



KINGS FOREST

STAGE 1 PROJECT APPLICATION

FERAL ANIMAL MANAGEMENT PLAN

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A REPORT PREPARED FOR PROJECT 28 PTY LTD

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1 INTRODUCTION

1.1 Background

The NSW Minister for Planning approved a Concept Plan for the proposed residential community at Kings Forest on the 19th August 2010. The approved documents included a Revised Feral Animal Management Plan (LandPartners 2009), which proposed the principles upon which the management of feral animals would be based.

Subsequently, the Director General issued modified Environmental Assessment Requirements (DGR's) on the 22nd December 2010. James Warren & Associates (JWA) has now been engaged by Project 28 Pty Ltd to complete a Kings Forest Stage 1 Project Application Feral Animal Management Plan (FAMP) in accordance with requirements of 9.4 of these DGR's and Clause C2 of the modified Concept Approval.

1.2 Proposed Development

The Kings Forest site consists of 872 hectares of land located at Cudgen between Bogangar to the south-east and Kingscliff to the north in Northern New South Wales (NSW). The concept plan for the Kings Forest site is shown in **FIGURE 1**.

The scope of the Stage 1 Project Application works is as follows:

- Construction of the entrance road to the site and associated intersection works on Tweed Coast Road.
- Alignment and construction details of two lanes of Kings Forest Parkway, from Tweed Coast Road via Precincts 2, 3, 4 and 5 through to the roundabout in the western part of the site from which access to the southern part of the site is to be gained.
- Alignment and construction details for the civil works of the two proposed roads through the east-west SEPP 14 area to access the southern part of the site.
- Rural retail development in Precinct 1 to the east of Tweed Coast Road.
- Subdivision and construction of residential Precinct 5.
- Bulk earthworks across the site in Precincts 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13 & 14.

The scope of works is illustrated in **FIGURE 2**.

1.3 Aims & Objectives

The aim of this FAMP is to minimise the impacts feral animals have on native species, primarily threatened species present on site.

Specific objectives of this FAMP are to:

- Review relevant literature on feral animal control;
- Identify feral animals which have been recorded at the site;



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- Prioritise species considered to warrant priority management;
- Examine control and/or eradication methods for 'high priority' feral animals; and
- Recommend long term control methods, including monitoring and reporting.

The impacts of the feral animals that are of primary concern within the Site are related to their predation of, and competition with, native species of fauna particularly threatened species and their affect upon the biodiversity of a given area by modifying species richness, abundance and ecosystem function (NPWS 2003).

There are a number of strategies potentially available for the control of the feral animals occurring at the site and each has advantages and disadvantages. These strategies have been reviewed and recommendations made as to which ones may be most appropriate to manage these feral animals at the Site. Recommendations are also provided with regard to the timing of the implementation of the various strategies.



2 REVIEW OF RELEVANT LITERATURE

2.1 Introduction

The following documents relevant to feral animal management have been reviewed:

- Department of Agriculture, Fisheries and Forestry (DAFF) (2010) 'Australian Pest Animal Research Program', Accessed 16th December 2010 from: <http://www.daff.gov.au/brs/land/feral-animals>
- Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) (2010) 'Feral Animals in Australia', Accessed 16th December 2010 from: <http://www.environment.gov.au/biodiversity/invasive/ferals/index.html#control>
- English, A.W. & Chapple R.S. (2002) 'A Report on the Management of Feral Animals by the New South Wales National Parks and Wildlife Service - Executive Summary', NSW National Parks and Wildlife Service, Accessed 16th December 2010 from: <http://www.environment.nsw.gov.au/resources/pestsweeds/englishReportPestAnimalProgsExecsum.pdf>
- NSW National Parks and Wildlife Service (1999) 'Cudgen Nature Reserve Plan of Management'

2.2 Findings

- Department of Agriculture, Fisheries and Forestry (DAFF) (2010) 'Australian Pest Animal Research Program', Accessed 16th December 2010 from: <http://www.daff.gov.au/brs/land/feral-animals>

The main objectives of the Australian Pest Animal Research Program (ADARP) are to:

- Develop integrated, strategic approaches to manage the impacts of nationally significant pest animals on agriculture
- Improve the effectiveness of control techniques and strategies for reducing pest animal impacts on agriculture
- Produce guidelines and extension materials for the best practice management of nationally significant pest animals
- Quantify the benefits of pest animal management.

One of the ADARP funded projects in the 2009 - 2010 period was; *FeralScan – Web-based community reporting, education and extension tool for landholders and community groups*. The aim of this project was to develop community-based web reporting tools for addressing major gaps in current reporting frameworks and have direct benefits to landholders, community groups and individuals managing pests and their impacts. This will allow easier access for industry, government and community to report on pest animals and their impacts.



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- Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) (2010) 'Feral Animals in Australia', Accessed 16th December 2010 from:
<http://www.environment.gov.au/biodiversity/invasive/ferals/index.html#control>

The objective for managing the majority of established feral animals is to reduce the damage caused by pest species in the most cost-effective manner. This is a general aim of most Feral Animal Management Plans, including the one for King's Forest. Conventional and historical methods of control include fencing, trapping, baiting and shooting. Fencing for wildlife management has a long history in Australia with the introduction of netting fences for rabbit and dingo exclusion over 100 years ago. Fencing to exclude other feral species, such as foxes and cats, is more recent. Fencing to exclude feral animals is only a viable option where the area to be enclosed is relatively small. Fences designed to exclude feral animals are much more costly than conventional stock fences, so it is impractical and nearly impossible to exclude feral animals from large tracts of land. These fences also need continuous inspection and maintenance, which is expensive.

Baiting of feral animals such as foxes, pigs and rabbits is usually done using the poison known as 1080. 1080 occurs naturally in native pea bushes in Western Australia. Where there is the problem of non-target species eating the baits, the common practice is to bury baits designed for foxes and feral pigs, or to dye baits green or black when using them for rabbits. Foxes and feral pigs are more likely to dig baits up, as they often dig for food, whereas native carnivores are less likely to take buried baits. The green dye reduces the likelihood of birds picking up baits, as many birds use colour to determine the tastiness of food.

Shooting is also used to control animals, such as feral horses, feral pigs and feral goats. Where the control program must take place in rugged terrain and in vast remote areas, helicopters may be used. Helicopter shooting by trained shooters is the most humane way of reducing the number of feral animals in these areas. It is quick and the animals are not subject to the stresses of mustering, yarding and transportation. Shooting control in urban areas need to be very controlled and planned, with consultation with adjoining land owners important.

- English, A.W. & Chapple R.S. (2002) 'A Report on the Management of Feral Animals by the New South Wales National Parks and Wildlife Service - Executive Summary', NSW National Parks and Wildlife Service, Accessed 16th December 2010 from:
<http://www.environment.nsw.gov.au/resources/pestsweeds/englishReportPestAnimalProgsExecsum.pdf>

The 2002 report by English and Chapple contains a focus on involving the local community and stakeholders with Feral Animal Control Methods.

Various aspects of community involvement (education, consultation, and stakeholder participation in control programs) need continuing effort on the part of NPWS. The amount of effective community consultation conducted by NPWS has escalated recently, and it is imperative that this process involves a sharing of decision-making power with the community.



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The Wild Horse Management Steering Committee established by the NPWS in Kosciuszko National Park and the NPWS Rusa Deer Working Group in Royal National Park are both very good examples of where effective community consultation aided in the development of a Management Plan.

The lack of trust in NPWS on the part of many landholders is a significant issue, and NPWS needs to continue to work at overcoming this. There is absolutely no doubt that the success of NPWS feral animal control programs depends on the full support of neighbours. There have been a number of recent wild dog and feral pig control programs that demonstrate how readily this trust can be developed, when all stakeholders are actively involved in the process.

- NSW National Parks and Wildlife Service (1999) 'Cudgen Nature Reserve Plan of Management'
- The Cudgen Nature Reserve Plan of Management contains limited advice on shooting and baiting, as a means of Feral Animal Control. It aims to address the wide range of issues that affect the entire reserve.



3 FERAL ANIMAL ASSESSMENT

3.1 Introduction

This section discusses the feral animals known from the site locality and provides a thorough review of the feral animals which pose potential significant problems to native fauna on the Kings Forest site.

3.2 Feral Animals recorded from the locality

A search of the NSW Department of Environment, Climate Change and Water (DECCW) Wildlife Atlas database shows records of the following exotic (non-native) species of animals occurring within 10km of the Subject site (TABLE 1). These results are briefly discussed further below. Detailed assessment of priority pest species follows in SECTIONS 3.3 - 3.6. The Plan of Management for Cudgen Nature Reserve (NSW NPWS 1998), which occurs adjacent to the site was consulted for any feral animal records or management considerations.

TABLE 1
FERAL ANIMALS WITHIN 10KM OF THE SUBJECT SITE
(Source: DECCW Wildlife Atlas, Undated)

Common Name	Scientific Name
Black Rat	<i>Rattus rattus</i>
Brown Hare	<i>Lepus capensis</i>
Cane Toad	<i>Bufo marinus</i>
Cat	<i>Felis catus</i>
Common Myna	<i>Acridotheres tristis</i>
Dingo, domestic dog	<i>Canis lupus</i>
European Cattle	<i>Bos taurus</i>
Fox	<i>Vulpes vulpes</i>
Goat	<i>Capra hircus</i>
House Mouse	<i>Mus musculus</i>
House Sparrow	<i>Passer domesticus</i>
Mallard	<i>Anas platyrhynchos</i>
Rabbit	<i>Oryctolagus cuniculus</i>
Rock Dove	<i>Columba livia</i>
Spotted Turtle-Dove	<i>Streptopelia chinensis</i>
Unidentified canid	<i>Canidae sp.</i>

3.3 Feral Animals recorded from Kings Forest site

The site has a record of dog predation on cattle (Land Partners 2009) with many incidents of dog baiting being undertaken over several years on the Kings Forest site to reduce losses of young cattle to feral dogs.

The cattle and goat record in the atlas database would refer to domestic animals as part of the grazing use of the properties in the area. The House Sparrow, Mallard, Rock Dove, Common Mynah and Spotted Turtle-Dove are elements of the urban and



urban/rural fringe. The House Mouse and Black Rat are widespread rodents that are well established and probably form the basis of the diet of many predatory birds such as the Black-shouldered Kites (*Elanus axillaris*) and Grass Owl (*Tyto capensis*). The Rabbit (*Oryctolagus cuniculus*) and Brown Hare (*Lepus capensis*) are opportunistic pest species utilising pasture and disturbed vegetation present at the site.

Feral dogs and cats have been recorded from the site, but are considered likely to occur only in limited numbers. However, given the future development of the site, it is possible that there may be an increase in feral cats and dogs resulting from straying and/or dumped animals. The Department of Planning (DoP) has requested that these species are addressed in regard to management considerations for other pest species.

Whilst these species (Black Rat, Common Myna, House Mouse, Cattle, Goat, Mallard, Rock Dove, House Sparrow, Spotted Turtle-Dove, Rabbit and Brown Hare) should not be encouraged, their control is not a priority per se and as such this plan will seek to address the remaining species (i.e. Cane Toad, Red Fox and feral cats and dogs). These species are most likely to have implications for the maintenance of the natural environment at the site, while other pest species are considered less threatening to native fauna (either due to habitat requirements or scarcity of records at the site) and are therefore more cursorily addressed.

The predatory impacts of the Cane Toad, Red Fox and feral cat are all recognised as Key Threatening Processes (KTPs) under the TSC Act. A Threat Abatement Plan (TAP) has been prepared for the Red Fox at a State level, while both the Red Fox and feral cat have had TAPs prepared at a Commonwealth level.

3.4 Feral animal species profiles

3.4.1 Red Fox

3.4.1.1 Introduction

The Red Fox (*Vulpes vulpes*) is the largest of the true foxes, as well as being the most geographically spread member of the Carnivora order, being distributed across the entire northern hemisphere from the Arctic Circle to North Africa, Central America, and the steppes of Asia. Its range has increased alongside human expansion, having been introduced to Australasia, where it is considered harmful to native mammal and bird populations (Henry 1986).

3.4.1.2 Biology

Female foxes reproduce only once a year and the gestation period is 51 to 53 days with most cubs born during the period between August and September. The average litter size is four and the maximum number of offspring is typically around ten. Both sexes become sexually mature from around ten months of age. Although social groups of one male and several vixens may exist, most foxes are thought to have only one mate. Males may leave their normal home territory temporarily in search of a mate (Saunders et al. 1995).



3.4.1.3 Habitat and Home Range

The Red fox is widely distributed throughout the southern half of mainland Australia and can survive in habitats ranging from arid lands through to alpine landscapes as well as in urban environments (Saunders et al. 1995).

Fox groups typically have well defined home ranges. The size of the home range depends on the resources present but is usually around 30 hectares in an urban environment (Saunders et al. 1995). Foxes are most active between dawn and dusk periods.

As foxes are known to occur in urban, agricultural, disturbed, natural and semi natural areas, it is most probable that individual animals would roam between the neighbouring beach and private land into the Site.

3.4.1.4 Potential Impacts on Threatened Species Occurring at the Subject Site

Foxes are considered to be opportunist omnivores. They are known to take a wide range of vertebrate and invertebrates as well as fruits, fungi and carrion. They also feed on human refuse and rubbish. Diet studies conducted in Australia show sheep taken as carrion, rabbits and house mice to be the most common food (Saunders *et al.* 1995). The fox is, however, known to prey upon a diversity of native fauna species. According to the NSW TAP (NPWS 2001), although the impact of fox predation on the abundance of the majority of native fauna is not known, evidence of impacts is greatest for medium sized ground dwelling and semi-arboreal mammals, ground-nesting birds and chelid tortoises. Additionally, the TAP states that these impacts may be intensified in areas of minimal understorey.

A number of threatened species of avifauna, mammals and amphibians occurring at the site are considered to be potential prey of the Red fox. These species are listed in TABLE 2.

TABLE 2
THREATENED SPECIES KNOWN FROM THE KINGS FOREST SITE THAT REPRESENT
POTENTIAL PREY FOR THE RED FOX

Common Name	Scientific name
Primary Prey Species#	
Black Bittern	<i>Ixobrychus flavicollis</i>
Bush Stone-curlew	<i>Burhinus grallarius</i>
Common Planigale	<i>Planigale maculata</i>
Secondary Prey Species*	
Australasian Bittern	<i>Botaurus poiciloptilus</i>
Black-necked Stork	<i>Ephippiorhynchus asiaticus</i>
Bush-hen	<i>Amaurornis olivaceus</i>
Koala	<i>Phascolarctos cinereus</i>
Olongburra Frog	<i>Litoria olongburensis</i>
Wallum Froglet	<i>Crinia tinnula</i>

Primary prey species are those considered likely to be preyed upon.

*Secondary prey species are those considered less likely to be preyed upon on a regular basis.



3.4.2 Cane Toad

3.4.2.1 Introduction

The Cane Toad (*Bufo marinus*) is a large ground-dwelling amphibian that was introduced into the sugar cane fields of North Queensland in 1935 to eradicate the cane beetle and its larvae from the sugar industry. The Toads thrived and have themselves become a major pest species in Australia with their range extending annually (DEH 2005).

Cane Toads were first recorded on the NSW North Coast in the 1960's and today they are considered to be resident along the wet coastal fringe as far South as the Clarence River with a smaller outlying population at Lake Innes South of Port Macquarie (DEH 2005, NPWS 2004a).

The Cane Toad is an abundant breeding resident of the Tweed Shire and is common in the locality of the site, with principle populations occurring in more developed and disturbed areas such as farm dams, urban areas and areas of short mown grass.

3.4.2.2 Biology

Cane Toads are considered to be extreme generalists capable of adapting to a wide range of habitats, climatic and environmental conditions and prey variety. Cane Toads breed in temporary or permanent still or slow-moving waters, can tolerate salinity levels up to 15% and have even been recorded in Mangroves. The species breeds quickly and is able to rapidly colonise and dominate an area (DEH 2005, NPWS 2004a). Cane Toad spawn occurs as long gelatinous strings comprising two rows of black eggs which is usually interweaved around rocks or water plants in shallow water. This gelatinous string-like spawn is unique to the Cane Toad in Australia, none of the native anurans lay such spawn. Females lay approximately 8,000 - 35,000 eggs at a time and usually breed twice a year. Eggs hatch in 48 to 72 hours and tadpoles develop into toadlets any time between 17 days to 6 months. Cane toads need between 6 and 18 months to reach sexual maturity and have a lifespan of approximately 5 years (CSIRO 2004).

Cane Toads are considered to be opportunistic breeders, have a far greater fecundity than native anurans and tadpoles develop rapidly under suitable conditions (DEH 2005).

The Cane Toad is an extremely adaptable species that can quickly reach high densities in suitable habitat. Densities of over 2000 individuals per hectare have been recorded (DEH 2005). In these situations they can quickly outnumber native frogs. It is possible that it competes with some native species for resources and it is poisonous at all stages of its development (Robinson 1998).

3.4.2.3 Habitat and Home Range

This species is a common breeding resident at the site and it is likely that there is a relatively large population in the local area due to the diversity of habitats, degree of development and abundant water.

The Cane Toad is found in most habitats within its range and can breed in fresh or brackish water. The species thrives in urban and disturbed areas and has been found



in mangroves. Cane Toads readily make their homes around areas inhabited by humans and feed on insects that are attracted to outside lights and breed in urban fish ponds (Robinson 1998).

Cane Toad numbers are often greatest in grassland and/or cleared or disturbed areas near to urban settlement (DEH 2005, Australian Museum 2002). Mown grassland areas in close proximity to bodies of water may be particularly favoured as such areas provide ready access to water for egg laying. Cleared tracks may provide dispersal routes for the species and allow for movement through otherwise uninhabitable native vegetation.

3.4.2.4 Potential Impacts on Threatened Species Occurring at the Subject Site

In Australia the Cane Toad has no natural enemies and as mentioned previously, is an opportunistic breeder and extreme generalist. There is concern in Australia over the impact of this species on native invertebrate populations and consequently their impact upon native anurans.

Most significantly, the species possesses highly toxic chemical predator defences whereby they secrete a toxin from an enlarged pair of parotoid glands and this toxin can kill most native animals that normally eat frogs. All stages of the Cane Toad's life cycle are poisonous, including the eggs, tadpoles and frogs.

Cane Toad tadpoles have been known to prey upon the eggs of some native frog species while the adult toads consume large volumes of invertebrates they will consume almost any small creature that fits in their mouth including small native mammals, birds, reptiles and frogs (Van Dam et. Al. 2002). Cane Toads have been recorded as consuming approximately 200 prey items a night, which is far more than a native frog would consume in the same period. Cane Toads are also suspected of carrying diseases that may be transmitted to native frogs and fishes (CISRO 2004).

Populations of native frogs may decline following the colonisation of an area by Cane Toads and a number of native fauna species that occur at the site are likely to be impacted by the presence of the Cane Toad. Under the key threatening process listing (DEC 2006), Cane Toads are expected to reduce the population viability of four threatened frog species, of which two (Wallum sedge frog and Wallum froglet) have been recorded at the site.

Therefore this ability to rapidly colonise an area: to rapidly reach high densities in a recently colonised area; take advantage of a wide variety of habitats; and consume a relatively large variety of prey types has led to concerns that the Cane Toad may be a key factor in the decline of many native anurans (DEH 2005). It is for these reasons that the Cane Toad has been listed as a "Key Threatening Process" under both the EPBC Act 1999 and the NSW TSC Act 1995.

Threatened species occurring at the site that are considered to be potential predators of, prey of, or subject to competition pressures from, the Cane Toad are listed in **TABLE 3**.



TABLE 3
THREATENED SPECIES KNOWN FROM THE KINGS FOREST SITE
THAT ARE POTENTIALLY AT RISK FROM CANE TOADS

Common Name	Scientific Name
Australasian Bittern	<i>Botaurus poiciloptilus</i>
Black Bittern	<i>Ixobrychus flavicollis</i>
Black-necked Stork	<i>Ephippiorhynchus asiaticus</i>
Bush Stone-curlew	<i>Burhinus grallarius</i>
Bush-hen	<i>Amaurornis olivaceus</i>
Common Planigale	<i>Planigale maculata</i>
Olongburra Frog	<i>Litoria olongburensis</i>
Wallum Froglet	<i>Crinia tinnula</i>

3.4.3 Feral Cat

3.4.3.1 Introduction

Feral cats occur in nearly all terrestrial habitats in Australia, with the main determinant of population size being the availability of food and shelter (NPWS 2000). In excess of 18 million feral cats occur on the continent (McLeod 2004, cited in DEWHA 2008) resulting in the decline and extinction of native fauna, particularly on islands (DEWHA 2000). Feral cats are capable of killing prey items up to 2-3 kg, however preference is shown for mammals weighing less than 220 grams, although reptiles, amphibians and invertebrates are also eaten (NPWS 2000).

3.4.3.2 Biology

Feral cats may weigh up to nine kilograms, are solitary and predominantly nocturnal creatures. Breeding capabilities are reached after one year, with females breeding in any season and producing up to 2 litters/year, averaging four kittens per litter, of which few survive (DEWHA 2008a).

3.4.3.3 Habitat and Home Range

Males may have home ranges of up to 10 hectares, with females occupying smaller areas (DEWHA 2008a). All habitat types are utilised by the species with the exception of very wet rainforests. Feral cats are likely to occur within all habitats at the Kings Forest site.

3.4.3.4 Potential Impacts on Threatened Species Occurring at the Subject Site

Feral cats prey upon a variety of fauna groups, with small ground-dwelling mammals consisting of the major part of the diet, with ground-nesting birds also at particular risk (NPWS 2000).

Threatened species occurring at the site that are considered to be potential prey of the feral cat are listed in **TABLE 4**.



TABLE 4
THREATENED SPECIES KNOWN FROM THE KINGS FOREST SITE THAT REPRESENT
POTENTIAL PREY FOR THE FERAL CAT

Common Name	Scientific Name
Bush Stone-curlew	<i>Burhinus grallarius</i>
Bush-hen	<i>Amaurornis olivaceus</i>
Common Planigale	<i>Planigale maculata</i>
Grass Owl	<i>Tyto capensis</i>
Olongburra Frog	<i>Litoria olongburensis</i>
Wallum Froglet	<i>Crinia tinnula</i>

3.4.4 Feral Dog

3.4.4.1 Introduction

Feral dogs occur in a broad range of habitats including natural wilderness areas, grazing land and on the fringes of urban population centres. They feed opportunistically, with the diet including live prey items in addition to roadkill, vegetable matter and scraps from rubbish tips or compost heaps. Feral and domestic dogs are known to exert a high intensity of predation pressure on native fauna, especially medium to large macropods (Mitchell & Banks 2005, cited in DECC 2008). The preliminary listing for predation and hybridisation of feral dogs (DECC 2008) notes that there is a continual influx of domestic dogs to the wild.

3.4.4.2 Biology

Feral dogs may be stray domestic animals living wild, or be wild dogs which have hybridised with dingo stock. Depending on the breed of parent dogs, feral dogs may weight between 8 - 38 kg and can live for up to 12 years, although an average lifespan of around 5 - 7 years is more common (Moreton Bay Regional Council, undated). Feral/wild dogs may hunt in packs and usually take smaller prey such as rabbits, possums, bandicoots and wallabies. In grazing areas, calves and lambs are also vulnerable to feral dog attack. Domestic Dogs and dingo-hybrids may have two oestrus periods per year with pups born in spring and autumn (Catling et al. 1992, cited in DECC 2008), whereas pure dingos only breed once a year.

3.4.4.3 Habitat and Home Range

Feral dogs will utilise a broad variety of habitat types, with evidence that habitat modification and increased availability of prey have contributed to population increases (Corbett 2001, cited in DECC 2008). Home ranges of feral dogs may vary widely, depending on availability of resources and species numbers. A study of ten free-roaming domestic dogs indicated that half of the dogs wandered widely with an average home range of 927 ha, while, while the remaining dogs roamed within the vicinity of the local community, with an average home range of 2.6 ha (Meek 1999).

3.4.3.4 Potential Impacts on Threatened Species Occurring at the Subject Site

Feral dogs have potential to prey on a variety of native fauna, and their impacts on several threatened species is of concern. Dog attack is well documented as being one



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of the major threats to Koala populations, while ground-dwelling bird species including the Bush Stone-curlew and Grass Owl are also particularly vulnerable to predation and disturbance by feral and domestic dogs. Threatened species occurring at the site that are considered to be potential prey of the Feral Dog are listed in **TABLE 5**.

TABLE 5
THREATENED SPECIES KNOWN FROM THE KINGS FOREST SITE THAT REPRESENT
POTENTIAL PREY FOR THE FERAL DOG

Common Name	Scientific Name
Bush Stone-curlew	<i>Burhinus grallarius</i>
Bush-hen	<i>Amaurornis olivaceus</i>
Common Planigale	<i>Planigale maculata</i>
Grass Owl	<i>Tyto capensis</i>
Koala	<i>Phascolarctos cinereus</i>



4 ASSESSMENT OF POSSIBLE CONTROL OPTIONS

4.1 Introduction

The long-term and effective control of the Red Fox, Cane Toad and feral Cats and Dogs at the Site is problematic and largely influenced by off-site management activities beyond the control of the landholders. However, the following sections detail control options to be utilised on the subject to reduce potential impacts of feral animals on native fauna, including Threatened species.

4.2 Habitat Management

Aside from methods for the capture and/or eradication of individual species as outlined below, habitat management is an option with some potential to reduce the impact of targeted feral pest species occurring at the Site. For example, according to Environment Australia (1997) “components of the environment may be manipulated or managed in order to reduce the damage done by feral cats”. Native animals may be more secure in structurally complex habitats (Dickman 1996, cited in Environment Australia 1997) and management of habitat to reduce fragmentation, including the rehabilitation of trails, roads and clearings, and increased vegetation density may be effective in reducing the level of feral animal predation. Likewise, the rehabilitation of roads and clearings may function to exclude Cane Toads as they are known to favour areas of cleared and/or disturbed land.

Regeneration/revegetation works proposed in accordance with the following Stage 1 Management Plans are likely to assist in reducing impacts of feral animals:

- Kings Forest Stage 1 Project Application: Precinct 1 & 5 Vegetation Management Plan (Precinct 1 & 5 VMP) (JWA 2011a);
- Kings Forest Stage 1 Project Application: Precinct 1 & 5 Weed Management Plan (Precinct 1 & 5 WMP) (JWA 2011b).
- Kings Forest Stage 1 Project Application: Precinct 12, 13 & 14 Vegetation Management Plan (JWA 2011c);
- Kings Forest Stage 1 Project Application: Precinct 12, 13 & 14 Weed Management Plan (JWA 2011d)
- Kings Forest Stage 1 Project Application: Precinct 2, 3, 4, 6, 7, 8, 9, 10 & 11 Vegetation Management Plan (JWA 2011e);
- Kings Forest Stage 1 Project Application: Precinct 2, 3, 4, 6, 7, 8, 9, 10 & 11 Weed Management Plan (JWA 2011f).



4.3 Red Fox

4.3.1 Background

The options currently available for the control of foxes are:

- Trapping;
- Poisoning;
- Shooting;
- Control of food supply; and
- Exclusion fencing.

Research is currently being undertaken into the biological control of foxes including immunocontraception (which controls fertility rather than killing the host pest species). This research is, however, considered to be breaking new ground and has to address difficult scientific, technical and biological problems. Consequently, the research is considered high-risk, with long-term effects still unknown (Saunders et al. 1995).

Considering that shooting is generally regarded as an inappropriate, or illegal control method in urban, near-urban or semi-urbanised environments, the potentially available methods of control for foxes occurring at the Site are poisoning, trapping and/or exclusion fencing. The implementation of any of these methods on the Subject site should include collaboration with adjoining land owners.

4.3.2 Possible Control Methods

Red Fox control operations should only commence if there are sightings or regular signs of foxes at the Site. This will be dependant upon the results of the monitoring programs identified below.

Baiting of Foxes

According to Saunders et al. (1995), poisoning using 1080 is the most suitable lethal technique for the control of foxes. This method can be made somewhat target-specific to foxes by controlling the amount of poison used, the form of the bait and bait placement (for example the bait can be buried which lessens the chance of the bait being taken by non-target species particularly birds and reptiles). Because baiting using 1080 is the most effective and target specific method of fox control currently available, it is used widely throughout Australia. The ability of a given baiting programme to reduce fox populations will be limited by many factors including:

- Immigration and reproduction;
- The proportion of the population exposed to baits;
- The proportion of bait-shy individuals in the population; and
- The potential for compensatory increases in survival among unexposed and bait-shy foxes.

Most of these factors are influenced in turn by the methods employed in baiting programmes (NPWS 2001).



Bait stations are made up of bait mounds, comprising one or more baits buried in a mound of earth or sand, surrounded by an area that has been raked smooth to allow for the identification of tracks. A baiting programme can be conducted with an initial free-feeding period when un-poisoned baits are placed in the mound. This allows for the identification of visits by non-target animals and only mounds visited solely by target species are refilled with poisoned baits (Fleming et al. 2001). The NSW Fox TAP (NPWS 2001) provides preliminary guidelines for the use of 1080 baits to control foxes and these recommend that where Quolls are absent from a given site, a free-feeding period is not necessary and that poison baits only be used.

Depending on the results of a baiting program, trapping and/or shooting may need to be considered for the subsequent control of individual foxes that are found to be bait-shy. The incidence of certain animals being wary of taking baits is well recorded.

Exclusion Fencing for Foxes

Foxes are agile and adaptable animals that are difficult to exclude with fences. Nevertheless, fences have been used successfully in some instances (Fleming et al. 2001). In the NSW TAP for the Red Fox (NPWS 2001) the NPWS acknowledges that “exclusion fencing may be particularly useful to protect colonial shore-nesting birds such as Little Terns because nesting birds are restricted to small areas and human habitation (presumably to monitor/maintain) is often close”.

In addition to appropriate design, the success of a fence depends upon appropriate construction, regular maintenance, frequent monitoring for breaches and quick action to remove any animals that break through (Fleming et al. 2001).

Trapping of Foxes

The effectiveness of trapping can be hampered by the fact that it is labour intensive, requires training, can be considered inhumane and can harm non-target native fauna. However, considering the constraints on the use of poisoned baits and/or fencing at the Site (refer Section 6.4), trapping for the control of foxes has been included here as a preferred control option despite these limitations. Alternative trapping methods for the control of foxes include snare traps, padded jaw traps and cage traps (Fleming et al. 2001).

Treadle Snare Traps

In Victoria a treadle snare trap, originally designed for the control of wild dogs, has been used for the capture of foxes in urban areas where other control methods are not practical (for example where poison baiting is deemed to be an unacceptable risk).

The treadle snare consists of a thrower arm activated by a trap plate which draws a cable noose about the target animal's leg. The snare cable usually causes minimal injury and non-target species can be released relatively unharmed. The snare plate is set to withstand a certain weight before triggering which minimises the risk to most smaller animals. Treadle snares need to be checked at regular intervals (preferably every 4-8 hours) so captured animals can be humanely removed.



Soft Catch Traps

Soft-catch or soft-jaw traps are a humane version of the traditional steel jaw trap. These traps have a rubber-like padding on each jaw which cushions the initial impact and provides friction thus preventing the captured animal from sliding along or out of the jaws. They are designed to reduce the risk of injury to a captured animal by having the jaws offset, reduced spring strength, a spring added to the anchor chain and a centrally attached bottom swivel to which the chain is attached (Saunders et al. 1995). As for treadle snare traps above, soft catch traps need to be checked at regular intervals so captured animals can be humanely removed.

Cage Traps

Cage traps are a simple method of capturing animals whereby the door of the cage is set in an open position using a trigger mechanism that is connected either to a treadle plate or swinging bait. In the event that an animal enters the trap and either depresses the treadle plate or manipulates the swinging bait, the door of the trap is released and falls to a closed and locked position. There is sometimes limited success with this method of trapping as it relies on the typically wary target animal actually entering the confines of the cage.

4.4 Cane Toad

4.4.1 Background

Aside from habitat management (refer Section 6.1 above), there is little that can be done to permanently reduce Cane Toad levels in a given area. Cane Toad control programs typically rely on individual toads simply being captured by hand (while wearing gloves) and euthanased according to the methods recommended by the relevant Animal Care and Ethics Authority (NSW Agriculture). In the past some authorities have organised Cane Toad ‘musters’ but this method of control, where it is conducted without appropriate training and supervision, is now considered inappropriate as there is an element of risk to do with an unknowing public killing non-target (native) frog species.

4.4.2 Possible Control Methods

Light Traps

Light traps as developed by Frogwatch in the Northern Territory have proved to be an effective and cost efficient method to reduce Cane Toad densities within a defined area (Frogwatch 2006). The traps have proven to be humane and Cane Toad specific. At the time of writing these traps could be purchased from the NT FrogWatch for \$100.00 including freight, although lighting is not included in this price.

It is therefore recommended that initially up to five (5) “FrogWatch” type Cane Toad traps be installed within the Golf Course area of the site, as this area has the potential to provide the best quality cane toad habitat on the site once it has been constructed. Traps should be distributed in proximity to wetland areas or constructed ponds (no closer than 15 metres) or open grassed areas.



A further ten (10) traps should also be deployed at a number of positions around the margins of SEPP 14 wetlands or wetland areas zoned for Environmental Protection at the site. Following completion of the Masterplan for the site, additional Cane Toad traps should also be deployed in proximity to areas of open space.

The following trapping protocols are recommended:

- The traps should be checked daily by personnel trained in the identification of Cane Toads and native frogs of similar appearance;
- Traps must also be closed and covered whenever they cannot be regularly checked or during periods of extreme weather conditions;
- The traps must contain an adequate water supply commensurate with the (toad) holding capacity of the trap;
- The light source used should be a UV light;
- The light should be on the top of the trap. The sides of the trap should be covered with cloth or dark plastic so as to stop the toads from sitting around the outside of the trap;
- The trap should be fitted with a one-way gate comprising clear plastic fingers that allow the toads to see into and easily enter the trap;
- Traps should be set in areas where the chance of the trap being disturbed or damaged is low;
- The trap site should be set back from the edge of any water body as anecdotal evidence suggests that female toads appear to keep back from the edge of the water and only approach as drier conditions set in or there is an opportunity to breed;
- Traps should be set at locations remote from existing street or building lighting so as to maximise the effectiveness of the trap.

Toads should be dispatched in a manner recommended by the relevant Animal Care and Ethics Authority (NSW Agriculture).

Cane Toad Muster

Despite the limitations associated with musters including the misidentification of Cane Toads and native frogs, and the ready reinvasion of the Site from adjacent areas it is recommended that periodic musters be undertaken for the control of Cane Toads at the Site. However, such musters must be undertaken by an ecologist or staff member who is trained and proficient in the identification of Cane Toads and native frogs of similar appearance.

Cane Toad musters should take place prior to the breeding season and following significant rainfall events that may trigger breeding.

Toads should be dispatched in a manner as recommended by the relevant Animal Care and Ethics Authority (NSW Agriculture).



4.5 Feral Cat

4.5.1 Background

The options currently available for the control of feral cats are:

- Shooting;
- Trapping;
- Exclusion fencing;
- Baiting;
- Fumigants;
- Biological Control;
- Fertility control; and
- Commercial harvesting.

Of the above options the latter four control methods are either very rarely used, or still under development. Furthermore, as shooting is not appropriate within proximity to urban/residential areas, the most practical control options for feral cats are trapping, exclusion fencing and baiting, and are further examined below as per the Commonwealth feral cat TAP (2008).

4.5.2 Possible Control Methods

Trapping

Traps which contain the cats are recognised as being more humane than other types of traps, with soft-catch traps enabling the release of non-target species with minimal harm. Cage traps are generally considered ineffective for trapping feral cats, although are useful in close proximity to urban areas where domestic and straying cats occur.

Trapping is an expensive, labour intensive and time-consuming control method and is usually only recommended on a small scale where eradication is the objective.

Exclusion Fencing

Exclusion fencing has been used successfully in small reserves to preclude predators, including feral cats. Ideally fencing should be combined with an integrated baiting or trapping program to reduce the risk of the fence being breached by predators.

Baiting

While baiting is the cheapest and most cost-effective technique for many small and medium-sized pest animals, baiting programs for feral cats tend to be less effective.

Baiting programs can be unsuitable for feral cat control as feral cats may have large home ranges, occur in low densities and are naturally wary animals. The timing of a baiting program is considered critical to successful feral cat control.



While 1080 is the bait most used for other feral animals (dogs, foxes), it is not well-suited to feral cat control as it must be buried. Research into the use of cyanide is currently being pursued, although its use in Australia is currently illegal. The development of a specific cat toxin has been identified as a high priority for cat control.

4.6 Feral Dog

4.6.1 Background

The options currently available for the control of feral/wild dogs are:

- Shooting;
- Trapping;
- Exclusion fencing; and
- Baiting.

As shooting at the site is inappropriate in an urban context, trapping, exclusion fencing and baiting are further examined below.

4.6.2 Possible Control Methods

Trapping

Trapping for wild dogs is usually only undertaken in areas with low dog populations or where small numbers of 'problem' dogs occur. As for feral cats, deployment of soft-catch traps is a skilled, costly and time-consuming business, with risks associated with the catching of non-target animals and the risk of escaped dogs becoming wary and 'trap shy'.

Exclusion Fencing

Exclusion fencing has been used successfully in the control of dingoes with some success. So long as fencing is properly installed and regularly maintained it represents a viable control option in targeted areas.

Baiting

Ground-baiting with buried 1080 baits is the most widely used method of wild dog control, and is the method employed by the DECC in park management. Given the future urban context of the site however, use of a 1080 baiting program is not appropriate.



4.7 Possible Constraints to the Implementation of Preferred Feral Animal Control Methods on Site

4.7.1 Introduction

Legislative restrictions on the use of poisoned baits in semi-urban areas and various limitations to the use of exclusion fencing at the site are outlined below.

4.7.2 Restrictions to the Use of Poisoned Baits

The use of poison baits is prohibited at the Site due to Site's proximity to dwellings and urban settlement. The provisions of the Pesticide Control (1080 Wild Dog Bait) Order 2002, which falls under Section 38 of the Pesticides Act 1999, outlines a number of restrictions to the use of baits where domestic pets may be at risk. Specifically, Schedule 1 of the Pesticide Control (1080 Wild Dog Bait) Order 2002 - Permit to Allow Use of 1080 Baits for Control of Wild Dogs states that "1080 baits must not be laid within close proximity to urban areas unless the baiting program is planned in conjunction with, and has been agreed to, by an Authorised Control Officer. Such programmes must include strategies for minimising risk to non-target animals. Proposals for baiting in closely settled farming areas or areas within four (4) kilometres of a village or any street with a speed restriction of 70 kilometres per hour or less fall within this requirement". The Site clearly falls within a 4km radius of a speed restriction of 70km per hour or less and is obviously in close proximity to urban areas where domestic pets are kept.

Consequently, despite the fact that the use of poisoned baits is considered the most effective method in the control of feral pest species such as foxes and dogs, the activity cannot be considered a 'recommended control option' for the purposes of control within the area of the Site.

4.7.3 Constraints to the Use of Exclusion Fencing

The use of fencing is commonly recognised as an expensive alternative for the control of feral pests. Additionally, native fauna, including rainforest pigeons, snakes and other small passerines are occasionally injured or killed by exclusion fencing as they collide, are electrocuted or become trapped or entangled.

Exclusion fencing is considered to be most effective where an extensive and sustainable tract of land is enclosed. Enclosing small tracts of land in this manner often leads to fragmentation of habitat and the creation of barriers to the free movement of existing native fauna populations.

However the overall impact feral exclusion fences have in terms of killing and injuring native fauna can be considered to be minimal compared to the benefits expected to be conferred on such fauna by the provision of an environment that is free of feral animals (Long & Robley 2004).

A Koala exclusion fence is proposed for the site as part of the proposed measures in the Kings Forest Stage 1 Koala Plan of Management (JWA 2011a). A number of fauna underpasses have been included in the design to allow native fauna to freely move between habitat areas.



4.7.4 Constraints to the Use of Cane Toad Traps

In the Northern Territory Cane Toad traps have proved effective in reducing local populations of Cane Toads however to maintain these populations at a low level requires an on-going and long-term commitment. Further, to treat a single property in isolation reduces the long-term effectiveness of the trapping and maintains a source of reinfestation.

Cane Toad trapping is relatively inexpensive however there is a requirement for on-going inspection of the traps on a daily basis and the need for on-going training of staff members in the identification of Cane Toads and similar looking native species.

4.7.5 Constraints to Trapping

5.7.5.1 Introduction

Constraints to the use of trapping of foxes, feral cats and dogs at the Site are not necessarily related to site parameters as is the case for the constraints for baiting and fencing, but rather are related to the relatively high costs associated with employing the specialist labour required and the fact that it may be considered by some to be inhumane and have potential to harm non-target animals.

5.7.5.2 Trapping Strategies

Timing/Seasonality

It is recommended that trapping be completed in response to the detection of foxes, feral cats and dogs during the above-mentioned monitoring activities. Prompt action would be required once these species are known to be using the Site so as to improve the effectiveness of the program. In particular, Red Fox activity levels may be greatest during their relevant breeding seasons and consequently detection and subsequent trapping may coincide not only with prey species presence at the site, but also with feral animal breeding activity.

Integrated Approach

It is recommended that where possible a collaborative approach to feral animal control be undertaken. For example, it may be possible to integrate trapping activities on-site with feral animal control activities on neighbouring properties. By using a collaborative approach, the area in which feral pests are targeted is increased and immigration of pests into controlled areas from non-controlled areas is restricted (NPWS 2001). As mentioned, given that poisoning is prohibited at the Site, Tweed Shire Council may be able to liaise with DECC/NPWS and surrounding landholders to encourage the appropriate use of baits (and/or other control methods) in the neighbouring Cudgen Nature Reserve and on private rural properties in the Cudgen/Bogangar area.



Personnel

Trapping for foxes, feral cats and dogs using treadle snare traps and/or soft catch traps would need to be undertaken by professionals skilled in the use of such traps. As there is generally less potential for animals to come to harm with the use of cage traps, it is possible that staff at the Site may be trained in their use. This would allow for cage traps to be held on-site and used in quick response to the detection of a fox on the Site. Persons undertaking the trapping would be required to have the relevant licences and approval from the Department of Environment and Climate Change (DECC) and the Animal Care and Ethics Committee of the Director-General of NSW Agriculture. It is essential that captured animals be treated humanely and disposed of in a humane manner by persons with the relevant qualifications (i.e. a trained veterinarian). It is noted that in most circumstances an Animal Care and Ethics Authority issued by the Director General of Agriculture is not generally required for feral animal control.

Effort

It is recommended that trapping be initiated in response to the detection of a pest species during monitoring as outlined above and that trapping continue until there is a successful capture or for a period considered reasonable for the expectation of success. For reasons of animal care and ethics, as specified under the Animal Care Guidelines for Wildlife Surveys, trapping should not be conducted for more than four consecutive nights in any trap location. There may, however, be potential to extend this period after consultation with the relevant Animal Care and Ethics Committee.



5 RECOMMENDED CONTROL OPTIONS

5.1 Introduction

This section discusses the practicality of the recommended control options and associated implementation strategies proposed for the King's Forest site.

5.2 Foxes

Habitat management, incorporating strategies such as the reduction of fragmentation, rationalisation of access, rehabilitation of trails, roads and clearings and increasing vegetation density, as outlined in **Section 4.2** is recommended for the control of foxes. Regeneration/revegetation works proposed in accordance with the following Stage 1 Management Plans are likely to assist in reducing impacts of foxes:

- Kings Forest Stage 1 Project Application: Precinct 1 & 5 Vegetation Management Plan (Precinct 1 & 5 VMP) (JWA 2011b);
- Kings Forest Stage 1 Project Application: Precinct 1 & 5 Weed Management Plan (Precinct 1 & 5 WMP) (JWA 2011c).
- Kings Forest Stage 1 Project Application: Precinct 12, 13 & 14 Vegetation Management Plan (JWA 2011d);
- Kings Forest Stage 1 Project Application: Precinct 12, 13 & 14 Weed Management Plan (JWA 2011e)
- Kings Forest Stage 1 Project Application: Precinct 2, 3, 4, 6, 7, 8, 9, 10 & 11 Vegetation Management Plan (JWA 2011f);
- Kings Forest Stage 1 Project Application: Precinct 2, 3, 4, 6, 7, 8, 9, 10 & 11 Weed Management Plan (JWA 2011g).

Additionally, due to the aforementioned restrictions on the use of poisoned baits and the constraints associated with exclusion fencing, it is considered that the most appropriate method of direct control for foxes at the site is trapping.

In terms of implementing a strategy of trapping, it is recommended that a process of monitoring for the presence of feral animals be established and trapping be undertaken in response to pest species being detected during the monitoring. The processes of monitoring and trapping are outlined in **SECTIONS 7 and 4.3** respectively.

5.3 Cane Toads

Light trapping, musters and habitat modification as outlined in **Section 4.2** is recommended for the control of Cane Toads. Specifically in the case of Cane Toads, management strategies should consider factors such as promoting dense ground cover in areas adjacent to waterbodies, leaving grassed areas unmown, and avoiding the creation of tracks including both vehicular and foot trails. Habitat management is seen as a critical factor in managing the golf course area in the South of the Kings Forest site, where open grassed areas and constructed wetlands are proposed.



5.4 Feral Cats

Following analysis of the various methods for feral cat control (**SECTION 4.5**) the best control method is considered to be a low-scale trapping regime, which would be implemented if monitoring recorded feral cats at the site. This method is safe, humane and suitable for use in land adjacent to urban areas. It is anticipated that feral cats which may occur at the site would be straying or dumped domestic cats from the locality, which are more easily trapped than wild feral cats. Furthermore, the prohibition on cat ownership at the site will reduce the potential for straying cats from within the site itself.

5.5 Feral Dogs

As for foxes and feral cats, trapping is the best method of control for feral dogs. It is anticipated that straying dogs from the locality or from within the site would be more prevalent than wild dogs, and therefore trapping techniques would have a greater chance of success. Trapping would only be undertaken in response to reports of straying or 'problem' dogs, or when monitoring indicated that feral dogs were occurring. Stray dogs within urban parts of the site would be reported to the ranger at Tweed Shire Council for their removal.

A Koala exclusion fence will be constructed with the primary aim of restricting Koalas from residential areas (JWA 2011a). This permanent fencing will generally be erected along the edge of the 30m inner buffer zone, or along the edges of EPZ's. This Koala exclusion fence will also provide permanent protection to the vegetation by preventing pedestrian and vehicular access during the operational phase. Locked gates will be located where necessary to allow for maintenance.



6 IMPLEMENTATION

ACTION		RESPONSIBILITY	TIMEFRAME	PERFORMANCE MEASURE
Feral Animal Monitoring	ID training	Suitably qualified ecologist	Project start up	All staff familiar with ID of feral animals at the site
	Establish track stations	Site Manager	On completion of training	Track stations located throughout the site
	Monitoring	Site Manager	Ongoing on completion of training	Identification of use of the site by Red Foxes so that trapping can commence
Trapping	Cage trapping	Site Manager	On detection of pest species	Red Foxes, feral cats/dogs trapped and delivered to vet for euthanizing
	Treadle Snare and/or Soft Catch trapping	Suitably qualified ecologist	On detection of pest species	Red Foxes, feral cats/dog trapped and delivered to vet for euthanizing
	Cane Toad trapping	Site Manager	Ongoing on completion of training	Cane Toads trapped and euthanased
	Cane Toad capture	Site Manager	On detection of pest species	Cane Toads trapped and euthanased



7 MONITORING THE OCCURRENCE OF FERAL ANIMALS

It is considered that a relatively simple and inexpensive approach to the monitoring of the presence of feral animals at the Site be undertaken while the proposed development is constructed. Monitoring would commence in conjunction with the completion of Stage 1 of the project, when on-ground staff are available.

Note that it is proposed that approximately 150 hectares of land currently within Environmental Protection Zones in the south of the site will be dedicated to DECCW/NPWS as an adjunct to Cudgen Nature Reserve. Following the transferral of this land, feral pest management would then be the responsibility of DECCW. It would be highly desirable for DECCW and managers of Environmental Protection Zones and the golf course at the site to liaise with regard to pest management, control strategies and land access.

All other Environmental Protection Zoned land will be dedicated to Tweed Shire Council. Therefore following the construction of all stages of the project, Tweed Shire Council will become land managers responsible for feral animal control on site.

A number of measures are therefore proposed for the establishment of a feral animal monitoring programme until Environmental Protection Zoned land is dedicated to Council and/or DECCW. All works would be completed (and funded) by the proponent (or their sub-contractors) in the interim. Proposed monitoring measures include:

- Staff (i.e. maintenance staff, landscapers, golf course ground staff, personnel involved in weed management and control) be trained in the identification of Fox, Dog and Cat tracks;
- Staff (as above) be trained in the identification of Cane Toads;
- Sand 'track stations' be established at key locations throughout the Site particularly along vehicle tracks and access points. These should be established every four (4) months and monitored for a fortnight. Responsibility for the establishment and monitoring of track stations would be undertaken by trained staff employed by the proponent;
- Staff (as above) integrate sand station monitoring with their regular work activities so as to minimise labour costs;
- The results of the monitoring are reported to the DoP; and
- Staff (as above) monitor for the presence of Cane Toads and identify periods when Cane Toad numbers are higher than normal.

Monitoring records would require the keeping of log books by golf course staff in the south of the site and management staff for the remainder of the site. A quarterly review of logbook records is recommended so that appropriate action can be planned and implemented, and the success of the plan can be assessed.



8 SUMMARY & CONCLUSIONS

James Warren and Associates (JWA) have been commissioned by Project 28 Pty. Ltd. to prepare a Feral Animal Management Plan (FAMP) for the Kings Forest Stage 1 Project Application. The FAMP is required under the modified Environmental Assessment Requirements (DGR's) on the 22nd December 2010, and is based on principles proposed in the Revised Feral Animal Management Plan (LandPartners 2009) which accompanied the Concept Plan Application.

It is considered that habitat management, trapping and collection currently represent the most feasible options for the control of the Red Fox, Cane Toad and feral cats and dogs at the Site. Habitat management, including restoration of roads, trails and clearings and establishment of planting areas, is recommended to reduce the potential level of Red Fox predation and the occurrence of Cane Toads at the Site. Additionally, trapping is recommended for the direct control of problem Red Foxes, Cane Toads and feral cats and dogs.

Other possible control methods are generally discounted for use at the Site. Poisoned baits are restricted in the urban area of Cudgen and Bogangar. Koala exclusion fencing has been recommended as part of the management program for the Koala Plan of Management and has been designed to include a number of fauna underpasses so that fauna movement is not restricted. Despite the high construction and maintenance costs of this options it is likely to provide good performance if well maintained.

A programme of monitoring for the occurrence of feral animals is also recommended to be undertaken by golf course and maintenance staff, with trapping for pest species undertaken in response to detections made during monitoring. Aside from monitoring for the occurrence of pest species, golf course and maintenance staff may be trained in the use of cage traps while expert staff would need to be recruited for snare and soft jaw trapping. Likewise, staff can be trained in the identification and collection of toads.

An integrated approach to pest control is encouraged whereby trapping activities undertaken on-site are conducted in unison with feral animal control strategies being undertaken on neighbouring properties.

In regard to other feral animal species, it is possible that the development of the site may result in an increase in numbers of some species such as the Common Mynah or Spotted Turtle Dove. Maintenance and golf course staff completing in Red Fox, Cane Toad and feral cat and dog control are also to be trained in recognising these species, and reporting any population increases to management so consideration can be given to whether control of these species is required.



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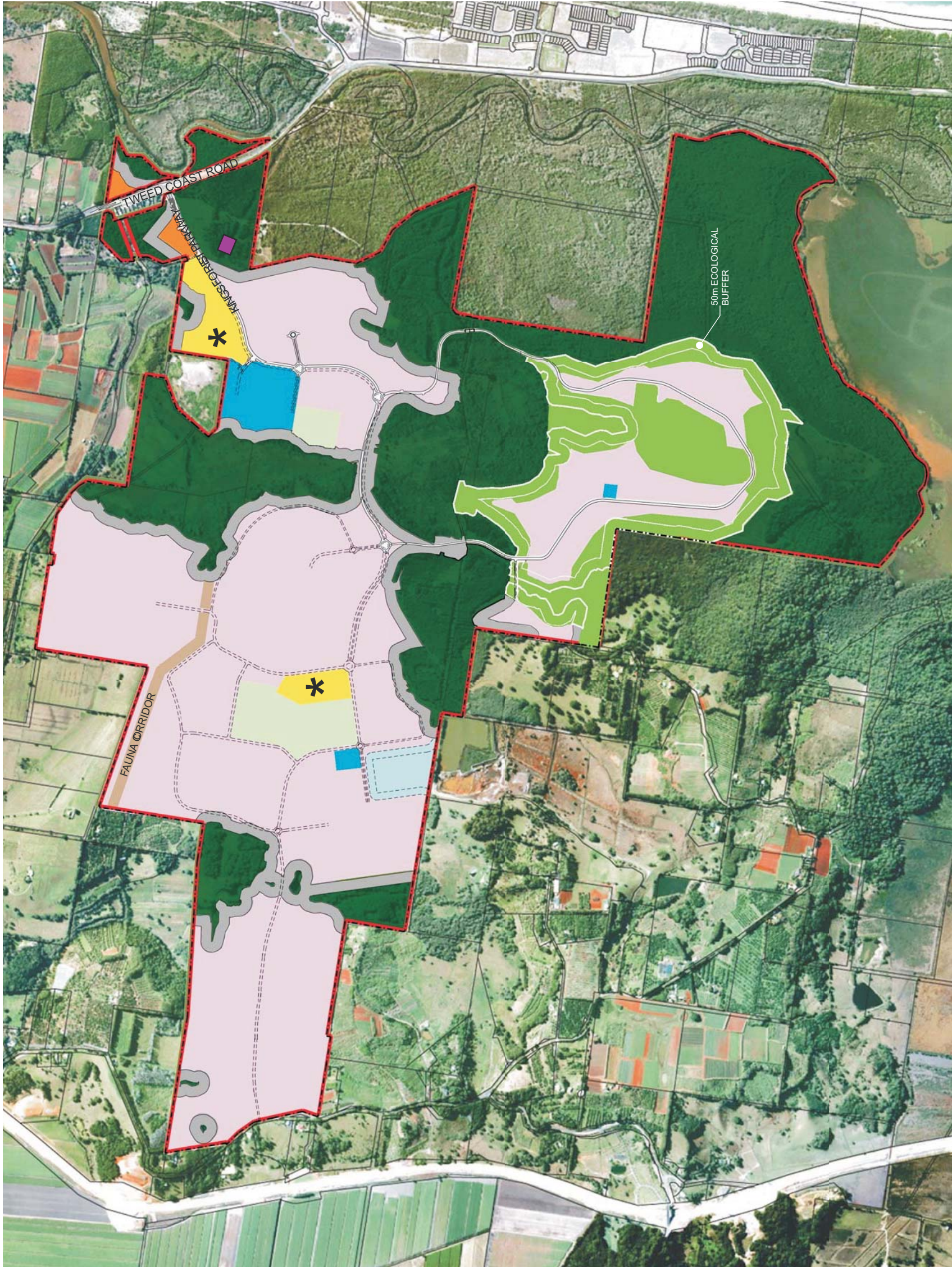
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LEGEND

- Town Centre / Neighbourhood Centre
- Residential
- Community Facilities / Education
- Employment Land
- Structured Open Space (Active)
(Passive open space to council standards, location subject to urban design)
- Environmental Protection Area
to be Dedicated to Council or NPWS
- 50m Ecological Buffer
(Includes APZs & Roads where approved)
- * State School Site
- Proposed Zone Substation
(Subject to Country Energy final approval)
- Private Open Space
- Golf Course Area
(Encompassing ecological buffers where indicated)
- Private Open Space Including Lake
- Kings Forest Boundary



SOURCE: MPS Architects
(Ref: 2011-02-28.pdf)
SCALE: 1 : 20 000 @ A3
JAMES WARREN & ASSOCIATES PTY LIMITED
Environmental Consultants

CLIENT
Project 28 Pty Ltd
PROJECT
Kings Forest Stage 1 Project Application
Feral Animal Management Plan
Melaleuca Drive, Duranbah, NSW
Shire of Tweed

FIGURE 1

CONCEPT
PLAN

PREPARED: BW
DATE: 21 April 2011
FILE: N97017_FAMP_Concept.cdr



PRECINCT 1
RURAL RETAIL DEVELOPMENT WORKS

PRECINCT 5 SUBDIVISION WORKS

LEGEND

- Tweed Coast Road Intersection Works
- Kings Forest Parkway through to Western Precincts
- Roads through to Southern Precincts
- Bulk Earthworks
- Kings Forest Boundary



SOURCE: MPS Architects
(Ref: 2011-02-28.pdf)
SCALE: 1 : 20 000 @ A3
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FIGURE 2

PREPARED: BW
DATE: 01 March 2011
FILE: N97017_FAMP_Scope.cdr

STAGE 1
SCOPE OF
WORKS