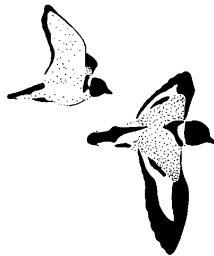


Fauna Assessment of Bush Forever Site 355 (Point Peron and adjacent bushland)

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INTRODUCTION

As part of the strategic environmental review process for a proposed marina/tourism precinct, Bamford Consulting Ecologists was commissioned to undertake a fauna assessment of Bush Forever Protection Area 355 and adjacent bushland on Point Peron. The aims of this fauna study are to collate information available on fauna of the area and place it in a regional context, so that likely impacts of the proposed development upon fauna in a local and regional setting can be assessed. The key stages in this fauna study are as follows:

- Review available information to produce a list of fauna species with the potential to occur at the sites;
- Identify any species of conservation significance with the potential to occur on the site;
- Identify significant or sensitive habitats and locations; and
- Discuss the local and regional significance of the fauna assemblage of the site.

This report details the findings of the fauna assessment.

METHODS

Level of assessment

This assessment is classified as a Level 1 survey (a background research or ‘desk-top’ study) according to the EPA Guidance Statement No. 56 (Environmental Protection Authority 2003). This was the level of assessment commissioned by the client. The approach involved a brief site visit, personal familiarity with the site from previous visits to the area, and a review of available published and unpublished information (see below).

Personnel

The site inspection, data review and report preparation were carried out by Dr Michael Bamford of Bamford Consulting Ecologists.

Sources of Information

Lists of fauna expected to occur in the study area were produced using information from a number of sources. These included publications that provide information on general patterns of distribution of frogs (Tyler *et al.* 2000), reptiles (Storr *et al.* 1983, 1990, 1999 and 2002), birds (Barrett *et al.* 2003; Johnstone and Storr 1998), and mammals (Menkhorst and Knight 2001; Strahan 1995). Kwinana, Rockingham and Mandurah Branch of the Naturalists’ Club (1998) provides information on fauna that is specific to the area. In addition, several databases were searched for fauna records in the general area as follows:

Database	Area searched	Fauna included in database
WA Museum faunabase	32.2 to 32.4S, 115.6 to 115.8 E	Frogs, reptiles, birds and mammals
CALM's threatened fauna database	32.2 to 32.4S, 115.6 to 115.8 E	Invertebrates and vertebrates included under WA Wildlife Conservation Act and CALM's priority species list
Birds Australia Atlas 2 Database	32 to 33 S, 115 116 E	Birds
Department for the Environment and Heritage EPBC Protected Matters search tool	32.2 to 32.4S, 115.6 to 115.8 E	Fauna listed under the federal EPBC Act, including threatened and migratory species

These sources of information were used to create lists of species with the potential to occur at the site. As far as possible, expected species are those that are likely to utilise the project area, and such lists exclude species that have been recorded in the general region as vagrants or for which suitable habitat is absent. Particularly among the birds, for example, vagrants can be recorded almost anywhere. Pelagic birds and marine mammals and reptiles have thus been excluded from the list of species likely to utilise the project area, but coastal species have been included.

Taxonomy and nomenclature for fauna species used in this report generally follow the WA Museum (2001) for amphibians, reptiles and mammals, and Christidis and Boles (1994) for birds. Where differences in the names of birds occur between these two sources, alternative names are given in parenthesis.

Assessment of conservation significance

The conservation status of fauna species is assessed under Commonwealth and State Acts such as the *Commonwealth Environment Protection and Biodiversity Conservation Act* (EPBC Act) 1999 and the *Western Australian Wildlife Conservation Act* 1950. The significance levels for fauna used in the EPBC Act are those recommended by the International Union for the Conservation of Nature and Natural Resources (IUCN 2001). The *WA Wildlife Conservation Act* 1950 uses a set of Schedules but also classifies species using some of the IUCN categories. These categories and Schedules are described in Appendix 1.

The EPBC Act also has lists of migratory species that are recognised under international treaties such as the China Australia Migratory Bird Agreement (CAMBA), the Japan Australia Migratory Bird Agreement (JAMBA) and the Bonn Convention (The Convention on the Conservation of Migratory Species of Wild Animals). The list of migratory species under the EPBC Act has been revised to include species only, thus excluding family listings (DEH, pers comm.). Those species listed in JAMBA are also protected under Schedule 3 of the *WA Wildlife Conservation Act*. There is a separate list of marine species under the EPBC Act, but this only applies to land and waters under

Commonwealth management. Therefore, marine listings are not included in this report.

The Department of the Environment and Heritage (DEH, formerly Environment Australia) has also supported the publication of reports on the conservation status of most vertebrate fauna species: reptiles (Cogger *et al.* 1993), birds (Garnett and Crowley 2000), monotremes and marsupials (Maxwell *et al.* 1996), rodents (Lee 1995) and bats (Duncan *et al.* 1999). The Threatened Species and Communities Section of Environment Australia has also produced a list of Threatened Australian Fauna (Environment Australia 1999), although this list is effectively a precursor to the list produced under the EPBC Act. These publications also use the IUCN categories, although those used by Cogger *et al.* (1993) differ in some respects because this report pre-dates categories reviewed by Mace and Stuart (1994) and revisited since by IUCN (2001).

In Western Australia, the Department of Conservation and Land Management (CALM) has produced a supplementary list of Priority Fauna, being species that are not considered Threatened under the WA Act but for which the Department feels there is cause for concern. Some Priority species, however, are also assigned to the IUCN Conservation Dependent category. Levels of Priority are described in Appendix 1.

Fauna species included under conservation acts and/or agreements are formally recognised as of conservation significance under state or federal legislation. Species listed only as Priority by CALM, or that are included in publications such as Garnett and Crowley (2000) and Cogger *et al.* (1993), but not in State or Commonwealth Acts, are also of recognised conservation significance. In addition, species that are at the limit of their distribution, those that have a very restricted range and those that occur in breeding colonies, such as some waterbirds, can be considered of conservation significance, although this level of significance has no legislative or published recognition and is based on interpretation of distribution information. The WA Department of Environmental Protection used this sort of interpretation to identify significant bird species in the Perth metropolitan area as part of Perth Bushplan (Dell and Banyard 2000).

On the basis of the above comments, three levels of conservation significance are recognised in this report:

- *Conservation Significance (CS) 1:* Species listed under State or Commonwealth Acts.
- *Conservation Significance (CS) 2:* Species not listed under State or Commonwealth Acts, but listed in publications on threatened fauna or as Priority species by CALM.
- *Conservation Significance (CS) 3:* Species not listed under Acts or in publications, but considered of at least local significance because of their pattern of distribution.

SITE DESCRIPTION

The study area consists of Bush Forever Site 355, located at Point Peron and Shoalwater Bay in Rockingham. Descriptions of the site are presented in the Bush Forever report volume 2 (Dell and Banyard 2000) and the vegetation is described in detail by Bennett Environmental Consulting Pty Ltd (2005) as part of the present study. The vegetation had previously been investigated by Keating and Trudgen (1986). The site supports coastal and near-coastal vegetation complexes consisting largely of low heaths and shrublands, but with some tall shrubland of *Acacia rostellifera* in dune swales and an area of open forest (near corner of Memorial Drive and Safety Bay Road) of Tuart *Eucalyptus gomphocephala*, Peppermint *Agonis flexuosa*, Rottneest Island Pine *Callitris preissii* and Rottneest Island Tea-tree *Melaleuca lanceolata*. The lease area proposed for development supports regenerating *A. rostellifera* shrubland and a heath dominated by the sedge *Lomandra maritima*, the grass *Acanthocarpus preissii* and the introduced wild geranium *Pelargonium capitatum*.

Topographically, the shoreline of the site consists of a series of limestone headlands with sandy bays and tidal reef platforms. Quindalup dunes lie behind the coast. There is a drain (channel) that contains water at least seasonally.

The natural landscape of the site is degraded by weed invasion and fragmented by roads and some development, with the largest areas of intact landscape at Point Peron and in the west of the study area, adjacent to Safety Bay Drive. Part of this area is the lease proposed for development alongside Lake Richmond, a highly significant site (see Dell and Banyard 2000). As part of the proposal, it has been suggested that existing developments in some parts of the area could be removed or consolidated, with rehabilitation undertaken to strengthen the link of native vegetation between Lake Richmond and the distal end of Point Peron.

RESULTS; FAUNA OF THE STUDY AREA

Invertebrates

The only information available on invertebrates is from CALM's threatened fauna database, the Kwinana, Rockingham and Mandurah Branch of the Naturalists' Club (1998) and some anecdotal information from residents. However, there are no threatened invertebrates listed for the search area investigated, while the Naturalists' Club publication does not address terrestrial invertebrates.

Despite the absence of species from CALM's database, three significant species of native bee, a moth and a cricket have been recorded on the coastal plain immediately east of the search area. The Graceful Sun-Moth *Synemon gratiosa* and the bee *Neopasiphe simplicior* are listed under Schedule 1 of the WA Wildlife Conservation Act, while the cricket *Throscodectes xiphos* and the bees *Leioproctus douglasiellus* and *Hylaeus globuliferus* are Priority species. These invertebrate species appear to be associated with understorey species of banksia woodland that is not present in the study area.

The Yellow Admiral Butterfly *Vanessa itea* is not listed as Threatened or Priority, but can be considered of local significance (Conservation Significance level 3) because it has declined in the Perth area, mainly due to the loss of its primary food plant. It is also of local significance because it is a spectacular species that is the target species for a number of school-based “butterfly garden” projects. The Point Peron area is considered to be a location where the species gathers to mate, before the females disperse to search for food plants on which to lay their eggs (R. Goodale, pers. comm.). High points in the landscape are important for mating gatherings and the extremity of Point Peron is such a location. The food plant for the Yellow Admiral butterfly, Native Pellitory *Parietaria debilis*, was recorded from Vegetation Unit 13, ‘Closed Tall Scrub to Open Heath of *Acacia rostellifera* over an Open Low Heath of mixed species or a Closed Grassland of introduced species, as described and mapped by Bennett Environmental Consulting (2005).

Impacts upon invertebrates will consist largely of loss of habitat on the development site, with the possibility of some benefits through habitat rehabilitation and consolidation.

Amphibians

Seven species of frogs may be present in the study area (Table 1). Most would breed in the drain or in seasonal freshwater pools around Lake Richmond, but would be expected to range widely outside the breeding season.

One of the frog species, the Turtle Frog, can be considered of local conservation significance (CS3) as it is close to the southern limit of its range on the coastal plain south of Perth. This species has not been recorded in the WA Museum database, however, and is included as potentially present only on the basis of general patterns of distribution. It occurs in Banksia woodlands of the Jandakot area (M. Bamford unpubl. data).

Impacts upon frogs will consist of some habitat loss and possibly an increase in mortality along roads in the area due to increased traffic volumes. This is likely as many of the frog species disperse or migrate away from breeding sites. There is the possibility of some benefits through habitat rehabilitation and consolidation.

Reptiles

The WA Museum database lists 33 reptile species for the area used in the database search, but general patterns of distribution suggest that as many as 42 reptile species may be present in this general region (Table 2). Only 16 species have been recorded in the study area, however (Naturalists’ Club 1988). This list of 16 species is almost certainly incomplete as the study area provides a range of fauna habitats, from coastal limestone to heathlands, shrublands and low forest, to the margins of a drain. However, it lacks banksia woodlands so some of the species listed may not be present. The reptile assemblage may be substantially complete, as in the Perth area reptiles generally display a high degree of persistence even in small remnants of native vegetation.

A number of the species included in Table 2 are of conservation significance, as discussed below.

Conservation significance level 1

South-West Carpet Python *Morelia spilota imbricata*

Schedule 4 (Other Specially Protected Fauna) of the WA Wildlife Conservation Act, and CALM Priority 4.

The record of this species is probably from Garden Island, where it is abundant, and the species is unlikely to occur in the study area. The possibility exists, however, for individuals to disperse into the study area via the Garden Island causeway.

Conservation significance level 2

Bold-striped Lerista *Lerista lineata*

Priority 4.

This skink has a restricted distribution with a core range on the coastal plain between the Swan River and Mandurah. It persists even in small remnants of native vegetation, including gardens, so is likely to be common in the study area where there are sandy soils and at least some vegetation cover.

Black-striped Snake *Neelaps calonotos*

Priority 4.

This snake has a restricted distribution on the coastal plain from Mandurah to just north of Lancelin. It is probably still present in the Rockingham area where there are large tracts of native vegetation, but How and Shine (1999) suggest this and similar fossorial snakes require large areas of continuous habitat for long-term persistence. Therefore, it is unlikely to persist in the study area.

Conservation significance level 3

The following species are considered of local significance as they are at the limit of their range in the area: Rosenberg's Goanna *Varanus rosenbergi*, Tree Goanna *Varanus tristis*, Glossy Swamp Egernia *Egernia luctuosa*, Worm Lerista *Lerista praepedita*, Western Blue-tongue *Tiliqua occipitalis* and Southern Shovel-nosed Snake *Brachyuropsis semifasciata*. Only the Worm Lerista and Shovel-nosed Snake have been recorded in the area.

Impacts upon reptiles will consist of some habitat loss and possibly an increase in mortality along roads in the area due to increased traffic volumes. There is the possibility of some benefits through habitat rehabilitation and consolidation.

Birds

The site may support 121 bird species (Table 3), including species that may be regular visitors but excluding species that may occur as vagrants. The actual number of species that may be present at any one time, however, is likely to be much less than the 121 suggested.

The list includes some ducks and other wetland birds that may visit the drain or nest in the Tuarts, and a number of shorebirds and seabirds likely to roost and/or forage along the shoreline. Many of the shorebirds and seabirds are likely to be more abundant on the islands of Shoalwater Bay than on the mainland of the study area. Other species likely to be present are landbirds, including occasional visitors, such as some birds of prey, regular visitors, such as the honeyeaters, and species that are probably resident or at least present at all times, including the Splendid Fairy-wren and Richard's Pipit.

A number of the bird species included in Table 3 are of conservation significance, as discussed below.

Conservation significance level 1

Peregrine Falcon

Schedule 4 of the WA Wildlife Conservation Act.

The Peregrine Falcon is reported to occur in the study area (B. Goodale pers. comm.) and breeds in the region, with a nest believed to be in a large tree on nearby private property. Although a widespread species, it occurs at low densities and birds in urban areas are at risk from roadkill and secondary poisoning.

Carnaby's Cockatoo

Endangered (EPBC and Wildlife Conservation Acts)

This species is abundant in the Perth area where loss of habitat is a threatening process, but it is probably only an occasional visitor to the study area as it forages primarily on Proteaceae, such as banksias, that are absent from the site. There are anecdotal reports of this species nesting in Tuarts in the general region but there have been no reports of the species frequenting the Tuarts on the site.

Conservation significance level 1 (migratory)

Eighteen species listed as migratory under the EPBC Act may occur at the site (Table 3). These include the Osprey and White-bellied Sea-Eagle, 13 shorebirds, the Rainbow Bee-eater and the Fork-tailed Swift. In general, these species are likely to occur in low numbers in the study area and in littoral or shallow water habitats, although the bee-eater may nest in sandy soils and forage over terrestrial areas. The swift is an aerial species likely to occur only occasionally and then only to overfly the site. The Osprey nests on Garden Island (Naturalists Club 1988).

A few of the shorebirds, such as the Grey-tailed Tattler and Ruddy Turnstone, may be moderately abundant. While unlikely to be directly impacted by the proposed development, they may be affected by increased levels of disturbance and the reliance of littoral and inshore marine species upon marine environments, such as sea-grasses, is virtually unknown. The bee-eater may lose some nesting habitat.

Conservation significance level 2

Hooded Plover

Priority 4

The Hooded Plover is probably a vagrant in the study area and has not been recorded by the Naturalists Club (1988), but is included because of its significance, there is a well-studied population on salt lakes south of Mandurah and there is suitable in the sandy beaches of the study area. If the species did move onto these beaches, disturbance, such as by people and dogs, would be a concern.

Conservation significance level 3

Eighteen bird species are listed as CS3, being locally significant. Most of these species are listed by Dell and Banyard (2000) as having declined in the Perth area, and most are dependent upon remnant native vegetation. At least some of these species also require linkage between areas of suitable habitat in order to be able to move across the landscape, and the juxtaposition of the study area and remnant vegetation around Lake Richmond may be important for these. Loss of habitat may affect some CS3 species, but there may be some benefit from an increase in linkage through the study area.

In summary, there may be a number of impacts of the proposed development upon birds. There will be some habitat loss and potential for disturbance, with the disturbance possibly affecting migratory species. There could also be some adverse impacts upon littoral and inshore marine species if marine environments, such as sea-grasses, are adversely affected. There is the possibility of some benefits through habitat rehabilitation and consolidation.

Mammals

Seventeen mammal species are listed as expected in the study area (Table 4), but few have been confirmed. This list excludes marine species, of which many are listed on the databases investigated, and species now confined to Garden Island. The mammal fauna is poor, with six introduced species, eight bat species that have been included because they are known from the general area and there is nothing to suggest that they are not present, and only one native species, the Quenda, known from the study area. Note that the CALM threatened list contains a record of the Brush-tailed Phascogale *Phascogale tapoatafa*, but this is reported to have been a specimen inadvertently brought into the area in a vehicle (B. Goodale pers. comm.).

There are no mammal species of Conservation Significance level 1 expected to occur in the study area, but several species of slightly lower significance could be present.

Conservation significance level 2

Quenda

Priority 5.

This is a conservation dependent species that is not listed by the Naturalists Club (1988) but is reported to be common in the area now (B Goodale pers. comm.). It favours dense, low vegetation and probably crosses roads in the area, making it vulnerable to roadkill. It

is therefore a species that could benefit from revegetation but be adversely affected by increased traffic volume.

Rakali or Water-Rat

Priority 4.

This species has not actually been recorded in the area, but it is known from some wetlands in the region, including Spectacle Swamp, and is known from a number of wetlands in urban areas around Perth, such as Lake Goollelal, Herdsman Lake and Alfred Cove on the Swan River (M. Bamford personal database). It therefore may be present at Lake Richmond and occasionally along the drain in the study area, while it does use rocky marine coastlines elsewhere. If present, it would be vulnerable to roadkill.

Western False Pipistrelle

Priority 4.

The Western False Pipistrelle has been recorded in Harry Waring Marsupial Reserve (Hosken and O'Shea 1994) and therefore the possibility that it is present in the study area cannot be discounted. If present, it would probably roost in the Tuarts, although some small bats will roost in limestone crevices.

Conservation significance level 3

At least some of the bat species could be considered of local significance as they have declined in the Perth area, with only the White-striped Bat and Gould's Wattled Bat regularly persisting in urban areas. All are tree-roosting species that could shelter anywhere trees provide hollows or crevices in which they can hide. The White-striped Bat, Gould's Wattled Bat, Southern Forest Bat and Lesser Long-eared Bat were recently (January 2005) recorded at Little Rush Lake in Beeliar Regional Park (M. Bamford personal database).

Although the mammal fauna is depauperate, at least one native terrestrial mammal, the Quenda, is present, while some bats species may also occur in the study area. Main concerns for native mammals will be some loss of habitat and increased risk of roadkill. Any increase in predation from feral species or domestic pets would also be a concern. Rehabilitation and consolidation of habitat could benefit some species.

CONCLUSIONS

The study area is not likely to be rich in fauna because it is partly degraded and provides a limited range of habitats, particularly because it lacks banksia woodland, but it is an isolated patch of coastal and near-coastal habitat recognised as significant through being listed as a Bush Forever site. It is therefore at least of local significance in supporting a suite of fauna not likely to be present in surrounding suburbs, and it is likely to enhance the values of the nearby Lake Richmond area in providing additional habitat for fauna of that site. There are also a few significant species present or likely to be present.

The proposed development could result in some loss of habitat, an increased risk of roadkill, an increased risk of predation, particularly from domestic pets, and increased levels of disturbance. It is not known to what extent impacts upon the marine environment would affect littoral species, such as shorebirds. The development, however, could also lead to some rehabilitation of habitat and some consolidation in areas where remnant habitat is partly fragmented by development.

Some vegetation units were limited in extent and confined or largely confined to development areas. VU24 is unusual within the study area as it is the only vegetation unit to contain Tuart and Peppermint, although Tuart occurs in VU21 and Peppermint in VU23. The Tuarts in particular are likely to be locally significant for fauna that uses tree hollows (eg bats and possible the Brush-tailed Possum), and for species that forage in eucalypt foliage, such as the Weebill and Striated Pardalote. There are scattered Tuarts outside the study area, but those within the study area do represent a locally rare habitat important for a number of species. Therefore, retention of part or all of VU24 would be desirable.

The existing drain is entirely within the proposed development area but there are large wetland areas available very close by.

Table 1. Amphibians expected to occur in the study area. Conservation Significance (CS) as defined in Methods is indicated in the status column. WM indicates species recorded in the WA Museum database (see Methods).

Species	Status	Recorded
Myobatrachidae (burrowing frogs)		
Glauert's Frog <i>Crinia glauerti</i>		WM
Sandplain Froglet <i>Crinia insignifera</i>		WM
Moaning Frog <i>Heleioporus eyrei</i>		WM
Pobblebonk Frog <i>Limnodynastes dorsalis</i>		WM
Turtle Frog <i>Myobatrachus gouldii</i>	CS3	
Hylidae (tree-frogs)		
Slender Tree Frog <i>Litoria adelaidensis</i>		WM
Motorbike Frog <i>Litoria moorei</i>		WM
Number of frog species expected:	7	

Table 2. Reptiles expected to occur in the study area. Conservation Significance (CS) as defined in Methods is indicated in the status column. WM indicates species recorded in the WA Museum database and Nat indicates species recorded by the Naturalists' Club (1988) (see Methods).

Species	Status	Recorded
Gekkonidae (geckoes)		
Marbled Gecko <i>Christinus marmoratus</i>		WM, Nat
Southern Spiny-tailed Gecko <i>Strophurus spinigerus</i>		WM, Nat
Barking Gecko <i>Underwoodisaurus milii</i>		
Pygopodidae (legless-lizards)		
Sand-Plain Worm-Lizard <i>Aprasia repens</i>		WM
Fraser's Legless Lizard <i>Delma fraseri</i>		WM
Gray's Legless Lizard <i>Delma grayii</i>		WM
Burton's Legless Lizard <i>Lialis burtonis</i>		WM, Nat
Common Scaleyfoot <i>Pygopus lepidopodus</i>		WM
Agamidae (dragon lizards)		
Western Bearded Dragon <i>Pogona minor</i>		WM
Varanidae (monitors or goannas)		
Gould's Sand Goanna <i>Varanus gouldii</i>		WM
Rosenberg's Goanna <i>Varanus rosenbergi</i>	CS3	
Tree Goanna <i>Varanus tristis</i>	CS3	

Table 2 (cont.).

Species	Status	Recorded
Scincidae (skink lizards)		
South-West Cool Skink <i>Acritoscincus trilineatum</i>		WM, Nat
Fence Skink <i>Cryptoblepharus plagiocephalus</i>		WM, Nat
Western Limestone Ctenotus <i>Ctenotus australis</i>		
West Coast Ctenotus <i>Ctenotus fallens</i>		WM
Jewelled Ctenotus <i>Ctenotus gemmula</i>		WM
Odd-striped Ctenotus <i>Ctenotus impar</i>		
King's Skink <i>Egernia kingii</i>		WM, Nat
Glossy Swamp Egernia <i>Egernia luctuosa</i>	CS3	
Salmon-bellied Skink <i>Egernia napoleonis</i>		
Two-toed Earless Skink <i>Hemiergis quadrilineata</i>		WM, Nat
West Coast Four-toed Lerista <i>Lerista elegans</i>		WM
Bold-striped Lerista <i>Lerista lineata</i>	CS2	WM, Nat
Worm Lerista <i>Lerista praepedita</i>	CS3	WM, Nat
Dwarf Skink <i>Menetia greyii</i>		WM
West Coast Morethia <i>Morethia lineoocellata</i>		WM, Nat
Dusky Morethia <i>Morethia obscura</i>		WM, Nat
Western Blue-tongue <i>Tiliqua occipitalis</i>	CS3	
Bobtail <i>Tiliqua rugosa</i>		WM, Nat
Typhlopidae (blind-snakes)		
Southern Blind Snake <i>Ramphotyphlops australis</i>		WM
Boidae (pythons)		
South-west Carpet Python <i>Morelia spilota imbricata</i>	CS1	WM, Nat
Elapidae (front-fanged snakes)		
Narrow-banded Shovel-nosed Snake <i>Brachyuropsis fasciolata</i>		WM
Southern Shovel-nosed Snake <i>Brachyuropsis semifasciata</i>	CS3	WM, Nat
Crowned Snake <i>Elapognathus coronatus</i>		WM
Black-naped Snake <i>Neelaps bimaculatus</i>		
Black-striped Snake <i>Neelaps calonotos</i>	CS2	WM
Western Tiger Snake <i>Notechis scutatus</i>		WM, Nat
Gould's Snake <i>Parasuta gouldii</i>		WM
Dugite <i>Pseudonaja affinis</i>		WM, Nat
Jan's Bandy-Bandy <i>Simoselaps bertholdi</i>		WM
Chelidae (side-neck tortoises)		
South-West Long-necked Tortoise <i>Chelodina oblonga</i>		WM
Number of reptiles expected:	42	

Table 3. Birds expected to occur in the study area. Conservation Significance (CS) as defined in Methods is indicated in the status column. Sources of information are: WM - WA Museum database; Nat - Naturalists' Club (1988); BA - Birds Australia database; CLM - (CALM's threatened fauna database); and EC - EPBC database (see Methods).

Species	Status	Source
Phasianidae (pheasants and quails)		
Stubble Quail <i>Coturnix pectoralis</i>		BA
Anatidae (ducks, geese and swans)		
Australian Shelduck <i>Tadorna tadornoides</i>		BA, Nat
Pacific Black Duck <i>Anas superciliosus</i>		BA, Nat
Grey Teal <i>Anas gibberifrons</i>		BA
Australian Wood Duck <i>Chenonetta jubata</i>		BA
Spheniscidae (penguins)		
Little Penguin <i>Eudyptula minor</i>		Nat, WM
Anhingidae (darters)		
Darter <i>Anhinga melanogaster</i>		BA, Nat, WM
Phalacrocoracidae (cormorants)		
Great Cormorant <i>Phalacrocorax carbo</i>		BA, Nat, WM
Pied Cormorant <i>Phalacrocorax varius</i>		BA, Nat, WM
Little Black Cormorant <i>Phalacrocorax sulcirostris</i>		BA, Nat
Little Pied Cormorant <i>Phalacrocorax melanoleucos</i>		BA, Nat, WM
Pelecanoididae (pelicans)		
Australian Pelican <i>Pelecanus conspicillatus</i>		BA, Nat, WM
Ardeidae (herons and egrets)		
White-faced Heron <i>Egretta novaehollandiae</i>		BA, Nat
Eastern Reef Egret <i>Egretta sacra</i>	CS1 (mig)	Nat
Great Egret <i>Egretta alba</i>	CS1 (mig)	BA
Nankeen Night Heron <i>Nycticorax caledonicus</i>		BA, WM
Plataleidae (ibis and spoonbills)		
Australian White Ibis <i>Threskiornis molucca</i>		BA
Straw-necked Ibis <i>Threskiornis spinicollis</i>		BA
Yellow-billed Spoonbill <i>Platalea flavipes</i>		BA, WAM
Accipitridae (kites, hawks and eagles)		
Osprey <i>Pandion haliaetus</i>	CS1 (mig)	BA, Nat, EC
Black-shouldered Kite <i>Elanus notatus</i>		BA, Nat
Square-tailed Kite <i>Lophoictinia (Hamirostra) isura</i>	CS3	WM
Whistling Kite <i>Haliastur sphenurus</i>	CS3	BA, WM
White-bellied Sea-Eagle <i>Haliaeetus leucogaster</i>	CS1 (mig)	BA, Nat, WM, EC
Swamp Harrier (Marsh Harrier) <i>Circus approximans</i>		BA, Nat
Spotted Harrier <i>Circus assimilis</i>		BA
Brown Goshawk <i>Accipiter fasciatus</i>	CS3	BA, Nat, WM
Collared Sparrowhawk <i>Accipiter cirrhocephalus</i>	CS3	BA, Nat, WM

Table 3 (cont.)

Species	Status	Source
Wedge-tailed Eagle <i>Aquila audax</i>	CS3	BA, Nat
Little Eagle <i>Hieraaetus morphnoides</i>	CS3	BA, Nat
Falconidae (falcons)		
Brown Falcon <i>Falco berigora</i>	CS3	BA
Peregrine Falcon <i>Falco peregrinus</i>	CS1	BA, Nat, WM
Australian Hobby <i>Falco longipennis</i>		BA
Nankeen Kestrel <i>Falco cenchroides</i>		BA, Nat
Rallidae (crakes and rails)		
Buff-banded Rail <i>Rallus (Gallirallus) philippensis</i>		BA, Nat, WM
Turnicidae (button-quails)		
Painted Button-quail <i>Turnix varia</i>	CS3	BA, Nat, WM
Scolopacidae (sandpipers)		
Bar-tailed Godwit <i>Limosa lapponica</i>	CS1 (mig)	BA, Nat, EC
Whimbrel <i>Numenius phaeopus</i>	CS1 (mig)	BA, Nat, EC
Eastern Curlew <i>Numenius madagascariensis</i>	CS1 (mig)	BA, Nat, CLM, EC
Common Greenshank <i>Tringa nebularia</i>	CS1 (mig)	BA, Nat, WM, EC
Common Sandpiper <i>Tringa hypoleucos</i>	CS1 (mig)	BA, Nat, EC
Grey-tailed Tattler <i>Tringa brevipes</i>	CS1 (mig)	BA, Nat, EC
Ruddy Turnstone <i>Arenaria interpres</i>	CS1 (mig)	BA, Nat, EC
Sanderling <i>Calidris alba</i>	CS1 (mig)	BA, Nat, EC
Red-necked Stint <i>Calidris ruficollis</i>	CS1 (mig)	BA, Nat, WM, EC
Sharp-tailed Sandpiper <i>Calidris acuminata</i>	CS1 (mig)	BA, Nat, EC
Curlew Sandpiper <i>Calidris ferruginea</i>	CS1 (mig)	BA, Nat, WM, EC
Haematopodidae (oystercatchers)		
Pied Oystercatcher <i>Haematopus longirostris</i>		BA, Nat
Sooty Oystercatcher <i>Haematopus fuliginosus</i>		BA, Nat
Charadriidae (plovers and lapwings)		
Grey Plover <i>Pluvialis squatarola</i>	CS1 (mig)	BA, Nat, EC
Red-capped Plover <i>Charadrius ruficapillus</i>		BA, Nat, WM
Greater Sand Plover <i>Charadrius leschenaultii</i>	CS1 (mig)	BA, Nat, WM, EC
Hooded Plover <i>Thinornis (Charadrius) rubricollis</i>	CS2	BA, WM, CLM
Banded Lapwing <i>Vanellus tricolor</i>		BA, Nat
Laridae (gulls and terns)		
Pacific Gull <i>Larus pacificus</i>		Nat
Silver Gull <i>Larus novaehollandiae</i>		BA, Nat, WM
Gull-billed Tern <i>Gelochelidon nilotica</i>		Nat
Caspian Tern <i>Hydroprogne (Sterna) caspia</i>		BA, Nat, WM

Table 3 (cont.)

Species	Status	Source
Crested Tern <i>Sterna bergii</i>		BA, Nat, WM
Roseate Tern <i>Sterna dougallii</i>		BA, Nat, WM
Fairy Tern <i>Sterna nereis</i>		BA, Nat, WM
Bridled Tern <i>Sterna anaethetus</i>		BA, Nat, WM
Sooty Tern <i>Sterna fuscata</i>		WM
Common Noddy <i>Anous stolidus</i>		
Columbidae (pigeons and doves)		
Rock Dove (feral pigeon) <i>Columba livia</i>	Int.	BA, Nat
Spotted Turtle-Dove <i>Streptopelia chinensis</i>	Int	BA, Nat
Laughing Turtle-Dove <i>Streptopelia senegalensis</i>	Int	BA, Nat
Crested Pigeon <i>Ocyphaps lophotes</i>		BA
Cacatuidae (cockatoos)		
Carnaby's (Short-billed) Black-Cockatoo <i>Calyptorhynchus latirostris</i>	CS1	BA, Nat, WM, CLM, EC
Long-billed Corella <i>Cacatua tenuirostris</i>	Int	BA
Little Corella <i>Cacatua sanguinea</i>	Int	BA
Galah <i>Cacatua roseicapilla</i>		BA, Nat
Psittacidae (lorikeets and parrots)		
Rainbow Lorikeet <i>Trichoglossus haematodus</i>	Int	BA
Purple-crowned Lorikeet <i>Glossopsitta porphyrocephala</i>		Nat
Red-capped Parrot <i>Purpureicephalus spurius</i>		BA, Nat, WM
Australian Ringneck <i>Barnardius zonarius</i>		BA, Nat, WM
Elegant Parrot <i>Neophema elegans</i>		BA
Rock Parrot <i>Neophema petrophila</i>		Nat
Cuculidae (cuckoos)		
Pallid Cuckoo <i>Cuculus pallidus</i>		BA, Nat
Fan-tailed Cuckoo <i>Cuculus pyrrhophanus</i>		BA, Nat
Horsfield's Bronze-Cuckoo <i>Chrysococcyx basalus</i>		BA, Nat, WM
Shining Bronze-Cuckoo <i>Chrysococcyx lucidus</i>		BA, Nat, WM
Strigidae (hawk-owls)		
Southern Boobook Owl <i>Ninox novaeseelandiae</i>		BA, Nat
Tytonidae (barn owls)		
Barn Owl <i>Tyto alba</i>		BA, WM
Podargidae (frogmouths)		
Tawny Frogmouth <i>Podargus strigoides</i>		BA, WM
Apodidae (swifts)		
Fork-tailed Swift <i>Apus pacificus</i>	CS1 (mig)	BA, WM
Halcyonidae (forest kingfishers)		
Laughing Kookaburra <i>Dacelo novaeguineae</i>	Int	BA, Nat, WM
Sacred Kingfisher <i>Todiramphus sanctus</i>		BA, Nat, WM
Meropidae (bee-eaters)		
Rainbow Bee-eater <i>Merops ornatus</i>	CS1 (mig)	BA, Nat

Table 3 (cont.)

Species	Status	Source
Maluridae (fairy-wrens)		
Splendid Fairy-wren <i>Malurus splendens</i>	CS3	BA, Nat
Pardalotidae (pardalotes)		
Striated Pardalote <i>Pardalotus striatus</i>		BA, WM
White-browed Scrubwren <i>Sericornis frontalis</i>	CS3	BA, Nat
Weebill <i>Smicrornis brevirostris</i>		BA, WM
Western Gerygone <i>Gerygone fusca</i>		BA, Nat, WM
Inland Thornbill <i>Acanthiza apicalis</i>	CS3	BA, Nat, WM
Western Thornbill <i>Acanthiza inornata</i>	CS3	BA, WM
Yellow-rumped Thornbill <i>Acanthiza chrysorrhoa</i>	CS3	BA, Nat, WM
Meliphagidae (honeyeaters)		
Red Wattlebird <i>Anthochaera carunculata</i>		BA, WM
Singing Honeyeater <i>Lichenostomus virescens</i>		BA, Nat, WM
Brown Honeyeater <i>Lichmera indistincta</i>		BA, Nat, WM
New Holland Honeyeater <i>Phylidonyris novaehollandiae</i>	CS3	BA, WM
White-cheeked Honeyeater <i>Phylidonyris nigra</i>	CS3	BA
White-fronted Chat <i>Epthianura albifrons</i>		BA, Nat
Pachycephalidae (whistlers)		
Rufous Whistler <i>Pachycephala rufiventris</i>		BA, Nat, WM
Grey Shrike-thrush <i>Colluricincla harmonica</i>	CS3	BA, Nat, WM
Dicruridae (flycatchers)		
Magpie-lark <i>Grallina cyanoleuca</i>		BA, Nat
Grey Fantail <i>Rhipidura fuliginosa</i>		BA, Nat, WM
Willie Wagtail <i>Rhipidura leucophrys</i>		BA, Nat, WM
Campephagidae (cuckoo-shrikes)		
Black-faced Cuckoo-shrike <i>Coracina novaehollandiae</i>		BA, Nat
White-winged Triller <i>Lalage sueurii</i>		BA, Nat, WM
Artamidae (woodswallows)		
Dusky Woodswallow <i>Artamus cyanopterus</i>	CS3	BA, Nat
Black-faced Woodswallow <i>Artamus cinereus</i>	CS3	BA
Grey Butcherbird <i>Cracticus torquatus</i>		BA, Nat, WM
Australian Magpie <i>Gymnorhina (Cracticus) tibicen</i>		BA, Nat, WM
Corvidae (ravens and crows)		
Australian Raven <i>Corvus coronoides</i>		BA, Nat, WM
Motacillidae (pipits and true wagtails)		
Richard's Pipit <i>Anthus novaeseelandiae (australis)</i>		BA, Nat, WM
Dicaeidae (flower-peckers)		
Mistletoebird <i>Dicaeum hirundinaceum</i>		BA

Table 3 (cont.)

Species	Status	Source
Hirundinidae (swallows)		
White-backed Swallow <i>Cheramoeca leucosternus</i>		BA, WM
Welcome Swallow <i>Hirundo neoxena</i>		BA, Nat, WM
Tree Martin <i>Hirundo nigricans</i>		BA, Nat
Zosteropidae (white-eyes)		
Silvereye <i>Zosterops lateralis</i>		BA, Nat, WM
Number of species: 121		

Table 4. Mammals expected to occur in the study area. Conservation Significance (CS) as defined in Methods is indicated in the status column. Sources of information are: WM - WA Museum database; CLM – CALM’s threatened fauna database; and Nat - Naturalists’ Club (1988).

Species	Status	Source
Peramelidae (bandicoots)		
Quenda or Southern Brown Bandicoot <i>Isoodon obesulus</i>	CS2	WM, CLM
Phalangeridae (possums)		
Brush-tailed Possum <i>Trichosurus vulpecula</i>		
Mollosidae (mastiff bats)		
White-striped Bat <i>Tadarida australis</i>		
Western Freetail Bat <i>Mormopterus planiceps</i>		
Vespertilionidae (vesper bats)		
Gould’s Wattled Bat <i>Chalinolobus gouldii</i>		WAM
Chocolate Wattled Bat <i>Chalinolobus morio</i>		
Western False Pipistrelle <i>Falsistrellus mackenzei</i>	CS2	
Southern Forest Bat <i>Vespadelus (Eptesicus) regulus</i>		
Lesser Long-eared Bat <i>Nyctophilus geoffroyi</i>		
Greater Long-eared Bat <i>Nyctophilus timoriensis</i>		
Muridae (rats and mice)		
Rakali or Water-Rat <i>Hydromys chrysogaster</i>	CS2	
House Mouse <i>Mus musculus</i>	Int.	WM, Nat
Brown Rat <i>Rattus norvegicus</i>	Int.	
Black Rat <i>Rattus rattus</i>	Int.	
Leporidae (rabbits and hares)		
Rabbit <i>Oryctolagus cuniculus</i>	Int.	
Canidae (foxes and dogs)		
European Red Fox <i>Vulpes vulpes</i>	Int.	
Felidae (cats)		
Feral Cat <i>Felis catus</i>	Int.	WM
Number of mammals:	17	

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Appendix 1.

Categories used in the assessment of conservation status.

IUCN categories (based on review by Mace and Stuart 1994) as used for the Environmental Protection and Biodiversity Conservation (EPBC) Act and the WA Wildlife Conservation Act.

Extinct. Taxa not definitely located in the wild during the past 50 years.

Extinct in the Wild. Taxa known to survive only in captivity.

Critically Endangered. Taxa facing an extremely high risk of extinction in the wild in the immediate future.

Endangered. Taxa facing a very high risk of extinction in the wild in the near future.

Vulnerable. Taxa facing a high risk of extinction in the wild in the medium-term future.

Near Threatened. Taxa that risk becoming Vulnerable in the wild.

Conservation Dependent. Taxa whose survival depends upon ongoing conservation measures. Without these measures, a conservation dependent taxon would be classed as Vulnerable or more severely threatened.

Data Deficient (Insufficiently Known). Taxa suspected of being Rare, Vulnerable or Endangered, but whose true status cannot be determined without more information.

Least Concern. Taxa that are not Threatened.

Schedules used in the WA Wildlife Conservation Act.

Schedule 1. Rare and Likely to become Extinct.

Schedule 2. Extinct.

Schedule 3. Migratory species listed under international treaties.

Schedule 4. Other Specially Protected Fauna.

WA Department of Conservation and Land Management Priority species (species not listed under the Conservation Act, but for which there is some concern).

Priority 1. Taxa with few, poorly known populations on threatened lands.

Priority 2. Taxa with few, poorly known populations on conservation lands; or taxa with several, poorly known populations not on conservation lands.

Priority 3. Taxa with several, poorly known populations, some on conservation lands.

Priority 4. Taxa in need of monitoring. Taxa which are considered to have been adequately surveyed, or for which sufficient knowledge is available, and which are considered not currently threatened or in need of special protection, but could be if present circumstances change.

Priority 5. Taxa in need of monitoring. Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years (IUCN Conservation Dependent).