8 Existing environment—terrestrial fauna

This chapter describes the fauna of the Project Area, including fauna habitats and rare and protected fauna. Other chapters of relevance are Chapter 7, which describes the vegetation and flora; Chapter 9, which describes the aquatic flora and fauna; and Chapter 10, which describes the proposed conservation strategy for the Project.

8.1 REVIEW OF BIOLOGICAL SURVEYS

8.1.1 Regional overview

The Project Area falls within the Torresian Zoogeographic Region (Ecologia 1997a), the humid tropical and subtropical areas of northern Australia. This region incorporates the Kimberley region of Western Australia, much of the 'Top End' of the Northern Territory, and northern Queensland.

Most of the fauna encountered within the Project Area is adapted to the wet–dry tropical environment and has Torresian distributions (Ecologia 1997a). However, the distribution of some fauna is more wide-ranging, and some faunal elements have strong affinities with the Eyrean Biogeographic Region (semi-arid to arid areas). Other fauna, in particular birds, may be even more wide-ranging, with distributions throughout Australia or overseas, such as transequatorial migratory species.

8.1.2 Fauna surveys of the East Kimberley

The locations of fauna surveys undertaken outside of the Project Area, but within the east Kimberley include:

- Prince Regent River Nature Reserve (Miles and Burbidge 1975);
- Drysdale River National Park (Kabay and Burbidge 1977);
- Mitchell Plateau (Western Australian Museum 1981);
- Argyle Diamond Mine (Dames & Moore 1982);
- Kimberley rainforests (McKenzie et al. 1991);
- Purnululu National Park (Department of Conservation and Land Management 1992);
- ORIA Stage Two Riverside Developments, Kununurra (Ecologia 1997b);
- Lower Ord Ramsar site (Department of Conservation and Land Management 1998).

Surveys performed within the Project Area include:

- Ecologia (1997a)
- Larson (1999) (Appendix L)
- Kinhill (Appendix J).

Ecologia was commissioned by the DRD to undertake biological surveys of the Project Area as part of studies for an unpublished Public Environmental Report. Two surveys were undertaken by Ecologia; a dry season survey over fifteen days in October 1996 and a wet season survey over four days in February 1997.

Assessment of vertebrate fauna by Ecologia was made using a variety of trapping, searching and observational techniques. During the dry season eighteen systematic fauna survey sites were established. Pit traps were established at fifteen sites and Elliott traps at all eighteen. The duration of surveys was fifteen days. Additional sites were searched for reptiles and birds. During the wet season four days of limited trapping was undertaken together with avifauna transects. During field work all fauna sighted and secondary evidence of fauna such as tracks, diggings and scats were recorded. Additional fauna trapping techniques included nocturnal searching, mist netting, tortoise trapping and aquatic funnel trapping.

The Larson (1999) survey (Appendix L) was commissioned by Wesfarmers–Marubeni and the Water Corporation specifically to assess the aquatic fauna of the Project Area. This survey was undertaken in October 1998 and also included opportunistic recordings of terrestrial fauna (see Chapter 9).

The objectives of the Kinhill surveys, conducted in May and June 1999, were to provide additional information on the fauna utilising the black-soil plains of the Project Area.

The locations of terrestrial fauna sampling sites utilised by the Ecologia and Kinhill surveys in the Project Area are shown in Figure 8.1.

Ecologia (1997a) compared the findings of its survey of the Project Area with those of other prior fauna surveys of the east Kimberley region in order to evaluate the importance of the Project Area as a refuge for wildlife. The conclusions made by Ecologia were as follows:

- The number of bird species recorded from the Project Area is high, primarily due to the abundance of waterbirds.
- The diversity and number of reptiles in the Project Area is relatively low, primarily due to the lack of favourable rocky habitat.
- The number of amphibians in the Project Area is relatively high—greater numbers were only recorded on the Mitchell Plateau.
- Mammal species diversity and numbers are relatively low in the Project Area.

8.1.3 Fauna of cracking-clay environments

Cracking-clay environments of the black-soil plains are the dominant feature within the Project Area that would be affected by the proposed development. Discussion of the similarity that these areas have with other cracking-clay environments in the surrounding region is outlined below.

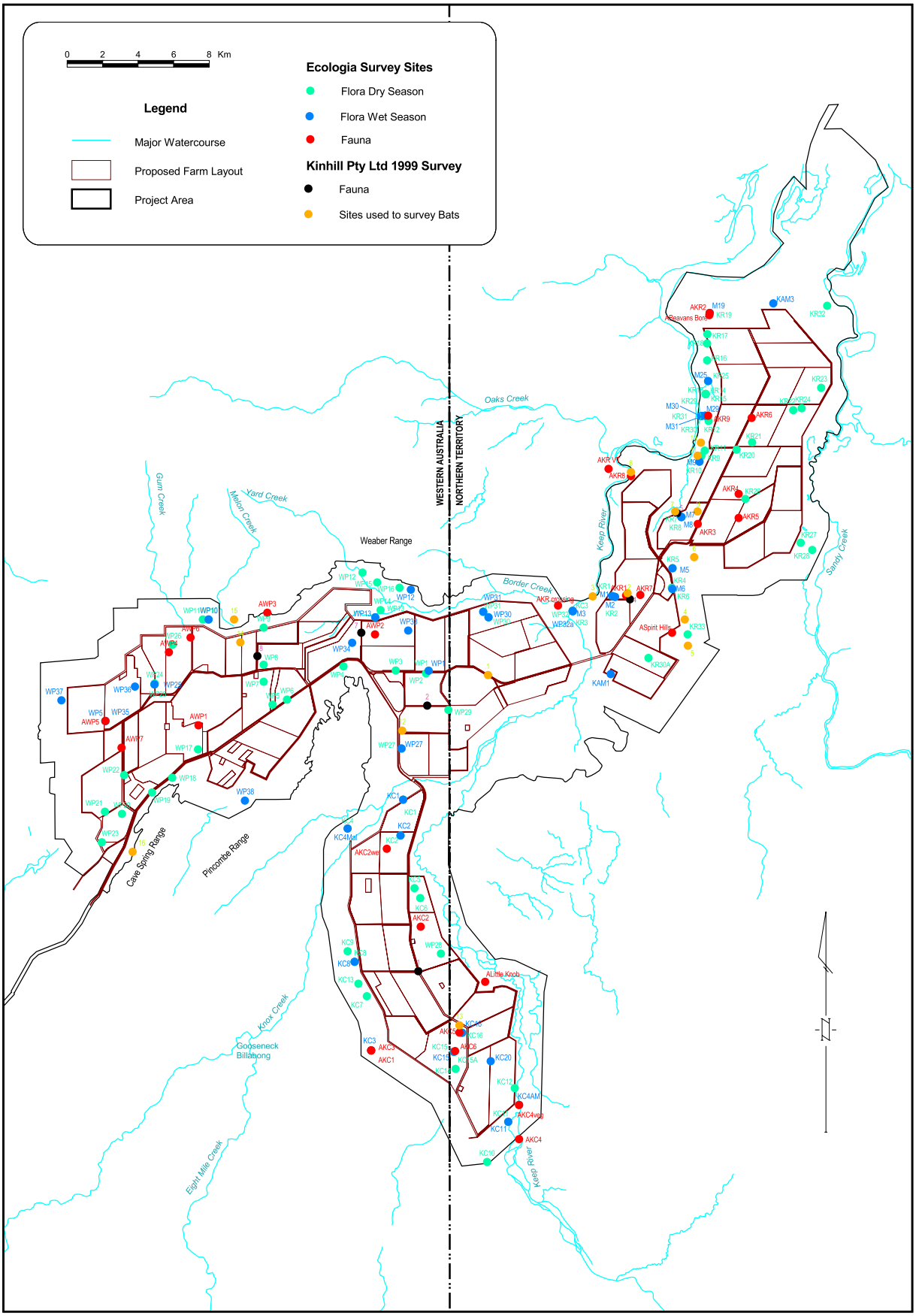

Figure 8.1 Map of fauna survey sites in the Project Area

An analysis of the Parks and Wildlife Commission of the Northern Territory's Fauna Atlas was carried out by Ecologia (1997a) for species preferentially inhabiting cracking-clay habitats. Eighty-seven vertebrate species that showed clear preferences for cracking-clay habitats were identified, as noted in Table 8.1. Also listed in Table 8.1 are those species endemic to cracking-clay soils.

Table 8.1 Vertebrate fauna of cracking-clay soils

Order	Number of records* for cracking clay (preference score > 2)†	Fauna species with a preference score > 4	Fauna species endemic to cracking clay
Amphibians	15	Black soil toadlet; Dahl's aquatic frog.	–
Birds	35	Red-chested button-quail, flock bronzewing, great crested grebe, grass owl, yellow chat.	–
Reptiles	30	*Diplodactylus tessellatus; Tympanocryptis tetraporophora; Ctenotus pulchellus; Acanthophis antarcticus; Demansia torquata; Pseudonaja ingrami.*‡	*Ctenotus rimicola rimicola; Ctenotus rimicola campestris; Proablepharus kinghorni.*‡ *Pseudodonaja guttata; Varanus spenceri.*
Mammals	7	Long-haired rat; long-tailed planigale.	–

* *Information taken from the Parks and Wildlife Commission of the Northern Territory's Fauna Atlas.*

† *A preference score was calculated for each species. This showed, for all the clay soil types, the degree to which the density of records was greater than the overall density of Northern Territory records for each species. However, these soil units were at a coarse scale and may contain significant areas of other soil types. A score greater than 1 indicates that particular species occurs on clay soils. A score > 2 indicates that species shows a preference for the cracking clay soil environment. Higher scores would therefore indicate a stronger preference.*

‡ *No common names available for these species.*

Note: Preference score was calculated by dividing the density of records in clay map-units by the overall density of Northern Territory records. The clay map-units were obtained by using the Atlas of Australian soils *(Northcote 1960).*

In order to determine the broad biogeographic patterns of species distribution, the cracking clay soil units within the Northern Territory were divided by Ecologia (1997a) into seven geographic zones, all of which are east of the Project Area, and were compared on the basis of number and types of species recorded in each zone.

Ecologia (1997a) concluded from this comparison that the observed differences between the geographic zones are likely to be a reflection of the steep north–south climatic gradient in the Northern Territory, which has been shown previously to be a major influence affecting variation in faunal assemblages in north-western Australia (Woinarski 1992). A primary division could be made between the high rainfall coastal zones and low rainfall inland zones.

Ecologia (1997a) also concluded that other black-soil plains within the Victoria–Bonaparte Biogeographic Region, with a similar faunal composition to those in the Project Area, are likely to be those with a similar climatic regime. Based on rainfall isohyets, these areas occur within the Victoria–Ord area on the Ivanhoe, Legune, Dillinya or Willeroo land systems in a broad arc between Adolphus Island in the west and Mt Leonard in the east (Stewart et al. 1970).

8.2 FAUNA HABITATS OF THE PROJECT AREA

Fauna habitats are closely aligned with landforms and associated vegetation.

The original fauna survey of the Project Area was undertaken by Ecologia (1997a) and this work was augmented by further field survey work undertaken by Kinhill (1999).

Ecologia (1997a) recognised seven fauna habitats in the Project Area. Two of the habitats, eucalyptus woodland and bauhinia woodland, differ in their soil characteristics (red clays for eucalyptus woodland and black clays for the bauhina woodland) and in the dominance of the tree species. The information provided for the Ecologia sites did not allow the separation of the two fauna habitats as the fauna sites listed by Ecologia are predominantly in the black soils. The red soils, Soil Units 2 and 3, are not abundant in the Project Area (Figure 4.3) whereas the black soils are dominant.

Kinhill (1999) consolidated the eucalyptus woodland and bauhinia woodland habitats as woodland, and recognised six faunal habitats in the Project Area (Table 8.2) Two of the habitats are widespread and broadly categorised as savanna woodland (grassland and woodland), while the remaining four are more restricted and provide more specialised habitats. For each habitat, examples of the soil unit and number of vegetation associations are listed for the Project Area. Figure 8.2 shows the distribution of fauna habitats within the Project Area.

Table 8.2 Fauna habitats in the Project Area

Habitat	Description	Soil Unit*	Vegetation associations†
Grassland	Grassland with scattered trees.	1, 3a, 5c, 5a, 5b, 4a, 6, 9c, 2b	G1–4, GT1–6, GT8–11,13,14
Woodland	Sparse eucalypt or open *Bauhinia cunninghamii* over grass on black soil (Cununurra clay).	1, 1g, 4b, 1c, 4d, 5, 5a, 5b, 5c, 5bt, 5e, 4a, 4c, 8, 8b, 9c, 8a, 6e, 1e, 8e,	Bc1–3, Cb3–5, Cb7–9, Cc2–4, Ct2, Em1, Em1–4, Em6–9, ET1, 3–6, Ex1–3, Me1
Riverine woodland	Closed woodland along river margins occurring on levees of sandy or loamy soils.	7, 7a, 7a/b, 7b, 7f	Cb1, Cb2, Cb6, Ep1, EM3, EM5, Ex4, Me2, Me3, G5, GT7
Vine thicket	Seasonally inundated forest adjoining Keep River.	7	EM3
Wetland	Billabongs and permanently inundated areas.	1, 5a, 5c/4d	GT9, G7, G6
Rock outcrops	Dolomite outcrops and sandstone scarps.	6, 6e, Cockatoo Dolomite, 11	CBG, Min1, Min2, GT14, EM2, Bo1, Tc1, GT10

* ***See Table 7.3.***

† ***See Appendix J***

Source: Kinhill Pty Ltd (1999).

The greater part of the habitat encountered in the Project Area and in the Gardner Botanical District of Beard (1979) consists of savanna woodland (Wheeler et al. 1992). This habitat occurs on the black-soil or red-soil plains. A description of the fauna habitats of the Project Area is provided below.

8.2.1 Grassland

Grass species common in this habitat include many species of *Sehima*, *Heteropogon*, *Sorghum*, *Triodia*, *Iseilema* and *Panicum*. Fauna species that commonly utilise the grassland habitat include agile wallaby (*Macropus agilis*), dusky rat (*Rattus colletti*) and star finch (*Neochmia ruficauda*). Several species are essentially restricted to this habitat, including singing bushlark (*Mirafra javanica*), golden-headed cisticola (*Cisticola exilis*) and an agamid

lizard (*Tympanocryptis uniformis*). This grassland habitat is typically found on soils inundated in the wet season and cracked in the dry season.

8.2.2 Eucalyptus woodland

Eucalypt woodland is grassland with few shrubs and emergent trees, dominated by *Eucalyptus* spp;. Corymbia spp. and *Bauhinia cunninghamii*. Birds, reptiles, amphibians and mammals are numerous, and common species include blue-winged kookaburra (*Dacelo leachii*), black-tailed treecreeper (*Climacteris melanura*), red-tailed black-cockatoo (*Calyptorhynchus banksii*), crested pigeon (*Ocyphaps lophotes*), frill-necked lizard (*Diporiphora magna*) and northern dwarf tree-frog (*Litoria bicolor*). Species recorded only from this habitat are the plumed whistling duck (*Dendrocygna eytoni*), southern boobook (*Ninox novaeseelandiae*), red backed kingfisher (*Todiramphus pyrrhopygia*), four lizards (*Proablepharus tenuis*, *Lerista griffini*, *Ctenotus rimicola rimicola* and an undescribed species of skink [*Morethia* sp. nov.]) and the long-footed frog (*Cyclorana longipes*).

8.2.3 Riverine woodland

The riverine woodland is a localised habitat, marked by an abundance and diversity of species. This habitat occurs along the margins of the Keep River, Knox Creek, Sandy Creek, Border Creek and on the levees adjacent to them, and is subject to inundation during the wet season.

When intact these areas serve a number of functions:

- they decrease the potential for erosion, and for organic matter to pass into streams and rivers;
- they provide habitats for aquatic species, waterbirds, stream-zone birds, amphibians, and semi-aquatic reptiles and mammals;
- they create a fauna corridor that facilitates movement of species for this area and the region.

Kitchener (1978) noted the absence of arboreal species in his survey of the Ord River area and this was also noted by Ecologia (1997a) in the Project Area. Kitchener (1978) suggested that the absence of this species group is due to the degradation of the riverine woodlands as a result of burning and of grazing pressure from cattle.

Kinhill (Appendix J) recorded nine species from the riverine areas. Species of rare and protected fauna (Section 8.5) recorded from riverine woodland habitat are white-browed robin (*Poecilodryas superciliosa*), radjah shelduck (*Tadorna radjah*), peregrine falcon (*Falco peregrinus*) and freshwater crocodile (*Crocodylus johnstoni*). Common species recorded are bar-shouldered dove (*Geopelia humeralis*), honeyeaters, pheasant coucal (*Centropus phasianinus*), dragon lizard (*Gemmatophora gilberti)* and frogs. Species recorded only from this habitat included azure kingfisher (*Alcedo azurea*), shining flycatcher (*Myiagra alecto*) and Roth's tree-frog (*Litoria rothii*).

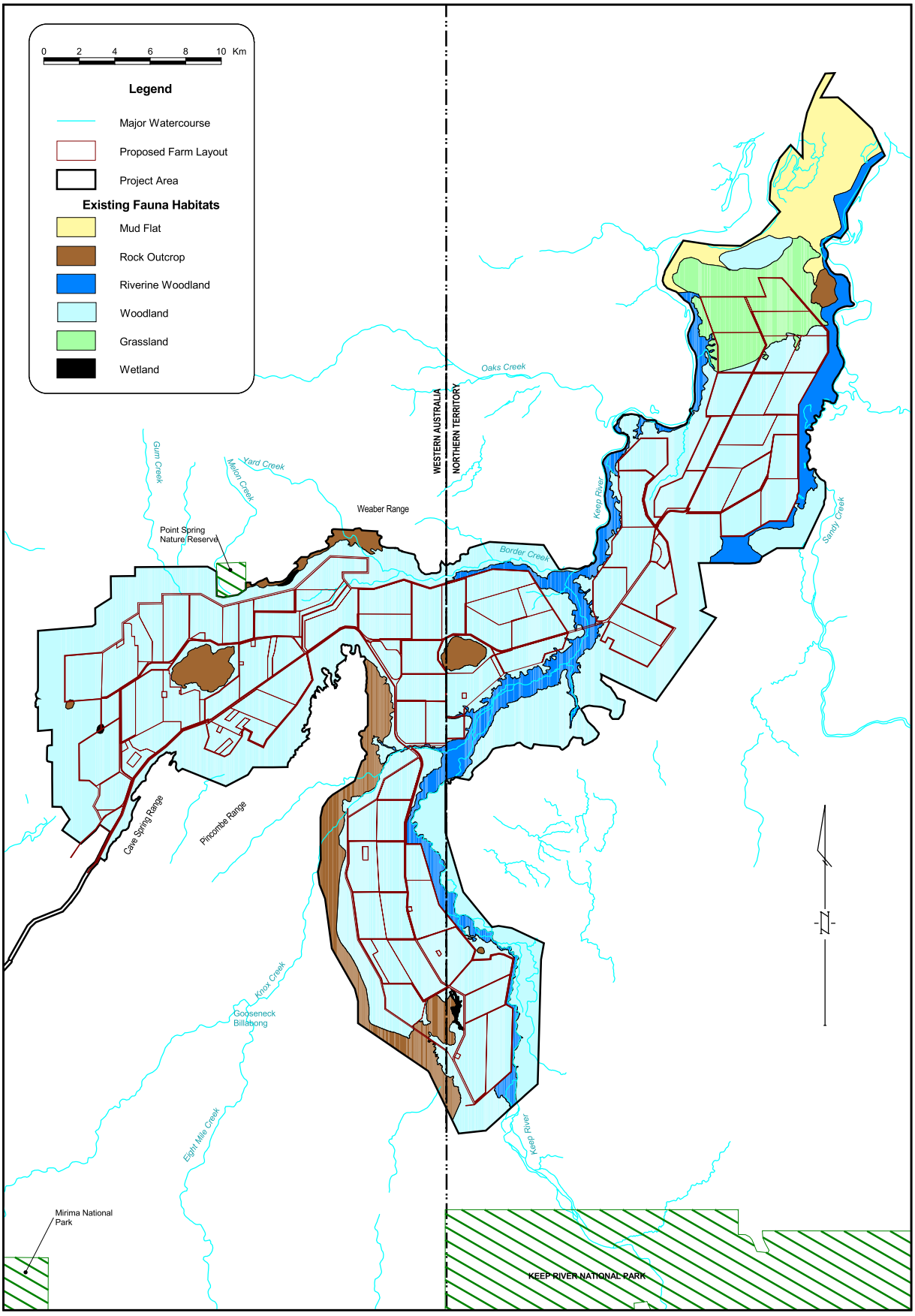

Figure 8.2 Fauna habitats in the Project Area

8.2.4 Vine thicket

Vine thickets occur in small localised patches within the Project Area and consist of a variety of tree and vine species. The thickets form a thick canopy, particularly in the latter stages of the wet season, and typically support a high diversity of flora and fauna due to their structural diversity and regionally atypical microclimate.

Bird species that are almost entirely restricted to this habitat include the P4 species (refer to Table 8.4) white-browed robin (*Poecilodryas superciliosa*) and yellow oriole (*Oriolus flavocinctus*). Commonly recorded species are nankeen night heron (*Nycticorax caledonicus*), sulphur-crested cockatoo (*Cacatua galerita*), restless flycatcher (*Myiagra inquieta*) and olive-backed oriole (*Oriolus sagittatus*).

8.2.5 Wetland

Wetlands in and adjacent to the Project Area include billabongs, permanently inundated areas, and artificial water storage areas (e.g. dams and tanks). These areas support a diverse array of vertebrate and invertebrate fauna species.

Wetland habitat is characterised by waterbirds such as darter (*Anhinga melanogaster*), Pacific heron (*Ardea pacifica*) and green pygmy-goose (*Nettapus pulchellus*). Migratory waders such as common sandpiper (*Actitis hypoleucos*) and grey-tailed tattler (*Heteroscelis brevipes*) occur, with finches, in the fringing vegetation. Mammals recorded are the dasyurid *Planigale ingrami* and Gould's wattled bat (*Chalinolobus gouldii*). An undescribed tortoise species (*Chelodina* sp. nov.) was recorded from Milligan Lagoon.

A flat-headed frog (*Limnodynastes depressus*) was recorded in December 1997 from Cockatoo Lagoon in the Keep River National Park, approximately 32 km south of the southern extent of the Project Area (Puckey et al. 1999). The habitat of this species is cracking-clay soil that is inundated during the wet season and previously it had only been collected in an area that was flooded to create Lake Argyle. It was more recently recorded as possibly occurring at Lisadell Station. A management plan is being prepared by the Parks and Wildlife Commission of the Northern Territory, and fieldwork will be undertaken by the Commission in 1999 to review the field status of populations and potential habitats of this species in the region.

8.2.6 Rock outcrops

Several rock outcrops occur throughout the Project Area, though none of these would be developed.

Rock crevices, loose rocks and small caves provide numerous niches for specialist saxicoline (rock-inhabiting) fauna species. Rock crevices may be utilised by geckos, while caves may be used as roosts for bats, or as shelter for a range of fauna. Species recorded only from this habitat include common rock rat (*Zyzomys argurus*), ningbing pseudantechinus (*Pseudantechinus ningbing*), sandstone dtella (*Gehyra nana*), ridge-tailed monitor (*Varanus acanthurus*) and Copland's rock frog (*Litoria coplandi*). Six species of bats were recorded from caves or rocky areas (Kinhill Pty Ltd 1999; see Appendix J).

8.3 VERTEBRATE FAUNA

Based on desktop research, it is believed that the Project Area may support fifty-five native and eight introduced mammals species, 240 species of birds, 102 species of reptiles and twenty-seven species of frogs. Table 8.3 lists the major vertebrate species groups recorded from each of the fauna habitats in the Project Area.

Table 8.3 Summary of vertebrate fauna species* recorded in habitats of the Project Area

	Ecologia (1997a)								Total
	Habitat								(including Kinhill 1999)
Fauna	EW	BW	GR	RW	WE	RO	VT	Total	
Native mammals									
Number recorded	5	2	4	1	2	5	0	11	28
Introduced mammals									
Number recorded	1	0	0	1	0	1	0	2	2
Birds									
Number recorded	89	74	61	103	78	79	49	156	166
Reptiles									
Number recorded	18	10	4	7	4	13	1	36	45
Frogs									
Number recorded	9	7	5	6	2	5	1	15	20
Total number recorded	**122**	**93**	**74**	**118**	**86**	**103**	**51**	**220**	**261**

* *All species confirmed with the Western Australian Museum.*

EW = eucalypt woodland; BW = Bauhinia woodland; GR = grassland; RW = riverine woodland; WE = wetland; RO = rock outcrops; VT = vine thicket.

Source: Kinhill Pty Ltd (1999) and Ecologia (1997a)

8.3.1 Mammals

Ecologia (1997a) recorded thirteen species of mammals in the Project Area, including eleven native and two introduced species. Five families of native fauna were found to be represented in the Project Area, including Dasyuridae (carnivorous marsupials—two species), Macropodidae (kangaroos and wallabies—three species), Pteropodidae (fruit bats—one species), Vespertilionidae (true bats—three species) and Muridae (rats and mice—four species).

Larson (1999) recorded five mammal species near the Keep River. Four species had been listed as occurring in the region but not recorded by Ecologia (1997a) in the Project Area. These are short-eared rock-wallaby (*Petrogale brachyotis*), grassland melomys (*Melomys burtoni*), little red flying-fox (*Pteropus scapulatus*) and common sheathtail-bat (*Taphozous georgianus*).

Kinhill Pty Ltd (1999) recorded (Appendix J) a second species of the family Dasyuridae (*Planigale maculata*), and thirteen species of bats not already recorded by Ecologia (1997a). Four of these bats had not previously been recorded in the region: orange leaf-nosed bat (*Rhinonycteris auranticus*), pygmy long-eared bat (*Nyctophilus walkeri*), inland broad-nosed bat (*Scotorepens balstoni*) and northern cave bat (*Vespedalus caurinus*).

Eight native mammal families have been recorded in the Project Area, comprising twenty-eight mammal species and eight introduced species. The recorded families included Dasyuridae (carnivorous marsupials—three species), Macropodidae (kangaroos and wallabies—four species), Pteropodidae (fruit bats—two species), Vespertilionidae (true

bats—nine species), Megadermatidae (ghost bats—one species), Hipposideridae (horseshoe bats—two species), Emballonuridae (sheathtail bats—two species), Molossidae (freetail bats—one species) and Muridae (rats and mice—four species).

On the basis of known habitat preferences and species distributions, it is possible that up to thirty-two additional native and six additional introduced mammal species may utilise the Project Area, but it is likely that only a small proportion of these species would reside in the Project Area.

Analysis of site similarity for mammal species composition was undertaken by Ecologia (1997a). The results indicate that only sites occurring within rock outcrops and wetland habitats show a distinct difference from other habitat types. Wetlands and vine thicket habitats also would be expected to provide shelter and water for a wide range of mammals, although the field surveys by Ecologia did not find this to be the case. Analysis of the remaining habitat types, grassland, eucalyptus woodland, bauhinia woodland and riverine woodland, did not group fauna sampling sites according to habitat type. It is likely that the structural similarities between the habitat types will allow for mammal distribution across all of these habitats.

8.3.2 Birds

A total of 156 species of bird, including ninety non-passerines and sixty-six passerines, was recorded by Ecologia with fifty-four families of avifauna represented in the Project Area. Families with the highest species richness include Meliphagidae (honeyeaters—fourteen species), Accipitridae (kites, hawks and eagles—eleven species), Ardeidae (herons and egrets—nine species) and Passeridae (finches and mannikins—nine species). Larson (1999) recorded seven species listed by Ecologia as 'expected to occur' in the Project Area: osprey (*Pandion haliaetus*), sharp-tailed sandpiper (*Calidris acuminata*), bush stone-curlew (*Burhinus grallarius*), silver gull (*Larus novaehollandia*), caspian tern (*Sterna caspia*), little shrike-thrush (*Colluricincla megarhyncha*) and white-quilled rock-pigeon (*Petrophassa albipennis*). Two species not listed for the area by Ecologia (1997a)—forest kingfisher (*Todiramphus macleayii*) and satin flycatcher (*Myiagra cyanoleuca*)—were also recorded by Larson (1999). Kinhill (Appendix J) recorded jabiru (*Ephippiorhynchus asiaticus*). The total number of bird species recorded to date in the Project Area is 166.

On the basis of known habitat preferences, species distributions and searches of the Western Australian Museum fauna database and the Parks and Wildlife Commission of the Northern Territory Fauna Atlas, 239 species, comprising 149 non-passerines and ninety passerines, would be expected to occur within the Project Area. During the dry season when water is scarce, the wetland and riverine woodland habitats provide valuable refuges for birds. This is reflected by the highest levels of species richness being encountered in these areas (sixty-three and forty-one species respectively). By contrast, the grassland offers few dry-season habitats and a relatively uniform range of habitats for birds, and consequently has the lowest species richness (seventeen species).

During the wet season the widespread abundance of water allows for the dispersal of many species. During this period, structurally diverse habitats (vine thicket, eucalypt woodland and rock outcrop) had the highest species richness (thirty-five, twenty-nine and twenty-eight species respectively). Grassland had the lowest species richness (fifteen species), presumably due to the lack of structural diversity (and consequent limited number of ecological niches).

Analysis of site similarity for avian species composition was undertaken by Ecologia (1997a) for the dry and wet seasons. The results indicate that, during the dry season, the overall composition of the avifauna varies little between habitats within the Project Area. This is expected, given the mobile nature of birds and the structural similarity between some of the habitat types. The results also indicated that bird assemblages may be more habitat specific during the wet season, possibly due to an abundance of food sources allowing birds to specialise in their habitat selection.

8.3.3 Reptiles and amphibians

A total of thirty-six reptile and fifteen amphibian species was recorded from the Project Area by Ecologia (1997a). The majority of reptile species recorded were lizards, the most commonly represented families being the Scincidae (skinks—sixteen species), Gekkonidae (geckos—seven species) and Agamidae (dragons—six species). The majority of frogs observed during the survey were tree frogs (eleven species), including seven species of *Litoria.*

Based on desktop research of known species distributions and their habitat preferences, up to twenty-seven frog species (from two families) and 102 reptiles (from eleven families) may exist in the Project Area.

Five of the thirteen reptile species recorded by Larson (1999) had been listed by Ecologia (1997a) as possibly occurring in the Project Area. These are bauxite rainbow-skink (*Carlia amax*), Mertens's water monitor (*Varanus mertensi*), Mitchell's water python (*Varanus mitchelli*), Children's python (*Liasis childreni*) and common tree snake (*Dendrelaphis punctulata*). Kinhill (Appendix J) recorded three additional species not listed by Ecologia (1997a): *Varanus scalaris*, a *Ramphotyphlops* sp. and a *Demansia* sp. A total number of forty-five reptile species have been recorded to date for the Project Area.

Larson (1999) recorded eleven species of frogs. Four species recorded by Larson (1999) were listed as expected to occur but were not recorded by Ecologia (1997a). In addition, *Limnodynastes tasmaniensis* was collected by Kinhill in June 1999 (Appendix J). This is a species not listed by Ecologia (1997) as occurring in the Project Area. The total number of frog species recorded in the Project Area is twenty, representing 70% of the species likely to occur there.

Analysis of site similarity for reptile and amphibian species composition by Ecologia (1997a) for dry-season data indicated only limited separation of sampling sites into described habitats. Rock outcrop habitat showed the strongest grouping, these sites being distinguished by the specialist reptile species taking advantage of relatively unique ecological niches within the study area. Sites occurring within the wetlands or riverine woodlands were less clearly grouped; however, the presence of water specialists, the turtle (*Chelodina* sp. nov.) and the freshwater crocodile (*Crocodylus johnstoni*), differentiated this habitat. The remainder of the sites formed broad, undifferentiated groupings (i.e. grassland, eucalyptus woodland and bauhinia woodland). The available ecological niches within these habitats are common, distributed in large areas and unlikely to restrict or control fauna distribution.

8.4 INVERTEBRATES

Limited surveying of invertebrates has been undertaken in the Kimberley Region. The University of Sydney is currently studying species at the Point Springs Nature Reserve, and Richards (1968) contains a list of species surveyed in ORIA Stage 1 during the early years of operation of the irrigation scheme. Most of the information available on insects relates to pests of the agricultural crops. The National Insect Collection at Canberra contains a total of 1380 separate species from the Kimberley Rregion.

No rare insects are recorded for the Project Area (P. Mawson, CALM, pers. comm. 1999).

A total of 163 pest species have been recorded in the Kimberley Region (Richards, 1968 and B.Thistleton pers.comm). Pest species are those insects that have been found to cause destruction, no matter how slight, either to crops or pastures, dwellings or possessions or to cause discomfort to humans. Trial plots of sugarcane at the Frank Wise Institute have shown the following insects as being pests:

- yellow-winged locust (*Gastrimargus musicus*)
- spur-throated locust (*Austracnis guttulosa*)
- grasshopper (*Valanga irregularis*)
- sugar cane army worm (*Leucania loreyi*)
- northern army worm (*Pseudaletia separata*)
- stem borer (*Saluria* sp.)
- scale (*Icerya* sp. nr. *aegyptica*)
- termites (*Microcerotermes serratus*)

In addition to the abovementioned insects, the following two species are known to be pests of sugarcane in Queensland:

- striped swarming beetle (*Rhyparida didyma*)
- giant termite (*Microcerotermes darwiniensis*).

Both of these species are known to occur in Western Australia but neither has so far proven to be a sugarcane pest in the State.

8.5 RARE AND PROTECTED FAUNA

Within the Project Area, faunal species that have been recognised as rare, threatened with extinction, or as having high conservation value are protected by law under Commonwealth, Northern Territory or Western Australian legislation.

Within Western Australia, scheduled fauna is protected under the *Wildlife Conservation Act 1950*. In addition, species are listed on CALM's Priority Fauna List, which includes species removed from the Scheduled Fauna List, and other species known from only a few populations or that are in need of monitoring. Within the Northern Territory, fauna is covered under Schedule 7 of the *Parks and Wildlife Conservation Act 1993*. At the national level, fauna is protected under the *Endangered Species Protection Act 1992.* CAMBA (China and Australia Migratory Bird Agreement) covers certain species of avifauna, particularly transequatorial waders. Migratory species are also protected through JAMBA

(Japan and Australia Migratory Bird Agreement) and the Australian New Zealand Environment and Conservation Council.

The vertebrate species considered rare and protected under Commonwealth, Northern Territory and State legislation that could be expected to be found within the Project Area are listed in Table 8.4.

Two species recorded in the Project Area are listed under the Commonwealth *Endangered Species Protection Act 1992*: the Derby white-browed robin (*Poecilodryas superciliosa*) is classified as endangered, and the ghost bat (*Macroderma gigas*) is considered vulnerable.

Black bittern (*Ixobrychus flavicollis gouldi*), recorded in the Project Area, is listed on Schedule 1 under the Western Australian *Wildlife Conservation Act 1950*. An additional four species recorded within the Project Area are listed under Schedule 4 of the Act: peregrine falcon (*Falco peregrinus*), radjah shelduck (*Tadorna radjah*), freshwater crocodile (*Crocodylus johnstoni*) and saltwater crocodile (*Crocodylus porosus*).

Table 8.4 Rare and specially protected fauna known or predicted to occur in the Project Area

		Conservation status*					Species
Species name	Common name	WA	NT	ESP	CAMBA	JAMBA	presence†
Mammals							
Macroderma gigas	Ghost bat	P3	7	V			D
Birds							
Cisticola juncidis	Zitting cisticola	P3	7				W
Erythrotriorchis radiatus	Red goshawk	1	7	V			R
Erythrura gouldiae	Gouldian finch	1	7	E			R
Falco hypoleucos	Grey falcon	1		R			R
Falco peregrinus	Peregrine falcon	4					D
Falcunculus frontatus whitei	Kimberley crested shrike-tit	1		E			R
Ixobrychus flavicollis gouldi	Black bittern	1					W
Lonchura flaviprymna	Yellow-rumped mannikin	1	7	IK			R
Malurus coronatus coronatus	Purple-crowned fairy-wren	1	7				R
Oriolus flavocinctus)	Yellow oriole	P4					D,W
Plegadis falcinellus	Glossy ibis				Listed		
Poecilodryas superciliosa cerviniventris	Derby white-browed robin	P4		E			D,W
Rostratula benghalensis	Painted snipe	P3					
Tardona radjah	Radjah shelduck	4					D,W
Tringa brevipes	Greytailed tattler				Listed		
Tringa glareola	Wood sandpiper				Listed		
Tringa hypoleucos	Common sandpiper				Listed		
Tringa nebularia	Greenshank				Listed	Listed	
Tringa stagnatilis	Marsh sandpiper				Listed	Listed	
Reptiles							
Crocodylus johnstoni	Freshwater crocodile	4		IK			D,W
Crocodylus porosus	Saltwater crocodile	4		IK			D
Amphibians							
Cyclorana vagitus	Wailing frog		7				W
Litoria splendida	Splendid tree frog		7				D
Limnodynastes depressus	Flat-headed frog						R

* *WA = Schedules 1–4, Priority species P1, P2, P3, P4; NT = Schedule 7; ESP = Endangered Species Protection Act* 1992; *E = Endangered; V = Vulnerable; IK = insufficiently known; R = Rare.*

† *R = recorded in the Victoria–Bonaparte Biogeographic Region. D, W = recorded in the Project Area (dry and wet season respectively).*

Ghost bat (*Macroderma gigas*), zitting cisticola (*Cisticola juncidis*) and wailing frog (*Cyclorana vagitus*) were also recorded within the Project Area, and are listed under Schedule 7 of the *Parks and Wildlife Conservation Action 1993.*

Flat-headed frog (*Limnodynastes depressus*) is classed as a critically vulnerable species in the Northern Territory. Two recently described subspecies—*Ctenotus rimicola rimicola* and *Ctenotus rimicola campestris*—were rated by the taxonomists Horner and Fisher (1998) as 'rare or insufficiently known' in both Western Australia and the Northern Territory.

Thirteen species listed under CAMBA and seven species listed under JAMBA are expected to occur in the Project Area. Two other CAMBA listed species that have been recorded in the Ord Valley are barn swallow (*Hirundo rustica*) and yellow wagtail (*Motacilla flava*).

Fifteen fauna species recorded or expected to occur in the Project Area, whilst not classified under Commonwealth or State Acts, have restricted distributions, have specialised habitat requirements or are recently named species. These species are as follows:

- Mammals: long-tailed planigale (*Planigale ingrami*), *Planigale maculata* and *Rattus colletti.*
- Birds: grass owl (*Tyto capensis*), lemon-bellied flycatcher (*Microeca flavigaster*) and king quail (*Coturnix chinensis*).
- Reptiles: *Ctenotus rimicola rimicola*, *Morethia* sp. nov., *Chelodina* sp. nov., Ord snake (*Suta ordensis*), *Demansia* sp. complex, and *Ramphotyphlops* sp. 2.
- Amphibians: Northern spadefoot (*Notadena melanoscaphus*), Northern toadlet (*Uperoleia borealis*), blacksoil toadlet (*Uperoleia trachyderma*).

Chapter 10 describes the management strategies proposed to mitigate impacts upon fauna from development of the Project Area.

8.6 INTRODUCED SPECIES

Three introduced species—introduced but naturalised dingo (*Canis lupus dingo*), cat (*Felis catus*), and donkey (*Equus asinus*)—were recorded in the Project Area by Ecologia (1997a). The native rat (*Rattus villosissimus*) should also be present, and it occasionally reaches plague proportions in ORIA Stage One. Introduced rodents, such as house mouse (*Mus musculus*) and black rat (*Rattus rattus*), are also expected to occur within the Project Area. Other mammals expected to occur are horse (*Equus caballus*) and feral pig (*Sus scrofa*). Cattle (*Bos indicus*) are widespread across the Project Area as a result of pastoral lease operations.