

ST MARYS PROPERTY - WESTERN PRECINCT

Feral and Domestic Animal Management Strategy

For:

MARYLAND DEVELOPMENT COMPANY

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Final Report

Cumberland Ecology

PO Box 2474, Carlingford Court 2118

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Approved by: David Robertson

Position: Project Director

Signed: 

Date: 16 July, 2008

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Executive Summary

This Feral and Domestic Animal Management Strategy has been prepared to address the potential impacts of feral and domestic animals resulting from the proposed development of the Western Precinct of the St Mary's Property (SMP) in compliance with the Environmental Planning Strategy.

A number of feral and domestic/stray animals currently occur within the SMP. Feral and domestic animals need to be managed during the construction of the precinct as well as in the long-term. Some native species may also require management as they become prolific in urban and disturbed environments and out-compete other native species.

The European Red Fox, Dog, Cat, Rabbit and Brown Hare occur at the SMP. These feral animals have potential to impact on native flora and fauna by predation, competition, grazing and land degradation. Other exotic pest species, such as the introduced Black Rat, House Mouse, Common Myna, Common Starling, Feral Pigeon and Plague Minnow have also been recorded within the SMP and are likely to occur in the Western Precinct. Some native species have become overabundant on the SMP. Most notably, large populations of Eastern Grey Kangaroos, Red Kangaroos and Emus occur on the SMP. These are managed separately under the Macrofauna Management Plan. The Noisy Miner has also been recorded in high proportions.

Strategies have been provided to ensure that the proposed development does not result in an increase in abundance of feral animals or improve habitats for these species. Strategies include:

- Minimising the dispersal of the Plague Minnow into created water bodies;
- Preventing access to rubbish during the construction and occupation phases;
- Avoid landscaping with hybrid *Grevillea* and *Callistemon*;
- Destroying rabbit warrens;
- Restraining pets in yards, indoors, in designated fenced pet exercise areas or on leashes so that they cannot access native wildlife; and
- Community education on pet ownership and the proliferation of feral animals.

Implementation of this plan will ensure that the potential impact of feral and domestic animals on the flora and fauna conservation values of the SMP are avoided or minimised.

Introduction

This Feral and Domestic Animal Management Strategy has been prepared to address the potential impact of feral/exotic pest and domestic animals associated within the proposed development of the Western Precinct on the St Mary's Property (SMP). Development of the Western Precinct has the potential to increase populations of feral/exotic pest or over-abundant native animals by enhancing habitats for these species. It could also potentially result in an increase in the number of domestic animals if people were allowed to bring pets into the precinct.

Feral and domestic animals, which are generally introduced species, have the potential to become major pests. When these animals occur outside of their natural habitat, they have the ability to impact on the biodiversity, cultural heritage and catchment values of an area. Pest species are among the greatest threats to biodiversity in Australia, and in New South Wales they have been implicated as a threat to approximately 70% of species, populations and communities listed under the *Threatened Species Conservation Act 1995* (TSC Act). This is greater than any other process with the exception of destruction and disturbance to native vegetation. This report seeks to address the potential impacts of feral and domestic animals on the Western Precinct and to identify actions that can be taken to minimise these impacts.

1.1 Purpose and Objectives

This plan has been prepared to ensure that impacts of feral/exotic pest, over-abundant native and domestic animals on the conservation values of the SMP are appropriately minimised and that the proposed development does not result in an increase of problematic animals.

The key objectives of this plan are to:

- ensure that development of the Western Precinct does not directly or indirectly increase populations of, or improve habitats for, feral/exotic pest animals and over-abundant native species;
- ensure that development of the Western Precinct does not exacerbate any Key Threatening Process including predation or grazing by feral animals ;

- minimise the potential for domestic animals within the Western Precinct to impact on native flora and fauna values at the SMP; and
- minimise the potential for feral/exotic pest, over-abundant native and domestic animals to impinge on the conservation values of the adjoining Regional Park.

1.2 Background

The SMP is a 1,545 hectare area of land which is situated north of St Marys and east of Penrith in Western Sydney. The site is bounded by Ninth Avenue, Palmyra Avenue, Forrester Road, Dunheved Golf Course, The Northern Road and the suburbs of Cambridge Gardens and Werrington County. The SMP is located within both the Blacktown and Penrith Local Government Areas (LGAs). It incorporates areas of cleared agricultural land, developed areas and areas of regenerating Western Sydney woodland vegetation¹.

The SMP was originally used for grazing, and a butchery and saleyard were located on the land. Following the outbreak of World War II, the Australian Government established an explosives and munitions filling factory on these lands. Extensive works were undertaken on the site involving the construction of more than 800 buildings, a transport network including roads and railway lines, as well as major services infrastructure and telecommunications facilities. This complex of munitions factories operated until production ceased in 1994. The site has subsequently been decontaminated, and the great majority of the buildings and other infrastructure removed.

In 1993 the State Government included the SMP in its Urban Development Program for future urban development, in recognition of its ability to meet future regional housing needs. The site is currently owned by St Marys Land Limited and is being jointly developed by ComLand Limited and Lend Lease Development Pty Ltd through the joint venture company, Maryland Development Company.

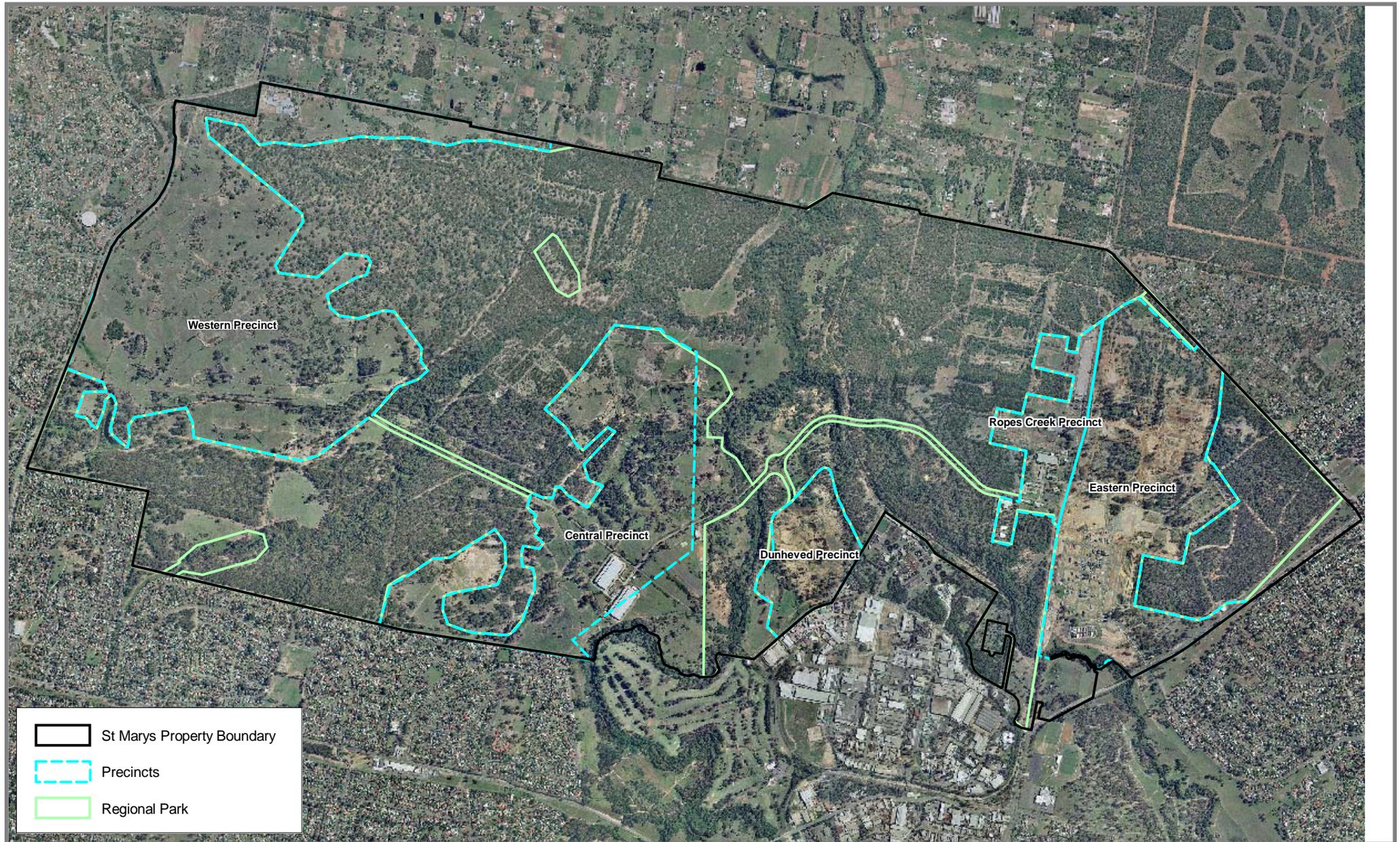
The SMP was rezoned in January 2001 by *St Marys Regional Environmental Plan No 30* (SREP 30) to permit its development for a combination of urban, employment, regional open space and regional park purposes. The SMP comprises six future development precincts, namely the Western Precinct, Central Precinct, North and South Dunheved Precincts, Ropes Creek Precinct and Eastern Precinct, identified by SREP 30 (Figure 1.1).

In accordance with SREP 30, St Marys Land Limited signed a Deed of Agreement with the NSW State Government in December 2002 which in part details the methodology for the establishment, funding and management of the Regional Park. This is an area approximately 900 ha in size that will be retained for conservation, as a mitigation measure for the development of the six development precincts.

In 2003, the Eastern, North Dunheved and South Dunheved Precincts were released, and Precinct Plans have since been submitted and adopted by Blacktown City Council and

Penrith City Council for these areas. The Eastern Precinct is currently under development and development of the Dunheved Precincts is expected to commence in 2008.

In 2006 the Western, Central, and Ropes Creek Precincts were released, allowing the planning process to proceed to the preparation of the Western Precinct Plan. The Western Precinct is located in the western part of the SMP and comprises land zoned for urban and employment uses, however SREP 30 is currently being amended to consolidate the employment zones from the Western and Ropes Creek Precincts into the Central Precinct. Biodiversity certification is being sought for SREP 30 with this amendment.



Legend:

- St Marys Property Boundary
- Precincts
- Regional Park

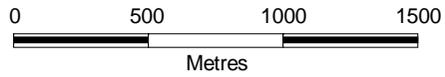


Figure 1.1 Aerial Photograph of the St Marys Property

1.3 Policy Context

1.3.1 *St Mary's Environmental Planning Strategy 2000*

The *St Mary's Environmental Planning Strategy 2000*, combined with *Sydney Regional Environmental Plan No 30 – St Mary's* and the Development Agreement, establishes town planning, urban design and environmental conservation principles to guide the long-term development and conservation of the SMP. Within this document is the requirement for the control and management of feral animals. To fulfil this requirement, it will be necessary to:

- “develop measures to control and limit the adverse impacts of feral animals in the regional park; and
- develop educational programs and materials for the local community and users of the park, outlining measures they can take to reduce the impact of feral animals”.

Feral animal management will also be a component of the Regional Park Plan of Management². A draft Plan of Management was released in 2007 and once approved will be implemented by DECC.

1.3.2 *Penrith City Council Sustainability Blueprint*

The Penrith Sustainability Blueprint has been prepared as a guide for planning and development of new release areas within the City of Penrith. The key aims are to:

1. *Provide the framework for delivering quality urban environments and sustainable outcomes in release area planning.*
2. *Reflect the ‘triple bottom line approach’ demonstrating best practice in economic, social and environmental sustainability, not only for current communities, but also for future generations.*
3. Apply to all new urban release areas, including employment or residential land uses, or a mix of both.

1.3.3 *Threatened Species Legislation*

State and Commonwealth legislation lists the impacts of some feral animals as Key Threatening Processes. In assessing the potential impacts of a proposed development or activity on threatened species or ecological communities, consideration must be given to the likelihood of the proposal increasing the abundance of these feral species, or their impact on threatened species or communities.

i. *Environment Protection and Biodiversity Conservation Act 1999*

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) lists Key Threatening Processes, some of which relate to the impacts of feral animals. A Key Threatening Process is a process that may threaten the survival, abundance or evolutionary development of a native species or ecological community. The following Key Threatening Processes are relevant to the SMP:

- Predation by the European Fox (*Vulpes vulpes*);
- Predation by Feral Cats; and
- Competition and land degradation by Feral Rabbits.

Threat Abatement Plans have been prepared for these species that outline a “feasible, and effective way” to abate the threatening process³⁻⁵. The strategies within this document have been formulated with due consideration to these Commonwealth Threat Abatement Plans.

ii. *Threatened Species Conservation Act 1995*

The NSW *Threatened Species Conservation Act 1995* (TSC Act) also lists Key Threatening Processes that relate to feral animals in NSW. Key Threatening Processes (KTP) under the TSC Act are processes that harm threatened species or could cause other species to become threatened. The same processes are listed under the TSC Act as the EPBC Act. The following are a list of KTP under the TSC Act which may occur on SMP:

- Competition and grazing by the feral European Rabbit (*Oryctolagus cuniculus*);
- Predation by the Feral Cat (*Felis catus*);
- Predation by the European Red Fox (*Vulpes vulpes*); and
- Predation by *Gambusia holbrooki* (Plague Minnow or Mosquito Fish).

Threat abatement plans have been prepared and approved for the ‘Predation by *Gambusia holbrooki*’ and Predation by the European Red Fox’. The strategies within this document have been formulated with due consideration to the State Threat Abatement Plans.

iii. *Fisheries Management Act 1994*

Like the EPBC and TSC Acts, the *Fisheries Management Act 1994* (FM Act) lists Key Threatening Processes that relate to feral animals in NSW. The key threatening process relevant to the Western Precinct is the “Introduction of fish to fresh water within a river catchment outside their natural range”.

1.3.4 Companion Animals Act 1998

The *Companion Animals Act 1998* aims to protect pets, pet owners and other people. Under this Act, all dogs and cats must be identified and registered, and the responsibilities of dog and cat owners are also outlined. Some of the key requirements under this Act include:

- A dog that is in a public place must be under the effective control of some competent person by means of an adequate chain, cord or leash (except at declared off-leash areas); and
- Dogs and cats are prohibited from wildlife protection areas (applies to areas set aside by the local authority for the protection of wildlife).

1.3.5 Rural Lands Protection Act 1998

The pest animal provisions of the *Rural Lands Protection Act 1998* (RLP Act) outline the conditions under which animals are declared pests and provides for the control of such pest species. Gazettal of pest species occurs through Pest Control Orders (PCO) that allow the Minister for Primary Industries to specify pest species on a state wide or local basis and the conditions or factors that apply to the control of each pest. The RLP Act binds land managers to control of pest animals declared under the Act. Under the RLP Act, a number of introduced species in NSW have PCO. These include:

- Wild dogs (including Dingoes);
- Feral Pigs; and
- European Rabbits.

1.3.6 Game and Feral Animal Control Act 2002

The objective of the *Game and Feral Animal Control Act 2002* (GFAC Act) is to provide for the effective management of introduced species of game animals and to promote responsible and orderly hunting of those game animals on public and private land. Any of the following animals that are living in the wild are also a "game animal" for the purposes of this Act:

- Pig;
- Wild Dog (other than dingo);
- Feral Cat;
- European Rabbit;
- Brown Hare; and

- European Red Fox.

1.4 Report Structure

The remainder of this report is set out as follows:

- Chapter 2 provides a summary of the current and potential future impacts of feral animals on the native flora and fauna of the SMP;
- Chapter 3 provides a management strategy for feral and domestic animals for the Western Precinct; and
- Chapter 4 provides conclusions drawn from this report.

Issues and Impacts

A number of feral and domestic animals are currently known to occur within the SMP⁶⁻¹¹. The proposed development of the Western Precinct is not likely to introduce additional feral animal species to the site but a precautionary approach should be adopted. There is potential for the development to improve habitat for some feral/exotic pest animals and there is also the possibility that domestic animals may access the site from the surrounding residential precincts. This chapter discusses the current impacts of feral and domestic animals and the potential for additional impacts following the development of the Western Precinct. Table 2.1 shows a list of the feral/exotic pest, overabundant native and domestic fauna species that have been recorded or are likely to occur on the SMP

Table 2.1 DOMESTIC, FERAL AND NATIVE PEST SPECIES THAT OCCUR OR ARE LIKELY TO OCCUR ON THE ST MARYS PROPERTY

Common Name	Status	Potential Impacts
Fish		
Plague Minnow	Introduced species; TSC Act KTP	Competes aggressively with native fish species, preys upon frog eggs and tadpoles
Birds		
Common Myna	Introduced species	Competes aggressively with native birds and mammals for nest hollows
Common Starling	Introduced species	Competes aggressively with native birds and mammals
House Sparrow	Introduced species	Occurs in large numbers
Noisy Miner	Native; potential pest species; Protected	Excludes most small birds from their territories, creating areas with a low diversity of small birds.
Red-whiskered Bulbul	Introduced species	Destructive of native plant species, spreads seeds of privet
Rock Dove/Feral pigeon	Introduced species	Competes with native birds, occurs in large numbers.
Spotted Turtle-Dove	Introduced species	Competes with native birds, occurs in

Table 2.1 DOMESTIC, FERAL AND NATIVE PEST SPECIES THAT OCCUR OR ARE LIKELY TO OCCUR ON THE ST MARYS PROPERTY

Common Name	Status	Potential Impacts
		large numbers
Mammals		
Black Rat	Introduced species	Predation on small fauna, competition with native rodents
Brown Hare	Introduced species	Degradation of habitats through grazing and burrowing
Cat	Introduced species; EPBC Act KTP and TSC Act KTP	Predation on small to medium sized fauna
Dog	Introduced species	Predation on small to medium sized fauna
Fox	Introduced species; EPBC Act KTP and TSC Act KTP	Predation on small to medium sized fauna
House Mouse	Introduced species	Degradation of habitats through grazing
Rabbit	Introduced species; EPBC Act KTP and TSC Act KTP	Degradation of habitats through grazing and burrowing

*KTP=Key Threatening Process; TSC Act=Threatened Species Conservation Act 1995; EPBC= Environment Protection and Biodiversity Conservation Act 1999

2.1 Existing Populations of Feral, Pest and Domestic Animals

The European Red Fox (*Vulpes vulpes*), Dogs (*Canis familiaris*), Cats (*Felis catus*), Rabbits (*Oryctolagus cuniculus*) and Brown Hares (*Lepus capensis*) are known to occur on the SMP. European Rabbits and European Red Foxes have been observed in the Western Precinct. All of these feral, pest and domestic animals have substantial potential to impact on native flora and fauna by predation, competition, grazing and land degradation. Other introduced pest species, such as the Black Rat (*Rattus rattus*), House Mouse (*Mus musculus*), Common Myna (*Acridotheres tristis*), Common Starling (*Sturnus vulgaris*) and Plague Minnow (*Gambusia holbrooki*) have also been recorded within the SMP. The Noisy Miner (*Manorina melanocephala*), although native, can become a limiting factor on bird diversity where it occurs in high numbers, aggressively defending its territory. The occurrence of and potential impacts from these feral pest and domestic species and additional species listed in Table 2.1 are discussed in more detail below.

2.1.1 Plague Minnow (*Gambusia holbrooki*)

In January 1999, 'Predation by the Plague Minnow' was listed as a Key Threatening Process under the TSC Act. The NPWS has produced a threat abatement plan in

accordance with the Act, for the intention of reducing the impacts of the Plague Minnow on threatened species and helping conserve biodiversity more generally.

The Plague Minnow is likely to occur in most of the water bodies in the SMP. This species is common throughout NSW in most coastal and inland drainages¹². Plague Minnow may influence the distribution and abundance of native fish, where they occur together, and are thought to have played a role in the decline of species from several genera¹². This species also preys on the eggs and tadpoles of native frogs, and on macroinvertebrates¹². This species is not considered likely to constitute a problem in the Western Precinct as there are few areas of aquatic habitat.

2.1.2 Bird Species

There are a number of exotic pest bird species that have been recorded or are likely to occur within the SMP. These include the Common Myna (*Acridotheres tristis*), Common Starling (*Sturnus vulgaris*), House Sparrow (*Passer domesticus*), Red-whiskered Bulbul (*Pycnonotus jocosus*), Rock Dove (*Columba livia*) and Spotted Turtle Dove (*Streptopelia chinensis*).

Common Mynas and Common Starlings are introduced birds that compete with native birds for food and shelter resources. These species are common in urban environments and edge habitats where their aggressive nature can result in exclusion of some native woodland bird species. Common Mynas are considered a biodiversity threat primarily because they compete aggressively with native birds and mammals for nest hollows. Old trees with hollows are a key habitat resource now being lost at a rate greater than replacement. Common Starlings are aggressive when competing for nesting sites and readily drive out native species. They may also disperse weeds through droppings, create a nuisance because of increased noise and droppings on cars and footpaths, and may be a disease risk¹³. These species are now considered as pests¹⁴.

House Sparrows are large finches which were introduced from Europe in the late 1950s and early 1960s¹⁵. The species quickly became established in urban areas throughout eastern Australia. While the introduction was deliberate, House Sparrows quickly became a major pest, and a reward was paid by the government for the birds and their eggs. Today, the species is so well established in the east that no amount of effort will exterminate the ever-expanding population. This species is now considered a pest¹⁴.

Red-whiskered Bulbuls are native to southern Asia, but were introduced into Sydney in 1880, however they only became established in the early 1900s¹⁵. Their success is probably a result of their ability to adapt well to environments modified by humans. The red-whiskered bulbul frequents parklands, gardens, orchards and thickly tangled creeksides¹⁵. This species is now considered a pest¹⁴.

Rock doves and Spotted turtle doves are introduced doves that have increased in abundance and have swamped native species. Rock Doves are descended from the wild rock pigeon of the Northern hemisphere¹⁵. In its native range, the Rock Dove prefers open

agricultural areas. They are now found living wild in nearly every town in Australia¹⁵. The birds feed primarily on food scraps in streets and parks and on food which has been put out for poultry and other domestic animals¹⁵. The Spotted turtle dove was released in Australia in 1870 from southern Asia¹⁵. The Spotted Turtle Dove is a common introduced bird species which has benefited from human habitation and can be found in gardens and agricultural areas. These species are now considered as pests¹⁴.

Some native bird species are considered pests, including the Noisy Miner (*Manorina melanocephala*). The Noisy Miner is a native bird species which lives in colonies and defends its territory. Research indicates that areas inhabited by Noisy Miners have lower bird diversity and fewer small bird species than areas without Noisy Miners¹⁶. It prefers open habitats and often lives in the interface between woodland and grassland. However, they may penetrate up to 300m from the remnant edge, and consequently influence bird assemblages inside these areas¹⁷. Development of the Western Precinct may create favourable habitats for this species by opening up areas, making it easier to defend territories and aggressively exclude other small birds. The species may colonise further if landscaping involves planting tree species favoured by Miners such as *Callistemons* and hybrid *Grevilleas*.

2.1.3 Rodents

Black Rats (*Rattus rattus*) and House Mice (*Mus musculus*) are generally common to areas of human habitats and surrounding habitats. Within the SMP, these species are not likely to exert a major impact on native flora and fauna as there are few native ground dwelling fauna with which these species would compete. As the Regional Park area regenerates however, habitat potential for native species may be expected to increase and there would be a potential for greater competition from rats and mice. Stockpiles and rubbish piles during construction may provide foraging and sheltering opportunities for rats and mice and this in turn may assist in supporting populations of feral predators, namely feral cats and foxes. The feral predators and domestic feral cats may also be encouraged to hunt within other parts of the SMP including the Regional Park areas following construction in the Western Precinct.

2.1.4 European Rabbit and Brown Hare

Competition and grazing by the European Rabbit (*Oryctolagus cuniculus*) is listed as a Key Threatening Process under both the TSC Act and the EPBC Act. It has also been issued a Pest Control Order under the RLP Act. The European Rabbit along with the Brown Hare (*Lepus capensis*) are classified as game animals under the *Game and Feral Animal Control Act 2002*.

Feral rabbit populations occur over a large part of the Australian mainland, in Tasmania and in many offshore islands. Wild rabbits are a declared pest under relevant legislation in all States and Territories of Australia and landholders are obliged to control rabbits on their land and are financially responsible for control³.

European Rabbits have a negative impact on indigenous fauna species through competition for resources, modification of the structure and composition of vegetation and land degradation. There are a number of native fauna species which have a similar diet to the European Rabbit and are impacted negatively through dietary competition. Rabbits compete with native species for resources, inhibit the regeneration of native vegetation, support populations of introduced predators and cause soil erosion³. Environmental damage includes significant degradation of vegetation and soil, loss of habitat and extinction of animal and plant species. Threatened plants and animals for which the rabbit is a known or potential threat include, but are not limited to, numerous threatened orchids, Night Parrot, Malleefowl, Mulgara, Brush-tailed Rock-wallaby and Baw Baw Frog³.

When above-ground and below-ground vegetation is removed, they may contribute to erosion and loss of topsoil by wind and rain. Consequently, this results in a reduction of the establishment of native vegetation, and increases the susceptibility of many indigenous vertebrates to predation from feral predators.

European Rabbits are a major prey source for introduced predators such as the European Red Fox and Feral cats. They can sustain artificially high populations of these exotic predators which may result in dietary switching from European Rabbits to native fauna if declines in European Rabbit populations occur. This may produce 'hyper-predation' impacts on native fauna species^{18,19}.

Rabbits and hares forage throughout the SMP and have been observed in the Western Precinct. Burrows are most likely to occur in areas where the ground is softer, including where soil has been moved in excavation works and along the riparian zones. Rabbits and hares are grazing competitors with kangaroos. As the kangaroo population is being reduced on the SMP through the implementation of the MMP, rabbits and hares may increase with the availability of grasses. Fox baiting has also been undertaken on the SMP and is likely to have resulted in the increase in rabbits and hares.

2.1.5 European Red Fox

Predation by the European Red Fox (*Vulpes vulpes*) was listed as a Key Threatening Process on Schedule 3 of the TSC Act and the EPBC Act. It is considered a game animal under the *Game and Feral Animal Control Act 2002*.

The European Red Fox has become well established over most of the southern half of mainland Australia. It occurs in habitats ranging from desert to urban areas²⁰ with its local distribution probably determined by food supply and refuge. It is usually nocturnal, nesting by day in a den, thicket, hollow log or leaning tree²¹. It is an adaptable predator common in rural and urban areas throughout southern Australia. They do not appear to favour any particular habitat and the main determinants of their population size and distribution appear to be food supply, disturbance of natural habitats and refuge availability.

Predation by the European Red Fox is considered a major threat to native fauna. Since their introduction into Australia in the 1870s, they have contributed to severe declines and

extinctions of a suite of native fauna, including mammals of the critical weight range (35–5500 g) and ground-nesting birds⁴, ground-dwelling and semi-arboreal mammals, ground-nesting birds and freshwater turtles. Studies have shown that European Red Fox predation endangers many native fauna remnant populations.

The European Red Fox occurs throughout the SMP. Within the SMP the main prey items for this species are likely to be European Rabbits, Brown Hares and small/poor condition kangaroos. Small native fauna species however, are also likely to make up a proportion of the diet. The fox may feed on emu eggs and chicks and is also likely to prey upon native reptiles such as the Bearded Dragon, skinks and young goannas.

Fox baiting has been undertaken as part of the Macrofauna Management Plan to protect kangaroos in holding yards from predation.

Of the three introduced vertebrates listed as key threatening processes, the European Red Fox currently poses the greatest risk to native fauna on the SMP. Foxes will be attracted to construction areas and industrial sites if there is discarded waste and rubbish left during the construction phase and in the long term. If there are high numbers of small mammals such as rabbits and rodents at the site, it is likely that European Red Foxes will frequent the area.

2.1.6 Feral and Domestic/Stray Cats

Predation by the Feral Cat (*Felis catus*) was listed as a Key Threatening Process on Schedule 3 of the TSC Act and the EPBC Act. A national threat abatement plan has been prepared for Feral Cats⁵. It is considered a game animal under the *Game and Feral Animal Control Act 2002*.

The Cat is an elusive predator which occurs throughout all parts of Australia including desert habitats. They have a history of association with humans dating back thousands of years, and now occur in virtually all areas of the globe that are inhabited by humans²². Food availability and number of shelters in the area are the most important determinants of local population sizes. Cats prey on native animals and have been shown to threaten the survival of some native species²³. There are a number of Endangered and Vulnerable species in New South Wales that are currently threatened from feral cats. In particular, small mammals such as rodents, dasyurids and ground-nesting birds are at particular risk of cat predation. Similarly, as companion animals, domestic cats can reach very high densities, and have the potential to exert detrimental effects on prey species²⁴.

Cats in Australia have been grouped into three categories according to how and where they live²². These categories are defined below:

- *Feral cats* are those that live and reproduce in the wild, eg forests, woodlands, grasslands and wetlands, and survive by hunting or scavenging. None of their needs are satisfied intentionally by people;

- *Stray cats* are those found in and around cities, towns and rural properties. They may depend on some resources provided by humans, but are not owned; and
- *Domestic cats* are those owned by an individual, a household, a business or corporation. Most of their needs are supplied by their owners.

Within the SMP, there are currently stray cats, domestic cats and possibly feral cats. In the future, the numbers of domestic cats within the SMP are expected to increase significantly. Cats have been observed in the Eastern and Ropes Creek Precincts, and it is highly likely that they occur in the Western Precinct. There is potential for these animals to impact on the native fauna populations, particularly birds, within the Regional Park and in habitats within the proposed development area.

2.1.7 Feral and Domestic/Stray Dogs

Both feral and domestic dogs and dingoes have been issued with Pest Control Orders under the *Rural Lands Protection Act 1998*. Feral dogs can have a large influence on environmental values, negatively affecting the survival of small to medium-sized native fauna and decreasing plant biodiversity by spreading weeds²⁵. This species preys upon native mammal, reptiles, fish and birds and may compete with native predators. Feral dogs may interbreed with native dingoes, which potentially threaten dingo populations. However, feral dogs may play a role in limiting other pest species such as feral goats and rabbits²⁶.

Stray dogs currently occur within the SMP but there are no populations of feral dogs on the SMP. These dogs are likely to enter the SMP from surrounding properties, particularly rural properties to the north. It is likely that the needs of the dogs within the SMP are met by dog owners on surrounding land. However, it is possible that some dogs may reside temporarily within the SMP on occasion.

2.2 Potential Future Impacts

Development of the Western Precinct has the potential to create habitats such as piles of rubbish/building materials that are favourable for some feral animals. Careful management of the works site and the future development of the site will in this respect decrease opportunities for feral animals, particularly foxes and rodents, to inhabit the area.

The greatest impacts of the proposed development regarding feral and domestic animals would be associated with potential increased numbers of feral animals such as rabbits, rodents and foxes. The development is likely to lead to an increase in food availability for rodents. Shelter availability may also increase due to increased construction material on the site. However, such impacts are not predicted to be significant, given that development of the Western Precinct would be expected to reduce habitat for European Rabbits and Red Foxes. It is possible however; that there will be an increase in domestic animals resulting from residential development within the Western Precinct and feral

populations can also develop from escaped pets such as rabbits and rats. Domestic animals from the residential housing could potentially impact on the flora and fauna on site, surrounding areas of Regional Park and if unmanaged, potentially other parts of SMP.

The potential direct impacts of an increase in feral and domestic species in the Western Precinct would be:

- competition of rabbits and rodents with native species in the Western Precinct and surrounding areas;
- land degradation and impacts on native flora from rabbit grazing pressures; and
- increased predation on native birds and small mammals (based on current knowledge, no threatened species occur in the Western Precinct that would be subject to predation or that would compete with cats or foxes for prey species).

The greatest concern would be the potential impacts from these species if they increased in number within the Regional Park. These species already occur in the Regional Park, but increased numbers could greatly amplify the impact on the native species currently surviving, including possums, birds and microbats. If the Plague Minnow is present in the wetland areas, it has the potential to impact on the Green and Golden Bell Frog. This would not be consistent with the conservation objectives for the Park, which is subject to the formulation and implementation of a Regional Park Plan of Management.

The indirect impacts on native flora and fauna arising from increased numbers of feral animals such as rabbits and rodents in Western Precinct are likely to be:

- a corresponding increase in feral predator numbers, these predator species being supported by the higher numbers of favoured prey species. As outlined previously, foxes and cats are voracious predators and are considered as threatening processes to native fauna under the TSC Act; and
- soil erosion on and off site, arising from continuing land degradation from rabbit grazing and burrow formation.

The proposed development of the Western Precinct may result an increased number of domestic dogs and cats at the SMP. This would result in increased impacts on native fauna through predation and disturbance of nesting/foraging habitat if not controlled. However, the implementation of this plan will minimise these impacts through the education of residents and strict controls on prohibiting domestic animals in the Regional Park. The relative increase in the number of domestic animals gaining access to the Regional Park is likely to be minimal.

Management Strategies

3.1 Feral and Stray Animal Management

3.1.1 Introduction

There are a number of priorities for this Feral and Domestic Animal Strategy. These include:

- protecting threatened fauna from feral and domestic animal threats eg fox threats to small and medium native species
- protecting threatened flora from feral and domestic animal threats eg damage to threatened flora species from feral herbivores;
- protecting EECs from feral and domestic animal threats eg European Rabbit threats to EECs;
- minimising feral and domestic animal impacts on neighbouring properties eg through public education, reducing domestic animals in the neighbouring Regional Park; and
- minimising injuries to park users eg through managing feral animal impacts in high visitation areas.

As pest species are capable of spreading quickly and they often have high reproductive rate, they are able to re-establish quickly following control. While it may not be feasible to attempt a large scale eradication program, a priority will be made to focus control efforts where the impact is greatest.

Populations of introduced vertebrates fluctuate in space and time and are expected to change in response to the changes in land use and climatic variation that will occur during construction and occupation of the proposed development. It is anticipated that some species may need to be controlled in some years and not others and it is also possible that new introduced species may colonise the precinct.

3.1.2 *Plague Minnow*

A threat abatement plan has been prepared for the Plague Minnow by the DECC, as this species is listed as a key threatening process under the TSC Act. The primary issue with the presence of the Plague Minnow at the SMP is that it is likely to negatively impact upon native frog species through predation of tadpoles and eggs. At the SMP, the primary actions to be taken to minimise the threat of this species are to:

- Minimise human dispersal of the Plague Minnow through public education. Humans have been the main mechanism in the spread of the Plague Minnow and it is essential that residents in the Western Precinct do not dump aquarium fish in the wetland area of the Regional Park; and
- Minimise the introduction of Plague Minnow into created water bodies. It can be assumed that all water ways and water bodies on the SMP contain the Plague Minnow. Habitat free of the Plague Minnow can be created with the construction of detention basins, provided that waterways containing the species do not drain into them. Draining and drying out water bodies is a successful way of eradicating the Plague Minnow from wetland habitat if it has been introduced, therefore it would be beneficial if these detention basins were designed in such a way that they could be drained.

3.1.3 *Bird Species*

The increase of urban-aggressive feral bird species, including the Common Myna, can be minimised by reducing feeding opportunities for these species and promoting habitat for native species.

There are a number of actions that can be taken to minimise the impact of these species:

- Prevent access to food in rubbish bins by modifying the design or by ensuring that a lid is attached and used; and
- Avoid providing nectar resources within landscaping such as *Callistemon* and hybrid *Grevillea*.

Where possible, and particularly in areas adjoining the Regional Park, dense plantings of native shrubs (subject to Asset Protection Zone requirements) can be used to promote sheltering habitat for native woodland birds.

Common Starlings, House Sparrows, Spotted Turtle Doves, Rock Doves, Red-whiskered Bulbul are a widespread and common species; therefore damage control is best accomplished by targeting problem areas. The best management strategy to reduce numbers of these bird species is to decrease access to nesting, roosting and food and water resources through habitat modification. Signage should inform the general public not to feed birds in or near the Regional Park.

The Noisy Miner is a native honeyeater; however it has become a pest species and has been shown to reduce native passerine bird diversity and abundance. The best management strategy for reducing the number of Noisy Miners, and consequently increasing the numbers of small native bird species, is to plant dense low-growing plant species. The presence of a dense understorey reduces habitat suitability for Noisy Miners, as this species prefers more open habitats with little or no understorey.

Numbers of Noisy Miners can be difficult to control and manage. Populations can be controlled to a degree by minimising habitat availability through the creation of structurally complex vegetation communities. Maintaining a dense shrub layer in open space and the riparian area can reduce the suitability of the habitat for the Noisy Miner, making it difficult for individuals to defend their territories. Additionally, planting species such as *Callistemon* and Hybrid *Grevillea* as part of landscaping should be avoided.

3.1.4 Rodents

The potential impacts of introduced rats and mice on the ecology of the SMP are considered to be small, given the low diversity of native ground dwelling fauna. Development of the Western Precinct may increase opportunities for these species by increasing food sources and creating favourable habitat conditions. However, any increase is likely to be relatively small and localised. Rubbish should not be left uncovered within the development area, but contained within closed bins. If managed correctly a small increase in introduced rodents should not significantly impact upon native species through competition or by attracting and supporting predators in the area.

3.1.5 European Rabbit and Brown Hare

Competition and grazing by rabbits is listed as a Key Threatening Process and a threat abatement has been prepared³. Feral rabbits have had a negative impact on many native fauna species. They occur in a number of habitat types, including grassland, woodland, heath and forest area and are found in high densities around suburban Sydney. The negative impacts of rabbits and hares on the environment take place due to grazing and burrowing activities. This can lead to significant erosion effects in areas and reduce the quality and diversity of native flora. Rabbits prefer green grass and herbage and their diet overlaps with a number of threatened native species. They have been shown to reduce native food sources, displace small animals from their burrows and attract introduced predators into the environment²⁷.

Controlling rabbit numbers can be a controversial undertaking. If the rabbit population drops significantly, it may have impacts on native species due to prey switching of introduced predators. Control techniques commonly utilised in NSW include biological control, mechanical methods such as warren ripping and rabbit proof fencing, poisoning and shooting. Poisoning, biological control and shooting are not recommended at SMP due to the proximity to residential housing. The recommended method for limiting numbers is through habitat modification and reducing potential food sources.

In the long term, development of the Western Precinct is likely to reduce current burrowing and feeding habitat for rabbits and hares within the SMP. There will however, still be some potential for rabbits and hares to utilise areas of soil disturbance or soil piles created during construction for burrowing and sheltering. If warrens are observed within the development area, they should be destroyed. Rabbits should be targeted if numbers in the area appear to have increased in order to control potential corresponding increases in numbers of cats and foxes.

3.1.6 European Red Fox

Predation by the European Red Fox is listed as a Key Threatening Process (KTP) under the TSC Act. Following this listing, DECC prepared a Threat Abatement Plan (TAP) to propose actions to reduce the impacts of fox predation on threatened species. This plan establishes priorities for fox control, effective control programs and provides methods to measure the response of native fauna to fox control²⁸.

Foxes have had a significant impact upon medium sized (450-5000g) ground dwelling and semi-arboreal mammals and ground nesting birds²⁹. However, fox predation may have little impact on some prey populations, having only a compensatory effect or a minor source of mortality. It is not clear at SMP whether foxes have an impact upon threatened species on the site. It is likely that the main food source at SMP is the Rabbit. It is unknown what effect limiting Rabbit numbers will have on fox populations or their behavioural response (ie prey switching).

While foxes are likely to occur in the Western Precinct, they are unlikely to have a significant impact on native fauna to warrant baiting. This may also be problematic due to the proximity to residential areas. Therefore, management strategies recommended for the Western Precinct relate to minimising impacts through non-lethal methods, as this is the most suitable and cost effective approach.

Foxes generally forage best in open habitats where they are able to range widely and freely. They will use clearings, tracks and roads to move through dense vegetation or complex topography. Clearings and tracks may also provide better opportunities for capturing prey as many arboreal species are vulnerable when they are moving on the ground between trees⁴. Therefore a suitable method for discouraging and decreasing the impact of foxes is through habitat manipulation. This entails modifying the habitat so that the habitat is less favourable for foxes. Closing and revegetating unnecessary tracks and roads, and ensuring that the canopy is continuous so that arboreal species do not have to leave trees to forage will help reduce the impact of foxes on threatened species¹⁴.

In order to discourage access into and within the Regional Park, access points and tracks from the proposed development area to the Regional Park should be planned to minimise access by foxes. These issues will be addressed in the Regional Park Plan of Management. Additionally, regeneration of unnecessary roads and tracks within the Regional Park should be considered to secure feeding and shelter opportunities for native species, subject to Regional Park Plan of Management objectives.

3.1.7 Feral Cats

A Threat Abatement Plan (TAP) has been prepared on predation by feral cats by the Department of the Environment and Heritage (now the Department of the Environment, Water, Heritage and the Arts)⁵. This document provides information on feral cat control programs, development of innovative and humane control methods and education of land managers and other about feral cat impacts. Feral cats have had a significant impact on native fauna in Australia, particularly on small to medium sized mammals and ground-nesting birds. They have been implicated in the failure of recovery programs through predation of threatened species. They may also be carriers of infectious diseases such as toxoplasmosis and sarcosporidiosis³⁰.

Feral cats are likely to exist in the Western Precinct of the SMP. There are a number of control methods that may be utilised to reduce cat numbers. These include baiting, shooting, trapping and using barrier fencing. At SMP, it is inappropriate to use shooting, or baiting methods due to the proximity to residential housing. Inappropriate uptake of baits by domestic cats may occur. Trapping is generally unsuccessful with feral cats as the species exhibits a tendency to avoid traps. It would therefore be a laborious and expensive task to control numbers using this method. Therefore, the recommended method to reduce the impact of feral cats on threatened species is to discourage cats from the development area during construction by ensuring that there are no potential food sources available. Rubbish should not be left uncovered within the development area, but contained within closed bins.

3.1.8 Feral Dogs

Wild or feral dogs include dingoes, domestic dogs living in the wild and hybrids (crosses between dingoes and wild dogs). While no feral dogs have been sighted at SMP, stray dogs do occur from time to time and may reside on the SMP periodically.

The impact of stray dogs on native fauna within the SMP is expected to be relatively small and there are very few ground-dwelling native fauna that are likely to function as prey species for dogs. However, dogs may prey on some bird species that nest and/or forage on the ground and on reptiles, and may also disrupt foraging/nesting activities for a small number of such species. It is likely that the Rabbit is the primary prey species for stray dogs on the SMP. It is unknown what effect limiting Rabbit numbers will have on dog numbers or their behavioural response (ie prey switching).

While baiting is regularly used to control numbers of wild dogs^{25,26}, it is unsuitable in the Western Precinct due to the proximity to housing, where inappropriate uptake may occur. The recommended action for decreasing the impact of stray dogs on native prey species is to discourage dogs from an area by limiting the food supply to prevent scavenging. Rubbish should not be left uncovered within the development area, but contained within closed bins. Fencing around the Regional Park will also prevent dogs from entering this conservation area.

3.2 Domestic Animal Management

Responsible pet ownership will be strongly encouraged in the Western Precinct through community education.

To reduce the impact of domestic animals on native environments, a few simple actions can be implemented:

- Domestic pets such as cats and dogs should be kept indoors at dawn, dusk and night. Pet owners will also be informed and encouraged to be responsible for their animals and to ensure they are prevented from roaming, particularly at night. Native animals are most vulnerable to attack at these times, when they do most of their feeding; and
- Fencing of properties to prevent domestic pets entering native bushland should also be encouraged.

3.2.1 Domestic Cats

Responsible cat ownership in adjacent precincts and, where applicable, in the Western Precinct will be encouraged to minimise the potential impacts of cats on native species. Purchasers of residential properties in the Western Precinct, who choose to own a cat, will be encouraged to act as responsible cat owners and are encouraged to ensure that all cats wear three bells on their collars to alert native fauna. Cat owners should be made aware that cats are a high risk to wildlife and should be contained on the owner's property to ensure protection of native animals in the regional park and surrounding areas. This will be implemented through an education program and supported by council through enforcement of the *Companion Animals Act 1998*.

Surveys of pet owners in Australia indicate that 70% of respondents believed that there is a need to regulate owned domestic cats and that the presence of cats in nature reserves is harmful to wildlife. Similarly, 70% or more of owners agreed to keep their cats on their property from sunset to sunrise and to register them if these measures became compulsory. This indicated that community education about responsible cat ownership is accepted by the majority of Australians, and that compliance with recommendations about responsible cat ownership should be high³¹.

Collar devices can be an effective way of reducing predation rates on wildlife from domestic cats. Collar pounce protectors such as 'CatBib' are effective at reducing bird and mammal kills by cats³²..

3.2.2 Domestic Dogs

Responsible dog ownership will also be encouraged by the following requirements:

- dogs should be restrained on a leash when not enclosed in a yard or a dedicated off-leash dog exercise park; and
- owners should carry plastic bags for the collection of dog droppings outside yards.

These measures can be implemented through appropriate signage and educational material aimed at advising purchasers of their pet ownership responsibilities. Council support will be sought through enforcement of the *Companion Animals Act*.

Following development of the Western Precinct, restrictions should be placed on pet entry into the Regional Park, subject to the provisions of the Regional Park Plan of Management.

3.3 Community Education

A key component to minimising potential impacts of feral and domestic animals on the native species of the SMP will be community education. It is essential to educate future users of the Western Precinct of the potential impacts of feral and domestic animals and of their responsibilities to minimise these impacts.

Information packs will be provided to all new residents and an ongoing campaign of community education will be actively promoted. This may take the form of information displays, hand out literature and website information. Education and awareness programs on feral and domestic animal management should be implemented within the Western Precinct in conjunction with other programs concerning flora and fauna, weeds and the adjoining Regional Park.

Educational programs concerning ecological issues in the Western Precinct (including domestic and feral animals) will be made available as pamphlets and distributed during induction courses.

Conclusion

Feral, stray, domestic and overabundant native animals currently occur throughout the SMP. The proposed development of the Western Precinct has potential to improve habitat opportunities for some feral/pest animals. However, the development is considered unlikely to increase populations of these species significantly, particularly in view of the active management measures proposed. Any increase in feral prey species may lead to the increase of other, more harmful, feral predators and control measures for prey species such as rabbit and mice are important components of the proposed management strategies.

Potentially, an increase in the number of domestic (and probably stray) animals will occur as a result of the proposed employment development and human presence and such an increase has the potential to impact on native fauna.

Management measures have been prescribed to ensure that habitats for feral/pest animals are not improved during construction and future operation of the Western Precinct and that the impacts of feral animals upon native fauna will be minimised to an extent where no significant impact is anticipated.

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