW Status	EPBC Status	NPWS Count[1]	ERM/CE[2]	Grassland[3]	Wood-land[3]
Juncaceae	*Juncus usitatus*		U		13	X	X	
Lamiaceae	*Prostanthera scutellarioides*		U		4	X		
Lauraceae	*Cassytha pubescens*		U		2	X		
	Cinnamomum camphora	Camphor Laurel	U		3	X		
	Hypsela sessiliflora		E1		6			
Lobeliaceae	*Pratia purpurascens*	Whiteroot	U		10	X		
Lomandraceae	*Lomandra filiformis subsp. coriacea*		U		1	X		
	Lomandra filiformis subsp. filiformis		U		5	X		X
	Lomandra longifolia	Spiny-headed Mat-rush	U		8	X		X
	Lomandra multiflora subsp. multiflora	Many-flowered Mat-rush	U		6	X	X	
Loranthaceae	*Amyema gaudichaudii*		U		3	X		
Malaceae	*Cotoneaster glaucophyllus*		U		1	X		

Table A.1 FLORA SPECIES LIST FOR PENRITH AND BLACKTOWN LGAS (1), EASTERN PRECINCT (2) AND DUNHEVED PRECINCT (3)

	Scientific Name	Common Name	NSW Status	EPBC Status	NPWS Count[1]	ERM/CE[2]	Grassland[3]	Wood-land[3]
	Cotoneaster pannosus		U		1	X		
	Malus pumila	Apple	U		1			
	Pyracantha angustifolia		U		1	X		
Malvaceae	*Modiola caroliniana*	Red-flowered Mallow	U		12	X	X	X
	Pavonia hastata		U		1	X		
	Sida rhombifolia	Paddy's Lucerne	U		21	X	X	X
Meliaceae	*Melia azedarach*	White Cedar	U		2	X	X	
Moraceae	**Maclura pomifera*		U		0			X
Myoporaceae	*Eremophila debilis*	Amulla	U		5		X	
Myrtaceae	*Angophora bakeri*	Narrow-leaved Apple	U		6	X		
	Angophora floribunda	Rough-barked Apple	U		5	X		X
	Callistemon salignus	Willow Bottlebrush	U		2	X	X	
	Corymbia citriodora		U		0	X		
	Corymbia gummifera	Red Bloodwood	U		1	X		

Table A.1 FLORA SPECIES LIST FOR PENRITH AND BLACKTOWN LGAS (1), EASTERN PRECINCT (2) AND DUNHEVED PRECINCT (3)

	Scientific Name	Common Name	NSW Status	EPBC Status	NPWS Count[1]	ERM/CE[2]	Grassland[3]	Wood-land[3]
	Corymbia maculata		U		3	X		
	Eucalyptus amplifolia	Cabbage Gum	U		7	X		X
	Eucalyptus baueriana	Blue Box	RS		1	X		X
	Eucalyptus benthamii	Nepean River Gum	V	V	1			
	Eucalyptus crebra	Narrow-leaved Ironbark	U		10	X		
	Eucalyptus eugenioides	Thin-leaved Stringybark	U		10	X		
	Eucalyptus fibrosa	Red Ironbark	U		7	X	X	
	Eucalyptus globoidea	White Stringybark	U		2	X		
	Eucalyptus moluccana	Grey Box	U		14	X	X	X
	Eucalyptus paniculata	Grey Ironbark	U		1	X		
	Eucalyptus parramattensis	Parramatta Red Gum	U		1	X		
	Eucalyptus sclerophylla	Hard-leaved Scribbly Gum	U		3	X		

Table A.1 FLORA SPECIES LIST FOR PENRITH AND BLACKTOWN LGAS (1), EASTERN PRECINCT (2) AND DUNHEVED PRECINCT (3)

	Scientific Name	Common Name	NSW Status	EPBC Status	NPWS Count[1]	ERM/CE[2]	Grassland[3]	Wood-land[3]
	Eucalyptus sideroxylon	Mugga Ironbark	U		4	X		
	Eucalyptus tereticornis	Forest Red Gum	U		17	X	X	X
	Kunzea ambigua	Tick Bush	U		4	X	X	
	Leptospermum parvifolium		U		1	X		
	Leptospermum trinervium		U		2	X		
	Melaleuca decora		U		7	X		X
	Melaleuca nodosa		U		7	X		
	Melaleuca sieberi		U		1	X		
	Melaleuca styphelioides	Prickly-leaved Tea Tree	U		4	X		X
	Micromyrtus minutiflora		E1	V	22	X		
Ochnaceae	*Ochna serrulata*	Mickey Mouse Plant	U		1	X		
Oleaceae	*Ligustrum lucidum*	Large-leaved Privet	U		5	X		X
	Ligustrum sinense	Small-leaved Privet	U		8	X		X

Table A.1 FLORA SPECIES LIST FOR PENRITH AND BLACKTOWN LGAS (1), EASTERN PRECINCT (2) AND DUNHEVED PRECINCT (3)

	Scientific Name	Common Name	NSW Status	EPBC Status	NPWS Count[1]	ERM/CE[2]	Grassland[3]	Wood-land[3]
	Olea europea subsp. africana	African Olive	U		0	X		
Oxalidaceae	*Oxalis spp.*		U		2	X	X	
Passifloraceae	*Passiflora edulis*	Common Passionfruit	U		2	X		X
Philydraceae	*Philydrum lanuginosum*	Frogsmouth	U		1	X	X	
Phormiaceae	*Dianella caerulea var. producta*		U		2	X		
	Dianella longifolia		U		8	X		X
	Dianella revoluta		U		3	X		
Phytolaccaceae	*Phytolacca octandra*	Inkweed	U		6	X	X	
Pinaceae	*Pinus radiata*	Radiata Pine	U		3	X		
Pittosporaceae	*Billardiera scandens*	Appleberry	U		1	X		
	Bursaria spinosa	Native Blackthorn	U		11	X	X	
	Bursaria spinosa subsp. spinosa		U		5	X		
	Pittosporum undulatum	Sweet Pittosporum	U		2	X		

Table A.1 FLORA SPECIES LIST FOR PENRITH AND BLACKTOWN LGAS (1), EASTERN PRECINCT (2) AND DUNHEVED PRECINCT (3)

	Scientific Name	Common Name	NSW Status	EPBC Status	NPWS Count[1]	ERM/CE[2]	Grassland[3]	Wood-land[3]
Plantaginaceae	*Plantago lanceolata*	Lamb's Tongues	U		20	X		
Poaceae	*Aristida ramosa*		U		10	X	X	X
	Aristida vagans	Threeawn Speargrass	U		12	X		X
	Avena fatua	Wild Oats	U		5	X		
	Axonopus affinis		U		0	X		X
	Bothriochloa spp.		U		0	X	X	
	Briza subaristata		U		5			X
	Bromus catharticus		U		5	X		
	Chloris gayana	Rhodes Grass	U		12	X	X	
	Chloris truncata	Windmill Grass	U		11		X	
	Cortaderia selloana	Pampas Grass	U		0	X	X	
	Cymbopogon refractus	Barbed Wire Grass	RS		8	X	X	X
	Cynodon dactylon	Common Couch	U		21	X	X	X
	Dichelachne micrantha	Shorthair Plumegrass	U		10	X		

Table A.1 FLORA SPECIES LIST FOR PENRITH AND BLACKTOWN LGAS (1), EASTERN PRECINCT (2) AND DUNHEVED PRECINCT (3)

	Scientific Name	Common Name	NSW Status	EPBC Status	NPWS Count[1]	ERM/CE[2]	Grassland[3]	Wood-land[3]
	Echinopogon caespitosus		U		6	X		
	Echinopogon caespitosus var. caespitosus	Tufted Hedgehog Grass	U		3	X		
	Entolasia stricta	Wiry Panic	U		7	X		
	Eragrostis brownii	Brown's Lovegrass	U		6	X	X	X
	Eragrostis cilianensis	Stinkgrass	U		1		X	
	Eragrostis curvula	African Lovegrass	U		13	X	X	X
	Eragrostis leptostachya	Paddock Lovegrass	U		12	X		
	Eriochloa pseudoacrotricha	Early Spring Grass	U		6	X	X	
	Hemarthria uncinata	Matgrass	U		1	X	X	
	Imperata cylindrica var. major	Blady Grass	U		5	X		X
	Microlaena stipoides		U		11	X		X

Table A.1 FLORA SPECIES LIST FOR PENRITH AND BLACKTOWN LGAS (1), EASTERN PRECINCT (2) AND DUNHEVED PRECINCT (3)

	Scientific Name	Common Name	NSW Status	EPBC Status	NPWS Count[1]	ERM/CE[2]	Grassland[3]	Wood-land[3]
	Microlaena stipoides var. stipoides		U		5	X		
	Oplismenus aemulus		U		1			X
	Panicum simile	Two-colour Panic	U		7	X		
	Paspalidium distans		U		4	X	X	X
	Paspalum dilatatum	Paspalum	U		20	X	X	
	Paspalum distichum	Water Couch	U		3		X	
	Paspalum urvillei	Vasey Grass	U		6		X	
	Pennisetum clandestinum	Kikuyu Grass	U		21	X	X	
	Phalaris aquatica	Phalaris	U		4	X		
	Phragmites australis	Common Reed	U		1	X		
	Poa annua	Winter Grass	U		4	X		
	Poaceae sp.		U		0		X	
	Setaria gracilis	Slender Pigeon Grass	U		14	X	X	X
	Sporobolus creber	Slender Rat's Tail Grass	U		13		X	X

Table A.1 FLORA SPECIES LIST FOR PENRITH AND BLACKTOWN LGAS (1), EASTERN PRECINCT (2) AND DUNHEVED PRECINCT (3)

	Scientific Name	Common Name	NSW Status	EPBC Status	NPWS Count[1]	ERM/CE[2]	Grassland[3]	Wood-land[3]
	Stipa pubescens		U		1	X		
	Stipa ramosissima/verticillata		U		0			X
	Themeda australis	Kangaroo Grass	U		17	X		X
Polygonaceae	*Persicaria decipiens*	Slender Knotweed	RS		8	X	X	
	Rumex brownii	Swamp Dock	U		3	X		
	Grevillea juniperina subsp. juniperina		V		45	X	X	X
	Grevillea mucronulata		U		3	X		
	Grevillea robusta	Silky Oak	U		5	X	X	
	Hakea sericea		U		6	X	X	
	Persoonia linearis	Narrow-leaved Geebung	U		3	X		
	Persoonia nutans		E1	E	19			
Ranunculaceae	*Clematis glycinoides*	Headache Vine	RS		5	X	X	
Rhamnaceae	*Cryptandra spinescens*		U		4	X		

Table A.1 FLORA SPECIES LIST FOR PENRITH AND BLACKTOWN LGAS (1), EASTERN PRECINCT (2) AND DUNHEVED PRECINCT (3)

	Scientific Name	Common Name	NSW Status	EPBC Status	NPWS Count[1]	ERM/CE[2]	Grassland[3]	Wood-land[3]
Rosaceae	*Rosa rubiginosa*	Sweet Briar	U		1	X		
	Rosa sp.		U		0			X
	Rubus fruticosus sp. agg.	Blackberry complex	U		6	X	X	X
	Rubus parvifolius	Native Raspberry	U		1	X		
Rubiaceae	*Pomax umbellata*		U		5	X		
	Richardia stellaris		U		1	X		
Rutaceae	*Boronia polygalifolia*		P13		1			
Salicaceae	*Salix alba*	White Willow	U		1			
	Salix babylonica	Weeping Willow	U		4			
Santalaceae	*Exocarpos cupressiformis*	Native Cherry	U		2	X		
Sapindaceae	*Dodonaea falcata*		U		4	X		
	Dodonaea multijuga		U		0	X		
	Dodonaea viscosa subsp. angustifolia		U		1	X		
	Dodonaea viscosa subsp. cuneata		U		6	X		

Table A.1 FLORA SPECIES LIST FOR PENRITH AND BLACKTOWN LGAS (1), EASTERN PRECINCT (2) AND DUNHEVED PRECINCT (3)

	Scientific Name	Common Name	NSW Status	EPBC Status	NPWS Count[1]	ERM/CE[2]	Grassland[3]	Wood-land[3]
Scrophulariaceae	*Veronica plebeia*	Trailing Speedwell	U		7			X
Simaroubaceae	**Ailanthus altissima*		U		0			X
Solanaceae	*Lycium ferocissimum*	African Boxthorn	U		7			X
	Solanum nigrum	Black-berry Nightshade	U		9	X		X
	Solanum prinophyllum	Forest Nightshade	U		5	X		X
	Solanum pseudocapsicum	Madeira Winter Cherry	U		6			X
Sterculiaceae	*Brachychiton populneus*	Kurrajong	U		2	X		
Thymelaeaceae	*Pimelea curviflora var. curviflora*		V	V	1			
	Pimelea linifolia subsp. linifolia		U		1	X		
	Pimelea spicata		E1		15			
	Trema aspera		U		0			X
Typhaceae	*Typha orientalis*	Broad-leaved Cumbungi	U		11	X	X	

Table A.1 FLORA SPECIES LIST FOR PENRITH AND BLACKTOWN LGAS (1), EASTERN PRECINCT (2) AND DUNHEVED PRECINCT (3)

	Scientific Name	Common Name	NSW Status	EPBC Status	NPWS Count[1]	ERM/CE[2]	Grassland[3]	Wood-land[3]
Verbenaceae	*Lantana camara*	Lantana	U		1	X		
	Verbena bonariensis	Purpletop	U		18	X	X	X
	Verbena officinalis	Common Verbena	U		3	X	X	X
Xanthorrhoeaceae	*Xanthorrhoea minor subsp. minor*		U		1	X		

Table A.2 FAUNA SPECIES FOUND WITHIN THE SMP (GUNNINAH), THE EASTERN PRECINCT STUDY AREA (ERM) AND CURRENT STUDY AREA (CE) (U=UNPROTECTED, P=PROTECTED, V=VULNERABLE, E1=ENDANGERED, RS=REGIONALLY SIGNIFICANT) **--- S=SUBJECT SITE, A = STUDY AREA, P=PROPERTY, I = INCIDENTAL**

	Scientific Name	Common Name	NSW status	NPWS Count	Gunninah 1991	ERM 2003	CE 2004
Aves							
Acanthizidae	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill	P	11	P-I	P	S
	Acanthiza lineate	Striated Thornbill	P	28	A		P
	Acanthiza nana	Yellow Thornbill	P	88	P	P	P
	Acanthiza pusilla	Brown Thornbill	P	25	P		

Table A.2 FAUNA SPECIES FOUND WITHIN THE SMP (GUNNINAH), THE EASTERN PRECINCT STUDY AREA (ERM) AND CURRENT STUDY AREA (CE) (U=UNPROTECTED, P=PROTECTED, V=VULNERABLE, E1=ENDANGERED, RS=REGIONALLY SIGNIFICANT) **---** **S=SUBJECT SITE, A = STUDY AREA, P=PROPERTY, I = INCIDENTAL**

	Scientific Name	Common Name	NSW status	NPWS Count	Gunninah 1991	ERM 2003	CE 2004
	Acanthiza reguloides	Buff-rumped Thornbill	P	35			P
	Gerygone mouki	Brown Gerygone	P	2			
	Gerygone olivacea	White-throated Gerygone	P	27			
	Origma solitaria	Rockwarbler	P	1			
	Pyrrholaemus sagittatus	Speckled Warbler	V/RS	4	P		
	Sericornis frontalis	White-browed Scrubwren	P	13			P
	Smicrornis brevirostris	Weebill	P	65			P
Accipitridae							
	Accipiter cirrocephalus	Collared Sparrowhawk	P	1	P-I		P
	Accipiter fasciatus	Brown Goshawk	P	11			P
	Accipiter novaehollandiae	Grey Goshawk	P	2			
	Aquila audax	Wedge-tailed Eagle	P	4		P	
	Aviceda subcristata	Pacific Baza	P	1			
	Circus approximans	Swamp Harrier	P	3			
	Circus assimilis	Spotted Harrier	P	1			
	Elanus axillaries	Black-shouldered Kite	P	16	P-I	P	
	Haliaeetus leucogaster	White-bellied Sea-Eagle	P	5			
	Haliastur sphenurus	Whistling Kite	P	3	P-I		

Table A.2 FAUNA SPECIES FOUND WITHIN THE SMP (GUNNINAH), THE EASTERN PRECINCT STUDY AREA (ERM) AND CURRENT STUDY AREA (CE) (U=UNPROTECTED, P=PROTECTED, V=VULNERABLE, E1=ENDANGERED, RS=REGIONALLY SIGNIFICANT) **---** **S=SUBJECT SITE, A = STUDY AREA, P=PROPERTY, I = INCIDENTAL**

	Scientific Name	Common Name	NSW status	NPWS Count	Gunninah 1991	ERM 2003	CE 2004
	Hieraaetus morphnoides	Little Eagle	P	8			
	Lophoictinia isura	Square-tailed Kite	V	3			
Aegothelidae							
	Aegotheles cristatus	Australian Owlet-nightjar	P	2	P-I		
Alaudidae							
	Mirafra javanica	Horsfield's Bushlark	P	1			
Alcedinidae							
	Alcedo azurea	Azure Kingfisher	RS	6	P		
Anatidae							
	Anas castanea	Chestnut Teal	P	6			S
	Anas gracilis	Grey Teal	P	5			P
	Anas platyrhynchos	Mallard	U	3			
	Anas superciliosa	Pacific Black Duck	P	41	A		A
	Biziura lobata	Musk Duck	P	0	P-I		
	Chenonetta jubata	Australian Wood Duck	P	35	P-I		A
	Cygnus atratus	Black Swan	P	1	P-I		
	Dendrocygna eytoni	Plumed Whistling-Duck	P	1			

Table A.2 FAUNA SPECIES FOUND WITHIN THE SMP (GUNNINAH), THE EASTERN PRECINCT STUDY AREA (ERM) AND CURRENT STUDY AREA (CE) (U=UNPROTECTED, P=PROTECTED, V=VULNERABLE, E1=ENDANGERED, RS=REGIONALLY SIGNIFICANT) **---** **S=SUBJECT SITE, A = STUDY AREA, P=PROPERTY, I = INCIDENTAL**

	Scientific Name	Common Name	NSW status	NPWS Count	Gunninah 1991	ERM 2003	CE 2004
	Malacorhynchus membranaceus	Pink-eared Duck	P	1			
	Oxyura australis	Blue-billed Duck	V	2			
	Stictonetta naevosa	Freckled Duck	V	2			
Anhingidae							
	Anhinga melanogaster	Darter	P	4			
Apodidae							
	Apus pacificus	Fork-tailed Swift	P	3			
	Hirundapus caudacutus	White-throated Needletail	P	3			
Ardeidae							
	Ardea alba	Great Egret	P	3	P-I		
	Ardea ibis	Cattle Egret	P	24	P-I		
	Ardea intermedia	Intermediate Egret	P	2	A		
	Ardea pacifica	White-necked Heron	P	5			
	Egretta garzetta	Little Egret	P	2			
	Egretta novaehollandiae	White-faced Heron	P	28	A		S
	Ixobrychus flavicollis	Black Bittern	V	1			
	Ixobrychus minutus	Little Bittern	P	2			

Table A.2 FAUNA SPECIES FOUND WITHIN THE SMP (GUNNINAH), THE EASTERN PRECINCT STUDY AREA (ERM) AND CURRENT STUDY AREA (CE) (U=UNPROTECTED, P=PROTECTED, V=VULNERABLE, E1=ENDANGERED, RS=REGIONALLY SIGNIFICANT) **---** **S=SUBJECT SITE, A = STUDY AREA, P=PROPERTY, I = INCIDENTAL**

	Scientific Name	Common Name	NSW status	NPWS Count	Gunninah 1991	ERM 2003	CE 2004
	Nycticorax caledonicus	Nankeen Night Heron	RS	1			
Artamidae							
	Artamus cyanopterus	Dusky Woodswallow	P	10			P
	Artamus personatus	Masked Woodswallow	P	2			
	Artamus superciliosus	White-browed Woodswallow	P	6			
	Cracticus nigrogularis	Pied Butcherbird	P	3			
	Cracticus torquatus	Grey Butcherbird	P	96	A	P	S
	Gymnorhina tibicen	Australian Magpie	P	95	A	P	S
	Strepera graculina	Pied Currawong	P	45	P	P	S
Burhinidae							
	Burhinus grallarius	Bush Stone-curlew	E1	2			
Cacatuidae							
	Cacatua galerita	Sulphur-crested Cockatoo	P	47	P	P	A
	Cacatua sanguinea	Little Corella	P	5	P-I		S
	Cacatua tenuirostris	Long-billed Corella	P	7			
	Callocephalon fimbriatum	Gang-gang Cockatoo	P	1			
	Calyptorhynchus funereus	Yellow-tailed Black-Cockatoo	P	19	P-I	P	P
	Calyptorhynchus lathami	Glossy Black-Cockatoo	V	5			

Table A.2 FAUNA SPECIES FOUND WITHIN THE SMP (GUNNINAH), THE EASTERN PRECINCT STUDY AREA (ERM) AND CURRENT STUDY AREA (CE) (U=UNPROTECTED, P=PROTECTED, V=VULNERABLE, E1=ENDANGERED, RS=REGIONALLY SIGNIFICANT) **---** **S=SUBJECT SITE, A = STUDY AREA, P=PROPERTY, I = INCIDENTAL**

	Scientific Name	Common Name	NSW status	NPWS Count	Gunninah 1991	ERM 2003	CE 2004
	Eolophus roseicapillus	Galah	P	37	P	P	S
	Nymphicus hollandicus	Cockatiel	P	1			
Campephagidae							
	Coracina novaehollandiae	Black-faced Cuckoo-shrike	P	82	P	P	S
	Coracina papuensis	White-bellied Cuckoo-shrike	P	3			
	Coracina tenuirostris	Cicadabird	P	3			
	Lalage tricolor	White-winged Triller	P	7			
Caprimulgidae							
Casuariidae							
	Dromaius novaehollandiae	Emu	P	1	P-I	P	S
Centropodidae							
	Centropus phasianinus	Pheasant Coucal	P	1			
Charadriidae							
	Elseyornis melanops	Black-fronted Dotterel	P	5	P		
	Vanellus miles	Masked Lapwing	P	40	P-I	P	S
	Vanellus tricolor	Banded Lapwing	P	3			
Climacteridae							
	Cormobates leucophaeus	White-throated Treecreeper	P	20			P

Table A.2 FAUNA SPECIES FOUND WITHIN THE SMP (GUNNINAH), THE EASTERN PRECINCT STUDY AREA (ERM) AND CURRENT STUDY AREA (CE) (U=UNPROTECTED, P=PROTECTED, V=VULNERABLE, E1=ENDANGERED, RS=REGIONALLY SIGNIFICANT) **---** **S=SUBJECT SITE, A = STUDY AREA, P=PROPERTY, I = INCIDENTAL**

	Scientific Name	Common Name	NSW status	NPWS Count	Gunninah 1991	ERM 2003	CE 2004
Columbidae							
	Columba livia	Rock Dove/Feral pigeon	U	7	P	P	
	Geopelia humeralis	Bar-shouldered Dove	P	3			
	Geopelia placida	Peaceful Dove	P	22	P-I		
	Leucosarcia melanoleuca	Wonga Pigeon	P	2			
	Lopholaimus antarcticus	Topknot Pigeon	P	1			
	Ocyphaps lophotes	Crested Pigeon	P	50	P-I		S
	Phaps chalcoptera	Common Bronzewing	P	6			P
	Streptopelia chinensis	Spotted Turtle-Dove	U	71	P	P	S
Coraciidae							
	Eurystomus orientalis	Dollarbird	P	5	P-I		
Corcoracidae							
	Corcorax melanorhamphos	White-winged Chough	RS	21	P	P	S
	Struthidea cinerea	Apostlebird	P	1			
Corvidae							
	Corvus coronoides	Australian Raven	P	115	P	P	S
Cuculidae							
	Cacomantis flabelliformis	Fan-tailed Cuckoo	P	18	P	P	

Table A.2 FAUNA SPECIES FOUND WITHIN THE SMP (GUNNINAH), THE EASTERN PRECINCT STUDY AREA (ERM) AND CURRENT STUDY AREA (CE) (U=UNPROTECTED, P=PROTECTED, V=VULNERABLE, E1=ENDANGERED, RS=REGIONALLY SIGNIFICANT) **---** **S=SUBJECT SITE, A = STUDY AREA, P=PROPERTY, I = INCIDENTAL**

	Scientific Name	Common Name	NSW status	NPWS Count	Gunninah 1991	ERM 2003	CE 2004
	Chalcites basalis	Horsfield's Bronze-Cuckoo	P	9			
	Chalcites lucidus	Shining Bronze-Cuckoo	P	20	P-I		P
	Cuculus pallidus	Pallid Cuckoo	P	10			
	Eudynamys orientalis	Pacific Koel	P	3			
	Scythrops novaehollandiae	Channel-billed Cuckoo	P	3			
Dicaeidae							
	Dicaeum hirundinaceum	Mistletoebird	P	16			P
Dicruridae							
	Dicrurus bracteatus	Spangled Drongo	P	1			
	Grallina cyanoleuca	Magpie-lark	P	125	P-I	P	S
	Myiagra cyanoleuca	Satin Flycatcher	P	4			
	Myiagra inquieta	Restless Flycatcher	P	10			P
	Myiagra rubecula	Leaden Flycatcher	P	3			
	Rhipidura albiscapa	Grey Fantail	P	95	A	P	P
	Rhipidura leucophrys	Willie Wagtail	P	77	P	P	S
	Rhipidura rufifrons	Rufous Fantail	P	4	P-I		
Estrildidae							
	Lonchura castaneothorax	Chestnut-breasted Mannikin	RS	2	P-I		

Table A.2 FAUNA SPECIES FOUND WITHIN THE SMP (GUNNINAH), THE EASTERN PRECINCT STUDY AREA (ERM) AND CURRENT STUDY AREA (CE) (U=UNPROTECTED, P=PROTECTED, V=VULNERABLE, E1=ENDANGERED, RS=REGIONALLY SIGNIFICANT) **---** **S=SUBJECT SITE, A = STUDY AREA, P=PROPERTY, I = INCIDENTAL**

	Scientific Name	Common Name	NSW status	NPWS Count	Gunninah 1991	ERM 2003	CE 2004
	Lonchura punctulata	Nutmeg Mannikin	U	1			
	Neochmia modesta	Plum-headed Finch	P	1			
	Neochmia temporalis	Red-browed Finch	P	71	P	P	P
	Stagonopleura guttata	Diamond Firetail	V/RS	1	P-I		
	Taeniopygia bichenovii	Double-barred Finch	P	43	P-I		P
	Taeniopygia guttata	Zebra Finch	P	2	P-I		
Eupetidae							
	Psophodes olivaceus	Eastern Whipbird	P	18			
Falconidae							
	Falco berigora	Brown Falcon	P	3			
	Falco cenchroides	Nankeen Kestrel	P	14	P-I		
	Falco longipennis	Australian Hobby	P	3			P
	Falco peregrinus	Peregrine Falcon	RS	3			
	Falco subniger	Black Falcon	P	1			
Halcyonidae							
	Dacelo novaeguineae	Laughing Kookaburra	P	65	P	P	S
	Todiramphus macleayii	Forest Kingfisher	P	1			

Table A.2 FAUNA SPECIES FOUND WITHIN THE SMP (GUNNINAH), THE EASTERN PRECINCT STUDY AREA (ERM) AND CURRENT STUDY AREA (CE) (U=UNPROTECTED, P=PROTECTED, V=VULNERABLE, E1=ENDANGERED, RS=REGIONALLY SIGNIFICANT) **---** **S=SUBJECT SITE, A = STUDY AREA, P=PROPERTY, I = INCIDENTAL**

	Scientific Name	Common Name	NSW status	NPWS Count	Gunninah 1991	ERM 2003	CE 2004
	Todiramphus sanctus	Sacred Kingfisher	P	13			
Hirundinidae							
	Cheramoeca leucosternus	White-backed Swallow	P	7			
	Hirundo neoxena	Welcome Swallow	P	50	P		S
	Petrochelidon ariel	Fairy Martin	P	2	P-I		
	Petrochelidon nigricans	Tree Martin	P	13	P-I		
Laridae							
	Larus novaehollandiae	Silver Gull	P	27			
Maluridae							
	Malurus cyaneus	Superb Fairy-wren	P	123	P	P	S
	Malurus lamberti	Variegated Fairy-wren	P	5			
Meliphagidae							
	Acanthorhynchus tenuirostris	Eastern Spinebill	P	36	P	P	P
	Anthochaera carunculata	Red Wattlebird	P	20			P
	Anthochaera chrysoptera	Little Wattlebird	P	13		P	
	Entomyzon cyanotis	Blue-faced Honeyeater	P	1			
	Grantiella picta	Painted Honeyeater	V	1			
	Lichenostomus chrysops	Yellow-faced Honeyeater	P	51	P	P	S

Table A.2 FAUNA SPECIES FOUND WITHIN THE SMP (GUNNINAH), THE EASTERN PRECINCT STUDY AREA (ERM) AND CURRENT STUDY AREA (CE) (U=UNPROTECTED, P=PROTECTED, V=VULNERABLE, E1=ENDANGERED, RS=REGIONALLY SIGNIFICANT) **---** **S=SUBJECT SITE, A = STUDY AREA, P=PROPERTY, I = INCIDENTAL**

	Scientific Name	Common Name	NSW status	NPWS Count	Gunninah 1991	ERM 2003	CE 2004
	Lichenostomus fuscus	Fuscous Honeyeater	P	17			
	Lichenostomus leucotis	White-eared Honeyeater	P	21			
	Lichenostomus penicillatus	White-plumed Honeyeater	P	21	P		P
	Manorina melanocephala	Noisy Miner	P	123	A	P	S
	Manorina melanophrys	Bell Miner	P	18			
	Meliphaga lewinii	Lewin's Honeyeater	P	8			
	Melithreptus brevirostris	Brown-headed Honeyeater	P	14			P
	Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subsp.)	V	2			
	Melithreptus lunatus	White-naped Honeyeater	P	12	P		S
	Myzomela sanguinolenta	Scarlet Honeyeater	P	8	P-I		P
	Philemon corniculatus	Noisy Friarbird	P	19	P-I		S
	Phylidonyris nigra	White-cheeked Honeyeater	P	9			
	Phylidonyris novaehollandiae	New Holland Honeyeater	P	4			
	Plectorhyncha lanceolata	Striped Honeyeater	P	1			
	Xanthomyza Phrygia	Regent Honeyeater	E1	6			
Menuridae							
	Menura novaehollandiae	Superb Lyrebird	P	3			

Table A.2 FAUNA SPECIES FOUND WITHIN THE SMP (GUNNINAH), THE EASTERN PRECINCT STUDY AREA (ERM) AND CURRENT STUDY AREA (CE) (U=UNPROTECTED, P=PROTECTED, V=VULNERABLE, E1=ENDANGERED, RS=REGIONALLY SIGNIFICANT) **---** **S=SUBJECT SITE, A = STUDY AREA, P=PROPERTY, I = INCIDENTAL**

	Scientific Name	Common Name	NSW status	NPWS Count	Gunninah 1991	ERM 2003	CE 2004
Meropidae							
	Merops ornatus	Rainbow Bee-eater	P	5			
Motacillidae							
	Anthus australis	Australian Pipit	P	7	P-I		
Muscicapidae							
	Turdus merula	Eurasian Blackbird	U	9			
	Zoothera dauma	Unindentified Ground Thrush	P	1			
Neosittidae							
	Daphoenositta chrysoptera	Varied Sittella	P	31	P	P	P
Oriolidae							
	Oriolus sagittatus	Olive-backed Oriole	P	28	P		S
Pachycephalidae							
	Colluricincla harmonica	Grey Shrike-thrush	P	78	P	P	P
	Falcunculus frontatus	Eastern Shrike-tit	RS	24	P	P	P
	Monarcha melanopsis	Black-faced Monarch	P	0	P-I		
	Pachycephala pectoralis	Golden Whistler	P	69	P	P	P
	Pachycephala rufiventris	Rufous Whistler	P	45			
Pardalotidae							

Table A.2 FAUNA SPECIES FOUND WITHIN THE SMP (GUNNINAH), THE EASTERN PRECINCT STUDY AREA (ERM) AND CURRENT STUDY AREA (CE) (U=UNPROTECTED, P=PROTECTED, V=VULNERABLE, E1=ENDANGERED, RS=REGIONALLY SIGNIFICANT) **---** **S=SUBJECT SITE, A = STUDY AREA, P=PROPERTY, I = INCIDENTAL**

	Scientific Name	Common Name	NSW status	NPWS Count	Gunninah 1991	ERM 2003	CE 2004
	Pardalotus punctatus	Spotted Pardalote	P	87	P	P	S
	Pardalotus striatus	Striated Pardalote	P	42			S
Passeridae							
	Passer domesticus	House Sparrow	U	24			
Pelecanidae							
	Pelecanus conspicillatus	Australian Pelican	P	6			
Petroicidae							
	Eopsaltria australis	Eastern Yellow Robin	P	55	P	P	P
	Microeca fascinans	Jacky Winter	P	5		P	P
	Petroica boodang	Scarlet Robin	P	10			P
	Petroica goodenovii	Red-capped Robin	P	4			
	Petroica phoenicea	Flame Robin	P	5			
	Petroica rosea	Rose Robin	P	19	P		P
Phalacrocoracidae							
	Phalacrocorax carbo	Great Cormorant	P	1			
	Phalacrocorax melanoleucos	Little Pied Cormorant	P	11	P		P
	Phalacrocorax sulcirostris	Little Black Cormorant	P	5			
	Phalacrocorax varius	Pied Cormorant	P	6			

Table A.2 FAUNA SPECIES FOUND WITHIN THE SMP (GUNNINAH), THE EASTERN PRECINCT STUDY AREA (ERM) AND CURRENT STUDY AREA (CE) (U=UNPROTECTED, P=PROTECTED, V=VULNERABLE, E1=ENDANGERED, RS=REGIONALLY SIGNIFICANT) **---** **S=SUBJECT SITE, A = STUDY AREA, P=PROPERTY, I = INCIDENTAL**

	Scientific Name	Common Name	NSW status	NPWS Count	Gunninah 1991	ERM 2003	CE 2004
Phasianidae							
	Coturnix chinensis	King Quail	P	1			
	Coturnix pectoralis	Stubble Quail	P	5			
	Coturnix sp.	Unidentified Quail	P	1			
	Coturnix ypsilophora	Brown Quail	P	3	P-I		
Podargidae							
	Podargus strigoides	Tawny Frogmouth	P	28	P		
Podicipedidae							
	Podiceps cristatus	Great Crested Grebe	P	8			
	Poliocephalus poliocephalus	Hoary-headed Grebe	P	2			
	Tachybaptus novaehollandiae	Australasian Grebe	P	8	P-I		P
Psittacidae							
	Alisterus scapularis	Australian King-Parrot	P	7			
	Glossopsitta pusilla	Little Lorikeet	P	3			
	Lathamus discolor	Swift Parrot	E1	38			
	Neophema pulchella	Turquoise Parrot	V	1			
	Northiella haematogaster	Blue Bonnet	P	1			
	Platycercus adscitus eximius	Eastern Rosella	P	80	P	P	S

Table A.2 FAUNA SPECIES FOUND WITHIN THE SMP (GUNNINAH), THE EASTERN PRECINCT STUDY AREA (ERM) AND CURRENT STUDY AREA (CE) (U=UNPROTECTED, P=PROTECTED, V=VULNERABLE, E1=ENDANGERED, RS=REGIONALLY SIGNIFICANT) **---** **S=SUBJECT SITE, A = STUDY AREA, P=PROPERTY, I = INCIDENTAL**

	Scientific Name	Common Name	NSW status	NPWS Count	Gunninah 1991	ERM 2003	CE 2004
	Platycercus elegans	Crimson Rosella	P	25	P-I	P	P
	Psephotus haematonotus	Red-rumped Parrot	P	53	P-I		S
	Trichoglossus chlorolepidotus	Scaly-breasted Lorikeet	P	0	P-I		
	Trichoglossus haematodus	Rainbow Lorikeet	P	32	P-I		S
Ptilonorhynchidae							
	Ptilonorhynchus violaceus	Satin Bowerbird	P	8			
	Sericulus chrysocephalus	Regent Bowerbird	P	1			
Pycnonotidae							
	Pycnonotus jocosus	Red-whiskered Bulbul	U	26	P-I		P
Rallidae							
	Fulica atra	Eurasian Coot	P	7	P-I		P
	Gallinula tenebrosa	Dusky Moorhen	P	17	P		P
	Porphyrio porphyrio	Purple Swamphen	P	24	P-I		P
	Porzana pusilla	Baillon's Crake	P	1			
Recurvirostridae							
	Recurvirostra novaehollandiae	Red-necked Avocet	P	1			
Scolopacidae							
	Actitis hypoleucos	Common Sandpiper	P	2			

Table A.2 FAUNA SPECIES FOUND WITHIN THE SMP (GUNNINAH), THE EASTERN PRECINCT STUDY AREA (ERM) AND CURRENT STUDY AREA (CE) (U=UNPROTECTED, P=PROTECTED, V=VULNERABLE, E1=ENDANGERED, RS=REGIONALLY SIGNIFICANT) **---** **S=SUBJECT SITE, A = STUDY AREA, P=PROPERTY, I = INCIDENTAL**

	Scientific Name	Common Name	NSW status	NPWS Count	Gunninah 1991	ERM 2003	CE 2004
	Gallinago hardwickii	Latham's Snipe	P	1			
	Limosa limosa	Black-tailed Godwit	V	1			
	Tringa glareola	Wood Sandpiper	P	2			
Strigidae							
	Ninox boobook	Southern Boobook	P	9	P-I		
	Ninox connivens	Barking Owl	V	2			
	Ninox strenua	Powerful Owl	V	1			
	Tyto/Ninox sp.	Unidentified Large Forest Owl	P	1			
Sturnidae							
	Acridotheres tristis	Common Myna	U	101	P-I		S
	Sturnus vulgaris	Common Starling	U	74	P		S
Sylviidae							
	Acrocephalus australis	Australian Reed-Warbler	P	4			
	Cisticola exilis	Golden-headed Cisticola	P	14			
	Megalurus gramineus	Little Grassbird	P	3			
Threskiornithidae							
	Platalea flavipes	Yellow-billed Spoonbill	P	5	P-I		P
	Platalea regia	Royal Spoonbill	P	5	P-I		

Table A.2 FAUNA SPECIES FOUND WITHIN THE SMP (GUNNINAH), THE EASTERN PRECINCT STUDY AREA (ERM) AND CURRENT STUDY AREA (CE) (U=UNPROTECTED, P=PROTECTED, V=VULNERABLE, E1=ENDANGERED, RS=REGIONALLY SIGNIFICANT) **---** **S=SUBJECT SITE, A = STUDY AREA, P=PROPERTY, I = INCIDENTAL**

	Scientific Name	Common Name	NSW status	NPWS Count	Gunninah 1991	ERM 2003	CE 2004
	Plegadis falcinellus	Glossy Ibis	P	1			
	Threskiornis molucca	Australian White Ibis	P	7			
	Threskiornis spinicollis	Straw-necked Ibis	P	6	P		
Turnicidae							
	Turnix varia	Painted Button-quail	P	2			
Tytonidae							
	Tyto alba	Barn Owl	P	12			
	Tyto novaehollandiae	Masked Owl	V	3			
Unknown							
	Bird sp.	Feathers (unknown species)	U	5			
Zosteropidae							
	Zosterops lateralis	Silvereye	P	68	P-I		P
Insecta							
Unknown							
	Insect sp.	Insect Remains	U	2			
Mollusca							
Camaenidae							
	Meridolum corneovirens	Cumberland Land Snail	E1	170		P	S

Table A.2 FAUNA SPECIES FOUND WITHIN THE SMP (GUNNINAH), THE EASTERN PRECINCT STUDY AREA (ERM) AND CURRENT STUDY AREA (CE) (U=UNPROTECTED, P=PROTECTED, V=VULNERABLE, E1=ENDANGERED, RS=REGIONALLY SIGNIFICANT) **---** **S=SUBJECT SITE, A = STUDY AREA, P=PROPERTY, I = INCIDENTAL**

	Scientific Name	Common Name	NSW status	NPWS Count	Gunninah 1991	ERM 2003	CE 2004
Helicidae							
	Helix aspersa	Brown gardensnail	U	6			
Amphibia							
Bufonidae							
	Bufo marinus	Cane Toad	U	1			
Hylidae							
	Litoria aurea	Green and Golden Bell Frog	E1	9			
	Litoria caerulea	Green Tree Frog	P	21			
	Litoria dentate	Keferstein's Tree Frog	P	6			P
	Litoria fallax	Eastern Dwarf Tree Frog	P	23			
	Litoria latopalmata	Broad-palmed Frog	P	9			
	Litoria lesueuri	Lesueur's Frog	P	1			
	Litoria peronii	Peron's Tree Frog	P	13		P	
	Litoria tyleri	Tyler's Tree Frog	P	1			
	Litoria verreauxii	Verreaux's Tree Frog	P	30		P	
Myobatrachidae							
	Crinia signifera	Common Eastern Froglet	P	113	P	P	S
	Heleioporus australiacus	Giant Burrowing Frog	V	1			

Table A.2 FAUNA SPECIES FOUND WITHIN THE SMP (GUNNINAH), THE EASTERN PRECINCT STUDY AREA (ERM) AND CURRENT STUDY AREA (CE) (U=UNPROTECTED, P=PROTECTED, V=VULNERABLE, E1=ENDANGERED, RS=REGIONALLY SIGNIFICANT) **---** **S=SUBJECT SITE, A = STUDY AREA, P=PROPERTY, I = INCIDENTAL**

	Scientific Name	Common Name	NSW status	NPWS Count	Gunninah 1991	ERM 2003	CE 2004
	Limnodynastes dumerilii	Bullfrog	P	2			
	Limnodynastes ornatus	Ornate Burrowing Frog	P	1			
	Limnodynastes peronii	Striped Marsh Frog	P	29			S
	Limnodynastes tasmaniensis	Spotted Marsh Frog	P	22			P
	Pseudophryne bibronii	Bibron's Toadlet	P	3			
	Pseudophryne sp.		P	1			
	Uperoleia laevigata	Smooth Toadlet	P	13			
Mammalia							
Bovidae							
	Bos Taurus	European cattle	U	10			
	Capra hircus	Goat	U	5			
	Ovis aries	Sheep (feral)	U	1			
Canidae							
	Canis lupus	Dingo, domestic dog	U	34			
	Canis lupus familiaris	Dog	U	12		P	
	Vulpes vulpes	Fox	U	60	P	P	
Dasyuridae							
	Antechinus stuartii	Brown Antechinus	P	2			

Table A.2 FAUNA SPECIES FOUND WITHIN THE SMP (GUNNINAH), THE EASTERN PRECINCT STUDY AREA (ERM) AND CURRENT STUDY AREA (CE) (U=UNPROTECTED, P=PROTECTED, V=VULNERABLE, E1=ENDANGERED, RS=REGIONALLY SIGNIFICANT) **---** **S=SUBJECT SITE, A = STUDY AREA, P=PROPERTY, I = INCIDENTAL**

	Scientific Name	Common Name	NSW status	NPWS Count	Gunninah 1991	ERM 2003	CE 2004
	Dasyurus maculates	Spotted-tailed Quoll	V	3			
Equidae							
	Equus caballus	Horse	U	19			
Felidae							
	Felis catus	Cat	U	20	P		S
Leporidae							
	Lepus capensis	Brown Hare	U	21	P	P	S
	Oryctolagus cuniculus	Rabbit	U	67	P	P	S
Macropodidae							
	Macropus giganteus	Eastern Grey Kangaroo	P	28	P	P	S
	Macropus robustus	Common Wallaroo	P	5			
	Macropus rufogriseus	Red-necked Wallaby	P	5			
	Macropus rufus	Red Kangaroo	P	0	P	P	S
	Wallabia bicolor	Swamp Wallaby	P	19			
Molossidae							
	Mormopterus norfolkensis	Eastern Freetail-bat	V	10		P	
	Mormopterus norfolkensis/sp 1	Unidentified Mastiff-bat	P	15			
	Mormopterus planiceps	Little Mastiff-bat	P	1			

Table A.2 FAUNA SPECIES FOUND WITHIN THE SMP (GUNNINAH), THE EASTERN PRECINCT STUDY AREA (ERM) AND CURRENT STUDY AREA (CE) (U=UNPROTECTED, P=PROTECTED, V=VULNERABLE, E1=ENDANGERED, RS=REGIONALLY SIGNIFICANT) **---** **S=SUBJECT SITE, A = STUDY AREA, P=PROPERTY, I = INCIDENTAL**

	Scientific Name	Common Name	NSW status	NPWS Count	Gunninah 1991	ERM 2003	CE 2004
	Nyctinomus australis	White-striped Freetail-bat	P	12		P	
Muridae							
	Mus musculus	House Mouse	U	48	P		
	Rattus fuscipes	Bush Rat	P	2			
	Rattus rattus	Black Rat	U	20	P		
	Rattus sp.	rat	P	12			
Peramelidae							
	Perameles nasuta	Long-nosed Bandicoot	P	2			
Petauridae							
	Petaurus australis	Yellow-bellied Glider	V	1			
	Petaurus breviceps	Sugar Glider	P	24	P		
	Petaurus norfolcensis	Squirrel Glider	V	2			
Phalangeridae							
	Trichosurus sp.	brushtail possum	P	7			
	Trichosurus vulpecula	Common Brushtail Possum	P	46	P		S
Phascolarctidae							
	Phascolarctos cinereus	Koala	V	4			
	Pseudocheirus peregrinus	Common Ringtail Possum	P	27	P	P	

Table A.2 FAUNA SPECIES FOUND WITHIN THE SMP (GUNNINAH), THE EASTERN PRECINCT STUDY AREA (ERM) AND CURRENT STUDY AREA (CE) (U=UNPROTECTED, P=PROTECTED, V=VULNERABLE, E1=ENDANGERED, RS=REGIONALLY SIGNIFICANT) **---** **S=SUBJECT SITE, A = STUDY AREA, P=PROPERTY, I = INCIDENTAL**

	Scientific Name	Common Name	NSW status	NPWS Count	Gunninah 1991	ERM 2003	CE 2004
Pteropodidae							
	Pteropus poliocephalus	Grey-headed Flying-fox	V	15			
	Pteropus sp.	Flying-fox	P	1			
Suidae							
	Sus scrofa	Pig	U	3			
Tachyglossidae							
	Tachyglossus aculeatus	Short-beaked Echidna	P	8	P-I		
Vespertilionidae							
	Chalinolobus dwyeri	Large-eared Pied Bat	V	3			
	Chalinolobus gouldii	Gould's Wattled Bat	P	27		P	
	Chalinolobus morio	Chocolate Wattled Bat	P	17	P	P	
	Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	1			
	Miniopterus schreibersii oceanensis	Eastern Bent-wing Bat	V	4	P	P	S
	Myotis adversus	Large-footed Myotis	V	7			S
	Nyctophilus geoffroyi	Lesser Long-eared Bat	P	17	P	P	
	Nyctophilus gouldi	Gould's Long-eared Bat	P	1			
	Nyctophilus sp.	long-eared bat	P	1		P	

Table A.2 FAUNA SPECIES FOUND WITHIN THE SMP (GUNNINAH), THE EASTERN PRECINCT STUDY AREA (ERM) AND CURRENT STUDY AREA (CE) (U=UNPROTECTED, P=PROTECTED, V=VULNERABLE, E1=ENDANGERED, RS=REGIONALLY SIGNIFICANT) **---** **S=SUBJECT SITE, A = STUDY AREA, P=PROPERTY, I = INCIDENTAL**

	Scientific Name	Common Name	NSW status	NPWS Count	Gunninah 1991	ERM 2003	CE 2004
	Nycticeius rueppellii	Greater Broadnosed Bat	V	0	P	P	
	Scotorepens orion	Eastern Broad-nosed Bat	P	14			
	Vespadelus darlingtoni	Large Forest Bat	P	4		P	
	Vespadelus pumilus	Eastern Forest Bat	P	4			
	Vespadelus regulus	Southern Forest Bat	P	41		P	
	Vespadelus vulturnus	Little Forest Bat	P	41	P	P	
Vombatidae							
	Vombatus ursinus	Common Wombat	P	3			
Reptilia							
Agamidae							
	Amphibolurus muricatus	Jacky Lashtail	P	12			
	Physignathus lesueurii	Eastern Water Dragon	P	6			
	Pogona barbata	Eastern Bearded Dragon	RS	6	P-I	P	
Chelidae							
	Chelodina longicollis	Eastern Snake-necked Turtle	P	8			
Elapidae							
	Demansia psammophis	Yellow-faced Whipsnake	P	1			
	Furina diadema	Red-naped Snake	P	3			

Table A.2 FAUNA SPECIES FOUND WITHIN THE SMP (GUNNINAH), THE EASTERN PRECINCT STUDY AREA (ERM) AND CURRENT STUDY AREA (CE) (U=UNPROTECTED, P=PROTECTED, V=VULNERABLE, E1=ENDANGERED, RS=REGIONALLY SIGNIFICANT) **---** **S=SUBJECT SITE, A = STUDY AREA, P=PROPERTY, I = INCIDENTAL**

	Scientific Name	Common Name	NSW status	NPWS Count	Gunninah 1991	ERM 2003	CE 2004
	Pseudechis porphyriacus	Red-bellied Black Snake	P	20	P	P	
	Pseudonaja textiles	Eastern Brown Snake	P	4	P-I	P	
	Suta spectabilis	Spectacled Hooded Snake	P	1			
Gekkonidae							
	Diplodactylus vittatus	Eastern Stone Gecko	P	7			
Pygopodidae							
	Pygopus lepidopodus	Southern Scaly-foot	P	3			
Scincidae							
	Cryptoblepharus virgatus	Cream-striped Shinning-skink	P	12			
	Ctenotus robustus	Robust Ctenotus	P	23			
	Ctenotus taeniolatus	Copper-tailed Ctenotus	P	8			
	Eulamprus quoyii	Eastern Water-skink	P	29			
	Eulamprus tenuis	Bar-sided Forest-skink	P	1			
	Lampropholis delicate	Dark-flecked Garden Sunskink	P	61			
	Lampropholis guichenoti	Pale-flecked Garden Sunskink	P	55	A	P	
	Lampropholis sp.	unidentified grass skink	P	11			
	Lygisaurus foliorum	Tree-base Litter-skink	P	1			
	Saiphos equalis	Yellow-bellied Three-toed Skink	P	1			

Table A.2 FAUNA SPECIES FOUND WITHIN THE SMP (GUNNINAH), THE EASTERN PRECINCT STUDY AREA (ERM) AND CURRENT STUDY AREA (CE) (U=UNPROTECTED, P=PROTECTED, V=VULNERABLE, E1=ENDANGERED, RS=REGIONALLY SIGNIFICANT) **---** **S=SUBJECT SITE, A = STUDY AREA, P=PROPERTY, I = INCIDENTAL**

	Scientific Name	Common Name	NSW status	NPWS Count	Gunninah 1991	ERM 2003	CE 2004
	Saproscincus mustelinus	Weasel Shadeskink	P	5			
	Tiliqua scincoides	Common Bluetongue	P	24	P-I		
Typhlopidae							
	Ramphotyphlops nigrescens	Blackish Blind Snake	P	3			
Varanidae							
	Varanus varius	Lace Monitor	RS	6			

Appendix B

Assessments of Significance

B.1 Endangered Ecological Communities

B.1.1 River-flat Eucalypt Forest

River-flat Eucalypt Forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions includes and replaces Sydney Coastal River-flat Forest Endangered Ecological Community (NSW Scientific Committee 2004b). River-Flat Eucalypt Forest (RFEF) may adjoin or intergrade with several other endangered ecological communities, which collectively cover all remaining native vegetation on the coastal floodplains of New South Wales (NSW Scientific Committee 2004b).

River-flat Eucalypt Forest occurs on the Cumberland Plain, along riverbanks and floodplains. It occurs in two forms: Riparian Forest, which is found on alluvial soils along main river channels, and Alluvial Woodland, which exists along minor watercourses and on terraces next to Riparian Forest. Dominant canopy species of Riparian Forest are Broad Leaf Apple (*Angophora subvelutina*), Cabbage Gum (*Eucalyptus amplifolia*), Bangalay (*E. botryoides*) and River Peppermint (*E. elata*). Alluvial Woodland is dominated by Cabbage Gum, Forest Red Gum (*E. tereticornis*) and Swamp Oak (*Casuarina glauca*) (NSW Scientific Committee 2004b).

The Alluvial Woodland form of RFEF occurs on the subject site. It generally occurs around the periphery of the precincts and several small sections are included on the subject site in varying form of degradation, but mainly as scattered indigenous tree cover. There is a small area of RFEF with the canopy intact on the western edge of the subject site adjacent South Creek, and an area with canopy gaps in the north of the subject site.

a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable.

b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable.

c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

The RFEF will be mostly removed from the subject site. However, this is not likely to place the local occurrence of the community at risk of extinction as these representations of the community are small and degraded, and much larger tracts of intact RFEF will be conserved within the Regional Park.

The RFEF to be conserved within the Regional Park will not be adversely modified by the proposed development but will be conserved intact.

d) In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

The community will be mostly removed from the subject site. However, large areas of the community will be retained within the Regional Park.

As all native vegetation will be removed from the Dunheved Precincts, aside from drainageline vegetation, no areas of habitat will become fragmented or isolated as a result of the proposed development. The native vegetation surrounding the precincts will remain connected within the Regional Park.

The habitat to be removed is not important for the long-term survival of the community. The areas of RFEF on the subject site are degraded or have a high edge to area ratio and are susceptible to weed invasion. Larger areas of intact RFEF will be conserved within the Regional Park which will ensure the long-term survival of the community within the locality.

e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat for this endangered ecological community is currently listed in the critical habitat registry by the Director-General of the DEC.

f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plans,

No recovery plan has been prepared for RFEF, although a recovery plan for the endangered ecological communities of the Cumberland Plain is currently being drafted.

No threat abatement plans are relevant to this community.

g) *Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.*

Clearing of native vegetation is a listed key threatening process under the TSC Act. The proposal will involve the removal of the majority of RFEF on the subject site but much larger areas will be retained within the Regional Park. Accordingly, the clearing associated with the development of the Dunheved Precincts is not likely to threaten or have the capacity to threaten the survival of RFEF in the locality.

Other key threatening processes that may be increased as a result of the proposed development include:

- Invasion and establishment of exotic vines and scramblers;
- Competition and grazing by the European Feral Rabbit; and
- Invasion of native plant communities by exotic perennial grasses.

However, the implementation of the Weed Management Plan and the Feral and Domestic Animal Management Strategy for the Dunheved Precincts will control weeds and rabbits, mitigating the effects that may be exacerbated by the clearance of RFEF from the subject site.

Conclusion

The proposed development is not likely to have a significant impact on RFEF. No Species Impact Statement is required for this ecological community.

B.1.2 Cumberland Plain Woodland

Cumberland Plain Woodland (CPW) occurs in two forms; Shale Hills Woodland and Shale Plains Woodland. Shale Hills Woodland occurs in the south of the Cumberland Plain in more elevated areas. Shale Plains Woodland (SPW) is more widely distributed, occurring throughout the drier areas of the Cumberland Plain (NSW NPWS 2001a). Dominant canopy species include Grey Box (*Eucalyptus moluccana*), Forest Red Gum (*E. tereticornis*), Narrow-leaved Ironbark (*E. creba*), Spotted Gum (*Corymbia maculata*) and Thin-leaved Stringybark (*E. eugenoides*). The shrub layer is dominated by Blackthorn (*Bursaria spinosa*). Grasses dominate the ground layer (Benson and Howell 1990).

The community is well adapted to fire and drought but is now under threat from disturbance triggering weed invasion, increasing soil nutrients, rubbish dumping and altered fire regimes (NSW NPWS 2001a).

Small patches of depauperate CPW occur on the subject site, as stands of scattered indigenous tree cover and one patch with canopy gaps. Larger patches and tracts of CPW

occur within the study area. Known areas of CPW occur at Scheyville National Park, Windsor Downs Nature Reserve, Leacock Regional Park and Mulgoa Nature Reserve (NSW NPWS 2001a).

a) *in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction*

Not applicable.

b) *in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction*

Not applicable.

c) *in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

   (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*

   (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*

The CPW that occurs on the study site will be entirely removed by the proposed development. However these patches are small and highly disturbed, and large tracts of CPW will be conserved within the Regional Park.

The CPW will be entirely removed from the subject site but the representation of the community within the Regional Park will not be modified by the proposed development.

d) *in relation to the habitat of a threatened species, population or ecological community:*

   (i) *the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*

   (ii) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*

   (iii) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*

The CPW will be entirely removed from the subject site. However, large tracts of the community will be retained within the Regional Park.

Clearing of CPW from the subject site will not fragment or isolate other areas of habitat as all areas of native vegetation will be removed from the subject site. Native vegetation adjacent the precincts will remain intact and connected to other areas of habitat.

The habitat to be cleared as a result of the proposed development is not an important area of habitat for CPW. The patches are small and highly disturbed, consisting of woodland with canopy gaps or scattered indigenous tree cover. Larger areas of intact CPW will be conserved within the Regional Park, maintaining the existence of the community in the locality in the long-term.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)

No critical habitat for this endangered ecological community is currently listed in the critical habitat registry by the Director-General of the DEC.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

The DEC is currently preparing a draft recovery plan for the endangered ecological communities of the Cumberland Plain, though it is yet to be finalised.

There are no threat abatement plans relevant to CPW.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Clearing of native vegetation is a listed key threatening process under the TSC Act. The proposal will involve the removal of the CPW on the subject site but much larger areas will be retained within the Regional Park. Accordingly, the clearing associated with the development of the Dunheved Precincts is not likely to threaten or have the capacity to threaten the survival of CPW in the locality.

Other key threatening processes that may be increased as a result of the proposed development include:

- Invasion and establishment of exotic vines and scramblers;
- Competition and grazing by the European Feral Rabbit; and
- Invasion of native plant communities by exotic perennial grasses.

However, the implementation of the Weed Management Plan and Feral and Domestic Animal Management Strategy for the Dunheved Precincts will control weeds and rabbits, mitigating the effects that may be exacerbated by the clearance of CPW from the subject site.

Conclusion

The proposed development is not likely to have a significant impact on Cumberland Plain Woodland. No Species Impact Statement is required for this ecological community.

B.1.3 Shale Gravel Transition Forest

Shale-Gravel Transition Forest (SGTF) has a dominant canopy species of Broad-leaved Ironbark (*Eucalyptus fibrosa*) but Grey Box (*E. moluccana*) and Forest Red Gum (*E. tereticornis*) may also occur. Paperbark (*Melaleuca decora*) dominates the understorey, with *Bursaria spinosa*, *Daviesia ulicifolia* and *Lissanthe strigosa* occurring in the shrub layer. Grasses and herbs occur in the ground layer. SGTF occurs mainly in the north of the Cumberland Plain, on gravel deposits over shale soils. Threats to SGTF include clearing, mining for gravel and weed invasion (NSW NPWS 2002a).

Regrowth SGTF of varying condition occurs in the study area. On the subject site it occurs as scattered stands of indigenous tree cover with no understorey. These patches are segregated by existing buildings and disturbed/remediated areas.

A small patch of scattered indigenous tree cover of SGTF occurs in the south eastern corner of the Dunheved Precincts adjacent existing industrial development outside the SMP boundary.

a) *In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*

Not applicable.

b) *In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,*

Not applicable.

c) *In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

   (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*

   (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*

All of the SGTF existing on the subject site will be removed for the proposed development. However, this is a very small, highly disturbed patch of the community and larger intact

areas will be conserved in the Regional Park. Therefore the local occurrence of the community will not be placed at risk of extinction.

Although the occurrence of SGTF on the subject site will be removed, the community where it exists within the Regional Park will not be modified by the proposed development.

d) In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

The proposed development occurs in currently cleared and highly degraded area. A small highly degraded patch of SGTF is to be entirely removed for the proposed development.

The patch of SGTF on the subject site is adjacent an existing industrial area. The clearance of this patch will not isolate or fragment areas of habitat for this community.

The patch of SGTF to be removed is not considered important for the long-term survival of the community as it is a small and highly degraded patch, and much larger areas will be represented within the Regional Park ensuring its long-term persistence in the locality.

e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat for this endangered ecological community has currently been identified by the Director-General of the DEC.

f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plans,

The DEC is currently preparing a draft recovery plan for endangered ecological communities of the Cumberland Plain, though it is yet to be finalised.

There are no threat abatement plans relevant to SGTF.

g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Clearing of native vegetation is a listed key threatening process under the TSC Act. The proposal will involve the removal of the SGTF on the subject site but much larger areas

will be retained within the Regional Park. Accordingly, the clearing associated with the development of the Dunheved Precincts is not likely to threaten or have the capacity to threaten the survival of SGTF in the locality.

Other key threatening processes that may be increased as a result of the proposed development include:

- Invasion and establishment of exotic vines and scramblers;
- Competition and grazing by the European Feral Rabbit; and
- Invasion of native plant communities by exotic perennial grasses.

However, the implementation of the Weed Management Plan and the Feral and Domestic Animal Management Strategy for the Dunheved Precincts will control weeds and rabbits, mitigating the effects that may be exacerbated by the clearance of SGTF from the subject site.

Conclusion

No significant impact is likely. No Species Impact Statement is required for this ecological community.

B.2 Threatened Flora Species.

B.2.1 Grevillea juniperina subsp juniperina

Grevillea juniperina subsp. *juniperina* is a dense shrub, 0.5-1.5m tall, found only in Western Sydney (Robinson 1991). The distribution is bounded by St Mary's, Londonderry and Prospect. It occurs on red sandy to clay soils in Cumberland Plain Woodland and Castlereagh Woodland. It is found in localised and small populations. *Grevillea juniperina* subsp. *juniperina* is threatened by habitat clearance, altered fire regimes, weed invasion, rubbish dumping, trampling and vehicular damage (NSW Scientific Committee 2000). In summary:

- The species does occur on the subject site in relatively small numbers of up to 200 individuals;
- Several hundred thousand individuals of the species occur within the Regional Park and throughout the study area; and
- The species is conserved within the nearby Castlereagh Nature Reserve.

a) *In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*

It is estimated that approximately 200 individuals occur on the subject site which will be removed for the purpose of the proposed development. However this amount is very small when compared with the extensive habitat and hundreds of thousands of this species within the Regional Park. Therefore the proposed development is not likely to have an impact on the life cycle of the species or compromise the viability of the local population.

b) *In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,*

Not applicable.

c) *In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable.

d) *In relation to the habitat of a threatened species, population or ecological community:*

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

All known and potential habitat for *G. juniperina subsp. juniperina* will be removed from the subject site as a result of the proposed development.

Areas of habitat for the species will not become fragmented or isolated from other areas of habitat as a result of the proposed development as all areas of habitat will be removed from the subject site and areas of habitat outside the subject site will remain connected through the Regional Park.

The habitat on the subject site is not considered important for the long-term survival of the species. The habitat is highly degraded and larger areas of intact habitat will be conserved within the Regional Park, thus ensuring the long term survival of the species in the locality.

e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat for this species is currently listed in the critical habitat registry by the Director-General of the DEC.

f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

A recovery plan has not been prepared for this species. No threat abatement plans are relevant to this species.

g) Whether the action proposed constitutes or is part of a key threatening process or likely to result in the operation of, or increases the impact of, a key threatening process.

Clearing of native vegetation is a listed key threatening process under the TSC Act. The proposal will involve the removal of habitat for the species on the subject site but much larger areas will be retained within the Regional Park. Accordingly, the clearing associated with the development of the Dunheved Precincts is not likely to threaten or have the capacity to threaten the survival of the species in the locality.

Other key threatening processes that may be increased as a result of the proposed development include:

- Invasion and establishment of exotic vines and scramblers;
- Competition and grazing by the European Feral Rabbit; and
- Invasion of native plant communities by exotic perennial grasses.

However, the implementation of the Weed Management Plan and the Feral and Domestic Animal Management Strategy for the Dunheved Precincts will control weeds and rabbits, mitigating the effects that may be exacerbated by the proposed development.

Conclusion

No significant impact is likely. No Species Impact Statement is required for this species

B.2.2 Pultenaea parviflora

Pultenaea parviflora is a small shrub to 1m endemic to the Cumberland Plain. It occurs in the Windsor – Penrith – Dean Park area, with outlying populations at Kemps Creek and Wilberforce. It is conserved within Scheyville National Park, Windsor Downs Nature Reserve and Castlereagh Nature Reserve. It occurs in dry heath areas within Castlereagh

Ironbark Forest on Tertiary alluvium and laterised clays. The abundance of the species depends on the extent of past disturbance; with clearing, altered fire regimes, vehicle access, rubbish dumping and weed invasion being a threat to *P. parviflora*. Disturbance that leads to competition with taller colonising species also threatens this species.

a) *In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*

It is estimated that approximately 50 individuals occur on the subject site which will be removed for the purpose of the proposed development. However this amount is very small when compared with the extensive habitat and thousands of individuals of this species within the Regional Park. This species is also highly tolerant of disturbance and is expected to persist around the construction site. Therefore the proposed development is not likely to have an impact on the life cycle of the species or compromise the viability of the population.

b) *In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,*

Not applicable.

c) *In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

   (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*

   (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable.

d) *In relation to the habitat of a threatened species, population or ecological community:*

   (i) *the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*

   (ii) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*

   (iii) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

All known and potential habitat for *P. parviflora* will be removed from the subject site as a result of the proposed development.

Areas of habitat for the species will not become fragmented or isolated from other areas of habitat as a result of the proposed development as all areas of habitat will be removed from the subject site and areas of habitat outside the subject site will remain connected through the Regional Park.

The habitat on the subject site is not considered important for the long-term survival of the species. The habitat is highly degraded and larger areas of intact habitat will be conserved within the Regional Park, thus ensuring the long term survival of the species in the locality.

e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat for this species has currently been listed in the critical habitat registry by the Director-General of the DEC.

f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

A recovery plan has not been prepared for this species. No threat abatement plans are relevant to this species.

g) Whether the action proposed constitutes or is part of a key threatening process or likely to result in the operation of, or increases the impact of, a key threatening process.

Clearing of native vegetation is a listed key threatening process under the TSC Act. The proposal will involve the removal of habitat for the species on the subject site but much larger areas will be retained within the Regional Park. Accordingly, the clearing associated with the development of the Dunheved Precincts is not likely to threaten or have the capacity to threaten the survival of the species in the locality.

Other key threatening processes that may be increased as a result of the proposed development include:

- Invasion and establishment of exotic vines and scramblers;
- Competition and grazing by the European Feral Rabbit; and
- Invasion of native plant communities by exotic perennial grasses.

However, the implementation of the Weed Management Plan and the Feral and Domestic Animal Management Strategy for the Dunheved Precincts will control weeds and rabbits, mitigating the effects that may be exacerbated by the proposed development.

Conclusion

There will be no significant impact. No Species Impact Statement is required for this species.

B.3 Threatened Fauna Species

B.3.1 Bats

The following assessment of significance demonstrates that no significant impacts will occur to the threatened bat species:

- Eastern Bent-wing Bat (*Miniopterus schriebersii oceanensis*)
- Greater Broad-nosed Bat (*Scoteanax rueppellii*)
- Eastern Freetail-bat (*Mormopterus norfolkensis*)
- Large-footed Myotis (*Myotis adversus*)
- Grey-headed Flying-fox (*Pteropus poliocephalus*)

All of these species have been recorded on the SMP except the Grey-headed Flying-fox, which has been detected in the surrounding LGAs, and is expected to forage on the SMP from time to time. The species are expected to forage over the study area and can potentially roost in some of the larger trees occurring in the study area.

a) *In the case of a threatened species, whether the lifecycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction*

Bats are highly mobile species and as such, foraging habitat occurs throughout the study area including the subject site and the Regional Park. The Regional Park contains extensive areas of foraging and potential roosting habitat for bat species. The proposed development will result in the clearance of small patches of disturbed forest containing some roosting and foraging habitat. However approximately 900ha of better quality woodland providing foraging and roosting habitat are conserved within the Regional Park. It is therefore unlikely that the proposed development would place a viable local population of any microchiropteran bat species at risk of extinction.

b) *In the case of an endangered population, whether the lifecycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised,*

Not applicable.

c) *In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

(i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*

(ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable.

d) *In relation to the habitat of a threatened species, population or ecological community:*

(i) *the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*

(ii) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*

(iii) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

All potential habitat for these species will be removed from the subject site. However, large areas of habitat will remain intact in the Regional Park, including the known foraging areas of South Creek and the STP outflow.

Areas of habitat for the species will not become fragmented or isolated from other areas of habitat as a result of the proposed development as all areas of habitat will be removed from the subject site and areas of habitat outside the subject site will remain connected through the Regional Park.

The habitat on the subject site is not considered important for the long-term survival of these species. The habitat is highly degraded and larger areas of intact habitat will be conserved within the Regional Park, thus ensuring the long term survival of the species in the locality.

e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No critical habitat for the subject bat species is currently listed in the critical habitat registry by the Director-General of the DEC.

f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

A recovery plan has not been prepared for these species. No threat abatement plans are relevant to these species.

g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of a key threatening process.

Clearing of native vegetation is a listed key threatening process under the TSC Act. The proposal will involve the removal of habitat for the species on the subject site but much larger areas will be retained within the Regional Park. Accordingly, the clearing associated with the development of the Dunheved Precincts is not likely to threaten or have the capacity to threaten the survival of the species in the locality.

Other key threatening processes that may be increased as a result of the proposed development include:

- Loss of hollow-bearing trees (proposed key threatening process); and
- Removal of dead wood and dead trees.

However, many hollow-bearing trees will be retained within the Regional Park to provide roosting habitat for hollow-dwelling bats.

Conclusion

No significant impact is likely. A species impact statement is not required for any of these bat species.

B.3.2 Koala

The following assessment of significance demonstrates that no significant impacts will occur to the Koala.

In summary:

- The species has not been detected in the subject site or the study area at any time during fauna surveys, including during the August 2004 targeted surveys;
- No verified Koalas or traces of Koala activities have been detected on the SMP during over a decade of fauna surveys throughout the site;
- Only a small number of unverified records lacking precise location details of Koalas are available from in or around the SMP – no confirmed records are known from the subject site;
- One feed tree species identified in SEPP 44 (Forest Red Gum) occurs in the study area; and
- Primary, secondary and supplementary feed trees that have been identified by the recovery plan for Koalas are widespread in the study area.

a) *In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.*

No sign of the species or indications of its presence were recorded during field surveys on the subject site. Koalas have not been detected in the numerous fauna surveys conducted in the study area (Gunninah 1991, ERM 2003).

The species is considered unlikely to occur on the subject site because there are no verified records of the species using the SMP, few records of the species occur in the Blacktown and Penrith LGAs with only two records occurring within the last decade and the SMP consists of fragmented patches of vegetation poorly connected to other areas of native vegetation with busy roads nearby.

There is no known local population of Koalas in the study area, however, extensive areas of potential habitat occur within the Regional Park. Therefore it is not likely that the proposed action will have an adverse effect on the life cycle of the species such that a viable local population of the species will be placed at risk of extinction.

b) *In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.*

Not applicable.

c) *In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

(i) Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable.

d) *In relation to the habitat of a threatened species, population or ecological community:*

(i) The extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

All potential habitat for the species will be removed from the subject site. However, large areas of habitat will remain intact in the Regional Park.

Areas of potential habitat for the species will not become fragmented or isolated from other areas of habitat as a result of the proposed development as all areas of habitat will be removed from the subject site and areas of habitat outside the subject site will remain connected through the Regional Park.

The potential habitat on the subject site is not considered important for the long-term survival of this species as the Koala is not known from the study area and not considered likely to occur there. The habitat is highly degraded and larger areas of intact habitat will be conserved within the Regional Park.

e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No critical habitat for this species has currently been listed in the critical habitat registry by the Director-General of the DEC.

f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

A Recovery Plan has been drafted for the Koala. The objectives of this plan include:

- To conserve koalas in their existing habitat;
- To rehabilitate and restore koala habitat and populations;
- To develop a better understanding of the conservation biology of koalas;
- To ensure that the community has access to factual information about the distribution, conservation and management of koalas at a national, state and local scale;
- To manage captive, sick or injured koalas and orphaned wild koalas to ensure consistent and high standards of care;
- To manage over-browsing to prevent both koala starvation and ecosystem damage in discrete patches of habitat; and
- To co-ordinate the implementation of the Koala Recovery Plan across NSW.

The proposed action is consistent with the second of these objectives in that potential habitat for the species will be conserved within the Regional Park. The proposed action does not conflict with the other objectives.

The fox threat abatement plan is relevant to this species, although the Koala is not listed as a priority species in the plan (NSW NPWS 2001b). The proposed development is consistent with the aims of the threat abatement plan.

g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Clearing of native vegetation is a listed key threatening process under the TSC Act. The proposal will involve the removal of potential habitat for the species on the subject site but much larger areas will be retained within the Regional Park. Accordingly, the clearing associated with the development of the Dunheved Precincts is not likely to threaten or have the capacity to threaten the survival of the species in the locality.

Other key threatening processes that may be increased as a result of the proposed development include:

- Predation by feral cats; and
- Predation by the European red fox.

However, the implementation of the Feral and Domestic Animal Management Strategy will mitigate any impacts exacerbated by the proposed development.

Conclusion

Koalas have not been detected on the SMP and are not considered likely to occur. Therefore, no significant impact is likely upon Koalas as a result of the proposed development and a Species Impact Statement is not required.

B.3.3 Birds

The following assessment of significance demonstrates that no significant impacts will occur to the threatened bird species:

- Speckled Warbler (*Pyrrholaemus sagittata*);
- Diamond Firetail (*Stagonopleura guttata*); and
- Black Bittern *(Ixobrychus flavicollis).*

a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The majority of potential habitat for all of these bird species is to be conserved within the proposed Regional Park. The areas of habitat for each species are extensive within the Regional Park and are likely to conserve local populations of these species if they are present.

An incidental record of Speckled Warbler has been recorded in the Central part of the Regional Park in 2006. The species has not been detected since that time but is assumed to occur in large woodland patches of the Regional Park.

The Diamond Firetail has not been recorded at the SMP since 1991 (Gunninah 1991). The species inhabits eucalypt dominated woodlands that have a grassy understorey.

The Black Bittern has been recorded once on the site circa 1960 on South Creek near the western boundary of the Precinct. The Black Bittern usually inhabits shadowy, leafy waterside tree cover such as *Casuarina*, *Eucalyptus* and *Melaleuca* species, tidal creeks and sheltered mudflats. It prefers areas of permanent water and dense vegetation (Marchant and Higgins 1990).

As much of the subject site is disturbed and consists of a relatively open canopy, scattered low shrubs and a sparse and/or heavily grazed grassy layer, it is unlikely that this area represents habitat for the Speckled Warbler, Diamond Firetail or the Black Bittern. If these species still occur on the SMP, they may forage on the edges of the proposed development area. However, it is most likely that they utilise the better quality woodland habitats of the Regional Park.

As 900 ha of good quality habitat will be conserved within the Regional Park, it is unlikely that any significant impact on the lifecycle of these species will occur due to the removal of a very small area of foraging habitat within the subject site. No threats to the viability of local populations of these species are therefore likely.

b) *In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.*

Not applicable.

c) *In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

(i) Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable.

d) *In relation to the habitat of a threatened species, population or ecological community:*

(i) The extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*

(iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*.

All potential habitat for these species will be removed from the subject site. However, large areas of habitat will remain intact in the Regional Park.

Areas of habitat for the species will not become fragmented or isolated from other areas of habitat as a result of the proposed development as all areas of habitat will be removed from the subject site and areas of habitat outside the subject site will remain connected through the Regional Park.

The habitat on the subject site is not considered important for the long-term survival of these species. The habitat is highly degraded and larger areas of intact habitat will be conserved within the Regional Park, thus ensuring the long term survival of the species in the locality.

e) *Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).*

No critical habitat for any of the species has been listed in the critical habitat registry by the Director-General of the DEC.

f) *Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.*

No recovery plan has been finalised or drafted for these species.

No threat abatement plans are relevant to these species.

g) *Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.*

Clearing of native vegetation is a listed key threatening process under the TSC Act. The proposal will involve the removal of potential habitat for the species on the subject site but much larger areas will be retained within the Regional Park. Accordingly, the clearing associated with the development of the Dunheved Precincts is not likely to threaten or have the capacity to threaten the survival of the species in the locality.

Other key threatening processes that may be increased as a result of the proposed development include:

- Predation by feral cats; and
- Predation by the European red fox.

However, the implementation of the Feral and Domestic Animal Management Strategy will mitigate any impacts exacerbated by the proposed development.

Conclusion

No significant impact is likely. A species impact statement is not required for any of these bird species.

B.3.4 Green and Golden Bell Frog

One threatened frog species is considered to have the potential to occur in the study area. The following assessment of significance demonstrates that no significant impacts will occur to the Green and Golden Bell Frog (*Litoria aurea*).

Green and Golden Bell Frogs have not been recorded on the SMP, although the species is known to occur in the locality. Targeted searches for it in the study area did not detect it.

Green and Golden Bell Frogs inhabit marshes, dams and stream sides, particularly water bodies containing bulrushes *Typha* spp. and spikerushes *Eleocharis* spp.

a) *In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.*

As Green and Golden Bell Frogs have not been recorded on the SMP and targeted searches for the species did not detect it in the study area, it is unlikely that any individuals of the species will be impacted by the proposed development. No viable local population is therefore likely to be placed at risk of extinction by the proposed development.

b) *In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.*

Not applicable.

c) *In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

(i) Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable.

d) *In relation to the habitat of a threatened species, population or ecological community:*

(i) The extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

All potential habitat for this species will be removed from the subject site. However, large areas of habitat will remain intact in the Regional Park.

Areas of potential habitat for the species will not become fragmented or isolated from other areas of habitat as a result of the proposed development as all areas of habitat will be removed from the subject site and areas of habitat outside the subject site will remain connected through the Regional Park.

The habitat on the subject site is not considered important for the long-term survival of the species. The habitat is highly degraded and larger areas of potential habitat will be conserved within the Regional Park, thus ensuring the long term survival of the species in the locality.

e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

Currently no critical habitat has been listed in the critical habitat registry for this species by the Director-General of DEC.

f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

A Recovery Plan has been drafted for the Green and Golden Bell Frog. The objectives of the plan include:

- Increase the security of key GGBF populations by way of preventing the further loss of GGBF habitat at key populations across the species range and where possible secure opportunities for increasing protection of habitat areas (reservation/conservation status, Section 10);

- Ensure extant GGBF populations are managed to eliminate or attenuate the operation of factors that are known or discovered to be detrimentally affecting the species (threat and habitat management, Section 11);

- Implement habitat management initiatives that are informed by data obtained through investigations into the general biology and ecology of the GGBF through a

systematic and coordinated monitoring program (research and monitoring, Section 12);

- Establish, within more than one institution, self sustaining and representative captive populations (particularly 'at risk' populations) of the Green and Golden Bell Frog for the primary purpose of maintaining 'insurance' colonies for re-establishment and supplementation of populations of the species (captive breeding and translocation, Section 13; with research and educational purposes a secondary objective.); and

- Increase the level of regional and local awareness of the conservation status of the Green and Golden Bell Frog and provide greater opportunity for community involvement in the implementation of this recovery plan (community education, awareness and involvement, Section 14).

The proposed action is consistent with these objectives and will assist in management of potential habitat for the species by limiting disturbance to habitat within the Regional Park.

The proposed action is also consistent with the aims of the Threat Abatement Plan for the Predation by *Gambusia holbrooki* – the Plague Minnow:

- Minimising further human dispersal of *Gambusia holbrooki* through implementing enhanced government regulation, public education and awareness campaigns;

- Removing *Gambusia holbrooki*, where practical, from areas occupied by key populations of priority frog species;

- Creating supplementary *Gambusia*-free habitat, adjacent to *Gambusia*-inhabited populations of priority frog species, in areas where *Gambusia* removal is considered not practical;

- Collaborating with broader water reform processes that seek to rehabilitate aquatic ecosystems; and

- Informing land managers by undertaking research into the biology and ecology of *Gambusia*, its impacts on frogs and the efficacy of proposed control measures.

g) *Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.*

Clearing of native vegetation is a listed key threatening process under the TSC Act. The proposal will involve the removal of potential habitat for the species on the subject site but much larger areas will be retained within the Regional Park. Accordingly, the clearing associated with the development of the Dunheved Precincts is not likely to threaten or have the capacity to threaten the survival of the species in the locality.

Predation by Plague Minnow is a key threatening process listed under the TSC Act (NSW Scientific Committee 2004a) for this species, however the proposed development is not likely to exacerbate this process in riparian habitats of the broader study area.

Conclusion

No significant impact is likely. A species impact statement is not required for this species.

B.3.5 Cumberland Land Snail

One threatened invertebrate species is known to occur in the study area. The following Assessment of Significance demonstrates that no significant impacts will occur to the Cumberland Land Snail (*Meridolum corneovirens*).

a) *In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*

The SMP is likely to support one large population or subpopulation of this species. The Cumberland Land Snail is likely to be present within most or all of the larger patches of Cumberland Plain Woodland and in the SMP and is represented within the Regional Park where more than 400 hectares of such vegetation occur. A viable population is likely to be conserved in the Regional Park, particularly in the western portion of the SMP.

Although the species has been detected in the northern corner of the subject site, it is not considered to provide suitable habitat for this species across the entire extent or even areas with scattered indigenous tree cover due to the high level of disturbance and sparse or absent understorey vegetation present. However, known and potential habitat occurs throughout the Regional Park. As 900 ha of good quality habitat will be conserved within the Regional Park, it is unlikely that the proposed development will have a significant impact on the lifecycle of these species such that a viable local population is placed at risk of extinction..

b) *In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,*

Not applicable.

c) *In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

   (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*

(ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable.

d) *In relation to the habitat of a threatened species, population or ecological community:*

(i) *the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*

(ii) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*

(iii) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

All potential habitat for this species will be removed from the subject site. However, large areas of habitat will remain intact in the Regional Park.

Areas of potential habitat for the species will not become fragmented or isolated from other areas of habitat as a result of the proposed development as all areas of habitat will be removed from the subject site and areas of habitat outside the subject site will remain connected through the Regional Park.

The habitat on the subject site is not considered important for the long-term survival of the species. The habitat is highly degraded and larger areas of potential habitat will be conserved within the Regional Park, thus ensuring the long term survival of the species in the locality.

e) *Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),*

Currently no critical habitat has been listed in the critical habitat registry for this species by the Director-General of DEC.

f) *Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plans,*

No recovery plan has been prepared for this species.

No threat abatement plans are relevant to this species.

g) *Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.*

Clearing of native vegetation is a listed key threatening process under the TSC Act. The proposal will involve the removal of potential habitat for the species on the subject site but much larger areas will be retained within the Regional Park. Accordingly, the clearing associated with the development of the Dunheved Precincts is not likely to threaten or have the capacity to threaten the survival of the species in the locality.

Conclusion

No significant impact is likely. A species impact statement is not required for this species.