JANDAKOT AIRPORT

FAUNA SURVEY

Prepared for

Jandakot Airport Holdings Pty Ltd

Common Scaly-foot (*Pygopus lepidopodus)*

JOB NO. 08.240

REPORT NO. RP001

env Australia

JANDAKOT AIRPORT FAUNA SURVEY

Prepared for

JANDAKOT AIRPORT HOLDINGS PTY LTD

Prepared by

ENV.Australia Pty Ltd
Level 7, 182 St Georges Terrace
PERTH WA 6000
Phone: (08) 9289 8360
Fax: (08) 9322 4251
Email: env@env.net.au

Prepared by:	*Michael Brown, Matthew Love and Mick Welsh*
Status:	*Final*
QA Review:	*Dr Mike Brewis*
Technical Review:	*Mitch Ladyman / Teresa Gepp*
Content Review:	*Sian Edwards*
Date:	*18 February 2009*

TABLE OF CONTENTS

FIGURES

TABLES (INCLUDED IN TEXT)

APPENDICES

STATEMENT OF LIMITATIONS

Scope of Services

This environmental site assessment report ('the report') has been prepared in accordance with the scope of services set out in the contract or as otherwise agreed between the Client and ENV.Australia Pty Ltd (ENV) (the 'scope of services'). In some circumstances the scope of services may have been limited by factors such as time, budget, access and/or site disturbance constraints.

Reliance on Data

In preparing the report, ENV has relied on data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations ('the data'), most of which are referred to in the report. Except as otherwise stated in the report, ENV has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report ('conclusions') are based in whole or in part on the data, those conclusions are dependent on the accuracy and completeness of the data. ENV will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, unavailable, withheld, unavailable, misrepresented or otherwise not fully disclosed to ENV.

Environmental Conclusions

In accordance with the scope of services, ENV has relied on the data and has conducted environmental field monitoring and/or testing in the preparation of the report. The nature and extent of monitoring and/or testing conducted is described in the report.

Within the limitations imposed by the scope of services, the monitoring, testing, sampling and preparation of this report have been undertaken and performed in a professional manner, in accordance with generally accepted practices and using a degree of skill and care ordinarily exercised by reputable environmental consultants under similar circumstances. No other warranty, express or implied, is made.

Report for Benefit of Client

The report has been prepared for the benefit of the Client and for no other party. ENV assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including, without limitation, matters arising from any negligent act or omission of ENV or for any loss or damage suffered by any other party relying on the matters dealt with or conclusions expressed in the report). Other parties should not rely on the report or the accuracy or completeness of any conclusions, and should make their own enquiries and obtain independent advice in relation to such matters.

Other Limitations

ENV will not be liable to update or revise the report to take into account any events occurring, or circumstances or facts becoming apparent, after the date of the report.

EXECUTIVE SUMMARY

A fauna assessment was carried out at Jandakot Airport from 1-6 September 2008. The assessment consisted of a desktop review, a field trapping program and other field surveys and a habitat assessment specifically relating to White-tailed Black Cockatoos. Seventy-three fauna species were recorded in the survey, consisting of four amphibian species, 11 reptile species, 46 bird species, and 12 mammal species.

The proposed development will result in the loss of approximately 167 ha of native vegetation, most of which is *Banksia* woodland. Several conservation-significant fauna species may be affected by the development, most likely the Western Brush Wallaby (*Macropus irma*), the Quenda (*Isoodon obesulus fusciventer*), Carnaby's Cockatoo, several species of reptiles, and the cricket (*Throscodectes xiphos*).

Carnaby's Cockatoo (*Calyptorhynchus latirostris*) is listed as Endangered under the Environment Protection and Biodiversity Conservation Act 1999 and as Schedule 1 under the Wildlife Conservation Act 1950. The site provides foraging habitat for Carnaby's Cockatoo and in a few places within Jandakot Airport there are patches of mature *Eucalyptus* trees where the species can roost. There is no potential nesting habitat on the site for Carnaby's Cockatoo. Therefore, Carnaby's Cockatoo may roost and forage, but do not nest, in the survey area. The significance of the loss of habitat is briefly discussed in this document, however, in this report it is not discussed in the context of regional habitat available.

1 INTRODUCTION

1.1 THE PROJECT

1.1.1 Objectives

ENV.Australia Pty Ltd ('ENV') was commissioned in June 2008 by Jandakot Airport Holdings Pty Ltd ('Jandakot Airport') to undertake a fauna assessment of Jandakot Airport in Perth, Western Australia.

The fauna assessment aimed to identify fauna habitats and fauna of conservation significance in selected areas of Jandakot Airport ('the project area'). This fauna assessment comprises the findings of a Level Two fauna survey, in accordance with *Guidance Statement No. 56* of the Western Australian Environmental Protection Authority ('EPA') (EPA 2004).

The objectives of the fauna assessment were to:

- document the general habitat types of the project area as they relate to faunal assemblages;
- compile (from database searches) a list of terrestrial vertebrate fauna likely to occur in the project area;
- identify (from database searches) terrestrial vertebrate fauna of conservation significance that may occur in the project area;
- undertake a trapping program to record terrestrial vertebrate fauna in the project area;
- report on the likely occurrence of terrestrial vertebrate fauna, including that of conservation significance, in the project area, based on habitats present and their condition;
- document any opportunistic records of fauna observed in the project area;
- conduct a White-tailed Black Cockatoo assessment in the project area, and;
- assess the likely impacts of the proposed development on conservation-significant fauna species.

1.1.2 Location

Jandakot Airport is approximately 16 km south of the central business district of Perth, Western Australia (Figure 1). The area is mostly fenced, and surrounds the runways at Jandakot Airport.

1.1.3 Previous Biological Studies

As a result of recent development in the areas surrounding Jandakot Airport, several surveys have been undertaken in the vicinity of the current project area. The most recent of these are:

- *Fiona Stanley Hospital Fauna Assessment* (GHD 2006);
- *Roe Highway Stage 7 Extension Review of Fauna Investigations* (Bamford 2003b);
- *Champion Lakes Master Plan; Fauna* (Bamford 2003a);
- *Fauna Survey of Jandakot Airport* (Bamford 2002); and
- *Vertebrate Fauna of Ken Hurst Park* (Dell & Cooper 1992).

1.2 PHYSICAL ENVIRONMENT

1.2.1 Climate

The project area is at Jandakot Airport, which has its own weather station, with more than 18 years of data recorded.

The Swan Coastal Plain Subregion has a Mediterranean climate. The area experiences a wide range of temperatures throughout the year, with an average maximum temperature of 24.2°C. In summer, maximum temperatures may reach 40°C, whilst in winter, minimum temperatures may reach <5°C (Bureau of Meteorology ('BoM') 2008).

Rainfall tends to fall in winter, with a maximum monthly mean rainfall of 180 mm in July. The annual average rainfall at Jandakot Airport is 842 mm (Figure 2).

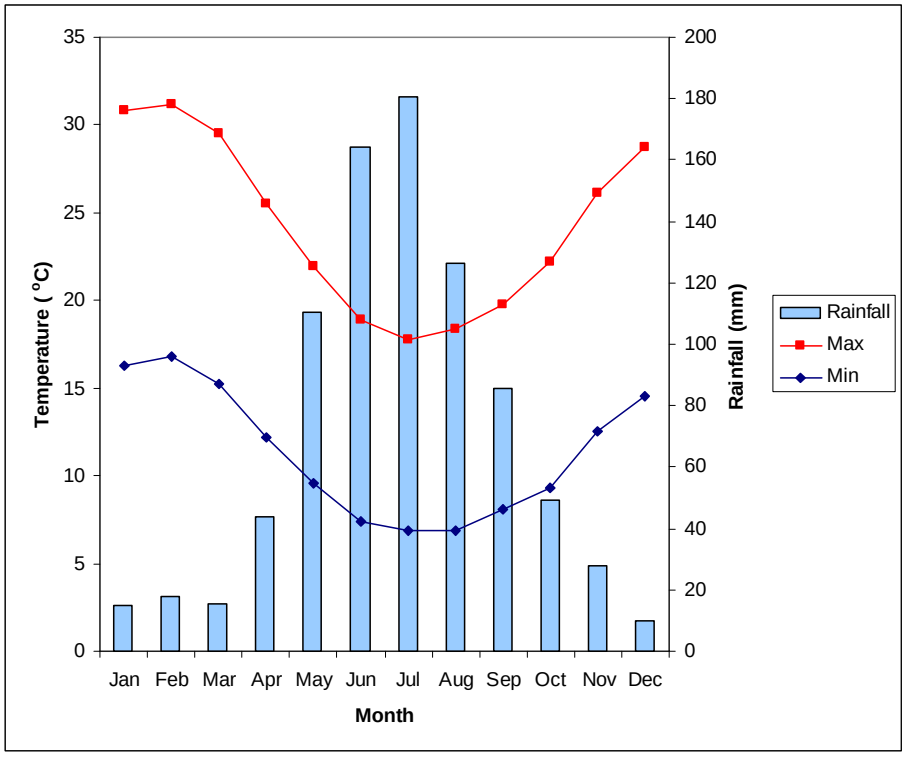


Figure 2: Average monthly rainfall and maximum and minimum temperatures for Jandakot Airport (BoM 2008)

1.2.2 Biogeography

The site is in the Swan Coastal Plain Bioregion (Thackway & Cresswell 1995). In terms of flora and vegetation characteristics, the site is in the Darling Botanical District and in the Swan Coastal Plain Subregion in the Drummond Botanical Subdistrict (Beard 1990). The Drummond Botanical Subdistrict consists mainly of the following vegetation communities:

- *Banksia* Low Woodland on leached sands and *Melaleuca* Swamps in poorly-drained areas;
- Woodland of Tuart (*Eucalyptus gomphocephala*); and
- Jarrah (*Eucalyptus marginata*) and Marri (*Corymbia calophylla*) on the less leached soils (Beard 1990).

2 METHODOLOGY

2.1 BACKGROUND TO SURVEY METHODOLOGY

2.1.1 State and Federal Legislation

All fauna surveys undertaken by ENV are designed to be compliant with Environmental Protection Authority (EPA) requirements for the environmental surveying and reporting of fauna surveys in Western Australia, as set out in the following documents:

- *Terrestrial Biological Surveys as an Element of Biodiversity Protection. Position Statement No. 3* (EPA 2002); and
- *Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia. Guidance Statement No. 56* (EPA 2004).

ENV then assesses and reports the results of its surveys with particular regard to the provisions of the following Commonwealth and State legislation:

- the Environment Protection and Biodiversity Conservation Act 1999 (Cth) ('EPBC Act');
- the Wildlife Conservation Act 1950 (WA) ('WC Act'); and
- the Environmental Protection Act 1986 (WA).

2.1.2 EPA Guidance Statement No. 56

A baseline field fauna survey for an Environmental Impact Assessment should provide a comprehensive list of species in a given area. There are two formal levels of fauna survey, as delineated by the EPA:

- ***Level One:*** a 'desktop' study to collate historical knowledge, in conjunction with a reconnaissance survey (site inspection); and
- ***Level Two:*** a trapping and opportunistic field survey to characterise the fauna present, combined with a Level One survey.

Where the scale and nature of the proposed impact is moderate to high, a Level Two survey will be required in most areas of the state. The expectations of the EPA are delineated in *Guidance Statement No. 56* (EPA 2004). Specifically, it details the extent, design and intensity of field surveys for environmental assessments.

2.1.3 Fauna of Conservation Significance

Species are protected formally and informally by various legislative and non-legislative measures, which are as follows:-

Legislative Protection

- *Environment Protection and Biodiversity Conservation Act 1999* (Cth): a federal Act;
- *Wildlife Conservation Act 1950* (WA): a State Act; and
- *Environmental Protection Act 1986* (WA): a State Act.

Non-Legislative Protection

- Western Australian Department of Environment and Conservation ('DEC') Priority lists; and
- informal recognition of locally significant populations

A short description of these Acts is given below, and definitions of the species conservation codes and ecological community categories they use, and those used by the DEC, are provided in Appendix A.

***Environment Protection and Biodiversity Conservation Act 1999* (Cth)**

The *Environment Protection and Biodiversity Conservation Act 1999* (Cth) ('the *EPBC Act'*) aims to protect matters of national environmental significance, which are detailed in Appendix A.

Under the *EPBC Act*, the Commonwealth Department of Environment, Water, Heritage and the Arts ('DEWHA') lists threatened species and Threatened Ecological Communities in certain categories determined by criteria set out in the Act (*www.environment.gov.au/epbc/index.html*).

The Act provides for substantial penalties for any unauthorised actions likely to adversely affect matters of national environmental significance. It also provides for a national environmental assessment and approvals process for proposed actions likely to affect the prescribed matters of national environmental significance. If a proposed action is approved subject to certain conditions, the proponent of the action does not contravene the Act if the action is carried out in accordance with the conditions imposed.

Projects likely to cause significant impacts on matters of national environmental significance (as defined in the *EPBC Act* – see Appendix A) should be referred to the DEWHA for assessment under the *EPBC Act*. Although the time taken for

a proposal to be assessed may be considerable if, for example, a public enquiry is considered necessary, there is considerable risk in not referring a project likely to affect matters of national environmental significance, as the Act provides for substantial penalties for unauthorised actions.

In addition, a referral to the DEWHA will not necessarily result in the formal assessment process being triggered, as the Minister has the discretion to determine that a project may proceed without further assessment.

Wildlife Conservation Act 1950 (WA*)*

The Western Australian Department of Environment and Conservation ('DEC'), (previously CALM) lists taxa under the provisions of the *Wildlife Conservation Act 1950* (WA*)* ('*WC Act*') as protected and are classified as Schedule 1-Schedule 4 according to their need for protection (see Appendix A).

The Act makes it an offence to 'take' threatened species without an appropriate license. There are financial penalties for contravening the Act.

DEC Priority Lists

The DEC produces a list of Priority species that have not been assigned statutory protection under the *WC Act*. Priority Fauna are under consideration as 'Scheduled' fauna, but are in urgent need for further survey or require regular monitoring, and although not currently threatened may become so in the future. See Appendix A for definitions of Priority codes.

In addition, the DEC maintains a list of Priority Ecological Communities which identifies those communities that need further investigation before possible nomination for Threatened Ecological Community ('TEC') status (see below).

Although DEC Priority species and communities have no formal legal protection, they are under consideration as 'Scheduled' taxa under the *WC Act*. Sensitivities to harm to Priority species can therefore be expected to be heightened, and the adverse effects of harming Priority species may include negative publicity (with the prospect of damage to the proponent's public image and possible adverse consequences for future projects) and local opposition to proposals.

Informal Recognition of Threatened Fauna

Certain populations or communities may be of local significance or interest because of their patterns of distribution and abundance. For example, fauna may be locally significant because they are range extensions to the previously-known distribution or are newly-discovered taxa (and therefore have the potential to be of more than local significance). In addition, many species are in decline as a

result of threatening processes (primarily land clearing), and relict populations of such species assume local importance.

An initiative by the State Government of Western Australia was to release an urban bushland strategy to protect the City of Perth's remnant 'bush' vegetation. The guideline was released in 2000, and was *Bush Forever*. Under *Bush Forever,* sites were surveyed across the City of Perth, including two sites relevant to the current project area, Ken Hurst Park and Jandakot Airport. Within these two sites certain fauna species were identified as being locally significant.

Despite the lack of any formal protection for species in this category, project proponents are strongly advised to be aware of and to be sensitive to community concerns as to locally significant species or communities.

2.1.4 General Advice

ENV recommends that proponents of proposals with the potential to affect flora or fauna in any of the above categories, or threatened ecological communities, should discuss the proposal with the appropriate regulatory authority at an early stage to identify mitigation measures and the requirements for submission of any appropriate application, including any conservation offset measures.

2.2 SURVEY METHODOLOGY

2.2.1 Desktop Review

The purpose of a desktop review is to gather background information on the project area and the fauna it may support. This involves a search of literature, data, aerial photographs and maps for information relating to habitats likely to be found in the project area.

A search of the Western Australian Museum's ('WAM') FaunaBase (WAM 2008) was undertaken to generate a list of fauna species recorded in the area. In addition, a literature review was conducted, together with a review of records of fauna species for the project area. Information on threatened species was obtained from the Threatened Fauna Database (maintained by the DEC). These sources were used to compile a list of species that have been recorded from the project area. Habitat knowledge gained from the above initial research, and that gained during the field habitat assessment, was used to refine this list of species to those now expected to occur at the site.

2.2.2 Field Survey

The purpose of the field survey was to verify the accuracy of the desktop survey and to further delineate and characterise the fauna and faunal assemblages in

the project area. The fauna field survey was undertaken from 1-6 September 2008, and consisted of:

- a fauna habitat assessment;
- a trapping program;
- opportunistic searches;
- nocturnal searching; and
- bat recordings.

Habitat Assessment

The information collated during the field survey on landforms and vegetation was used to characterise the habitats at the site. This habitat information was used to determine which of the fauna potentially occurring at the site were likely to occur, after consideration of their habitat requirements.

Habitats in the site were assessed in terms of their faunal attributes, i.e. their vegetation structure, microhabitats present and the potential to support fauna of conservation significance. From these attributes, the fauna habitats were then ranked according to the quality and diversity of refuge they provide for fauna, and the amount of each habitat present.

Trapping Program

Fauna habitats identified through the habitat assessment were subjected to a trapping program. Six sites were established during the survey. These sites were located in *Banksia* and *Melaleuca* woodlands. The location and habitat details of each site are detailed in Appendices B1-B2 and in Figure 3, with site photographs presented in Appendix C.

Six trapping sites were established, with each site consisting of 10 trap lines (Figure 3). The four sites in the *Banksia* woodland contain ten trap lines, each consisting of five-metre fences with one pit trap in the centre of the fence and a funnel trap at each end. Each trap line was positioned approximately 30 m apart, with one Elliott trap and one cage trap to each trapping line. The Elliott and cage traps target mammal species, and the funnel and pit traps target large reptile species and small fossorial species. Where suitable, the Elliott traps were attached to the trunk of trees or to small wooden mounts attached to trees (targeting small arboreal mammals). Two additional trap sites, consisting only of ten Elliott traps each, were established in open *Melaleuca* woodland. Details of the trap lines erected at each site are presented in Appendix B3.

The trapping program was conducted from 1-6 September 2008, with traps open for up to five nights. Each of the main trapping sites were subjected to an average of 50 trap-nights for pit, cage and Elliott traps, and 100 trap-nights for funnel and pot traps. The two additional sites were subject to 40 trap-nights for Elliott traps. Details of trap-nights are presented in Appendix B4.

Opportunistic Searches

Opportunistic searches for fauna in major habitats in the project area were undertaken. Searches included:

- investigating burrows;
- examining scats, tracks and other traces;
- turning rocks and fallen timber;
- opening standing timber crevices; and
- raking leaf litter.

Nocturnal searches and road cruising were also conducted to target nocturnal fauna, helping to provide an accurate picture of all fauna species in the project area. Details of the time and duration of the diurnal and nocturnal searches are presented in Appendices D1 and D2, and in Figure 4. Several fox scats were collected in the field. Identification of hairs and bones in the scats was conducted by Barbara Triggs.

Bat Recordings

Bat recordings were undertaken using AnaBat SD1 recording units, to document the presence of bat species in the area. AnaBat recording units convert ultrasonic echolocation signals produced by bats into audible electronic signals, which are later analysed for species-specific calls. The units were left overnight in the field and were set to record all bat calls.

Trees identified as potential roosting or maternal nesting sites were subjected to AnaBat recordings. AnaBat units were also set in areas likely to be used by bat species for foraging (e.g. along bush tracks). AnaBat recording locations and survey effort details are presented in Appendices E1 and E2, and in Figure 5.

2.2.3 Taxonomic Identification

Where field identification of the species was not possible, specimens were collected systematically for later identification by expert taxonomists from the Western Australian Museum Collections and Research Facility.

2.3 WHITE-TAILED BLACK COCKATOO METHODOLOGY

Two species of White-tailed Black Cockatoos occur in the south-west of Western Australia: Carnaby's (*Calyptorhynchus latirostris*) and Baudin's Cockatoo (*Calyptorhynchus baudinii*), both of which are protected by the federal *EPBC Act*.

Surveys for White-tailed Black Cockatoos, evidence of their presence, and assessment of their habitat were conducted for approximately 30-person hours from 1-3 September 2008.

Feeding

The primary food plants used for feeding by Black Cockatoos are *Banksia*, *Eucalyptus*, *Corymbia* and *Hakea* spp., plus the introduced *Pinus* spp. Although these are the major plant groups targeted, many other native and non-native plant taxa are used as food sources, for example, some *Acacia* spp. and many agricultural plants. The use of the food plants varies widely, from eating the flowers and seeds to peeling back the bark to find grubs and larvae (Shah 2006).

In this survey, evidence of Black Cockatoo feeding was determined by looking for feeding evidence (chewed plant matter, such as *Banksia* cones) and for foraging flocks of Black Cockatoos.

Roosting

Whether a location is being used as an overnight roost site can be determined by dusk/dawn roost surveys. Flocks or smaller groups of Black Cockatoos seek out relatively tall trees at sunset in which to spend the night. Around Perth, Pine trees and tall *Eucalyptus* trees appear to be favoured as roost locations. At dawn, the birds gather and take flight in a single group to forage (Shah 2006).

During this survey, several dawn and dusk surveys were conducted to detect Black Cockatoos entering or leaving a potential roosting area. These surveys were conducted by listening for Black Cockatoo calls at areas with potential roosting trees. These roosting surveys were conducted at the patches of potential roosting habitat marked on Figure 6.

Breeding

Both White-tailed Black Cockatoo species breed from July to November. Tree hollows are the main emphasis when assessing a site's potential for Cockatoo breeding activity. To predict the dimensions of tree hollows, the following criteria (as suggested by Gibbons & Lindenmayer 2002) were examined from the ground:

- minimum entrance width of a hollow;

- diameter of the branch on which the hollow occurred; and
- whether the branch was living, part-dead or dead.

To determine whether a tree hollow could potentially be used for breeding by White-tailed Black Cockatoos, hollow dimensions and other characteristics (as shown in Table 1) were recorded.

Table 1: Preferred Tree Hollow Characteristics for South-West White-tailed Black Cockatoo Species (Cale 2003; Chapman 2007).

White-tailed Black Cockatoo	Hollow Entrance Size	Hollow Depth	Height Above Ground	Preferred Tree Species
Carnaby's Cockatoo	>15 cm	25-250 cm	2->10 m	*Eucalyptus wandoo* (Wandoo), *E. salmonophloia* (Salmon Gum).
Baudin's Cockatoo	30-40 cm	>30 cm	8-14 m	*E. wandoo, E. diversicolor* (Karri), *E. marginata* (Jarrah), *Corymbia calophylla* (Marri)

3 RESULTS

3.1 FAUNA SURVEY CONSTRAINTS

It is important to note the specific constraints imposed on surveys. Constraints are often difficult to predict, as is the extent to which they influence survey outcomes. Survey constraints of the Jandakot Airport project area fauna survey are detailed in Table 2.

Table 2: Constraints associated with the Jandakot Airport Holdings Fauna Survey

Variable	Impact on Survey Outcomes
Experience levels/ Resources	The biologists who executed these surveys were practitioners suitably qualified in their respective fields: • Mr Michael Welsh – Senior Zoologist/Ornithologist • Mr Mike Brown – Zoologist • Mrs Breanne Menzies – Environmental Biologist • Mr Justin Freeman – Field Assistant
Scope: sampling methods/Intensity	The survey carried out was a Level Two survey, comprising a desktop survey and a site visit that included a habitat assessment, trapping program, bat recordings and opportunistic observations.
Proportion of fauna recorded/ Completeness	The field survey recorded 74 taxa, which is 24% of the potentially occurring fauna for the project area.
Sources of Information	Fauna surveys in the vicinity of Jandakot Airport include the Fiona Stanley Hospital Fauna Assessment (GHD 2006), the Roe Highway Stage 7 Extension (Bamford 2003b), Champion Lakes Fauna Assessment (Bamford 2003a), the previous Jandakot Airport Fauna Survey (Bamford 2002) and the Vertebrate Fauna of Ken Hurst Park (Dell & Cooper 1992).
Proportion of task completed	The field survey was completed adequately, with the trapping program and opportunistic searches carried out in full for five nights to a sufficient level. Of the 303 fauna species potentially occurring for the project area, 74 (24%) were recorded. comprising four amphibian, 11 reptile, 46 bird and 13 mammal species.
Timing, weather, season.	The survey was undertaken from 1-6 September 2008. The Jandakot Airport area had received 382.2 mm of rainfall in the three months preceding the survey (BoM 2008). Day temperatures were in the low 20s (°C), with night temperatures falling below 10°C (BoM 2008). These

Variable	Impact on Survey Outcomes
	weather conditions were not likely to limit the activity of any faunal group. There had been some localised light rainfall just before the survey.
Disturbances	No disturbances affected the outcome of the fauna survey.
Access problems	No access problems were encountered during the survey.

3.2 HABITAT ASSESSMENT

3.2.1 Fauna Habitat Types Present

There are two broad fauna habitats in the Jandakot Airport project area: *Banksia* Woodland and Paperbark (*Melaleuca*) Woodland.

Banksia Woodland

The *Banksia* woodland is considered a high-value fauna habitat. This habitat consists of open *Banksia* Woodland over a medium well-developed shrubland, with scattered grasses and herbs over a dense leaf litter layer. *Banksia* species provide a range of microhabitats for fauna to exploit, including exfoliating bark, deep cracks or fissures. Dead fall timber quickly rots or is broken down by termites, providing ideal fossorial habitat for skinks, small burrowing elapid snakes and blind snakes. This habitat type is well represented in the survey area, with most of the project area being made up of the *Banksia* woodland. Because of urban development, this habitat type is not as well represented outside the project area as it once was, a factor which emphasises the value of remaining areas as fauna habitat.

Paperbark (*Melaleuca*) *Woodland*

The Paperbark woodland is considered a medium-value fauna habitat, as it provides a smaller range of microhabitats, with little mid-storey or low-storey vegetation. Invasive weed species are present in these areas. However, this habitat is not well represented in the project area, as it is found only in a few low-lying areas. However, in these *Melaleuca* woodlands areas with thick ground-storey vegetation are important refuge habitat for the Quenda. These low-lying areas are often subjected to flooding in times of heavy rainfall, thereby providing habitats for frogs.

3.2.2 Regional Context of the Site

All the bushland within the airport (and part of this study area) is part of *Bush Forever* site 388. The site is described in *Bush Forever* (2000) as *Banksia* Low

Woodland with scattered *Eucalyptus marginata*, with more than 85% of vegetation in excellent to very good condition.

Immediately to the north of the site is Ken Hurst Park, which is also a *Bush Forever* site (site 245), which is described as *Banksia* low open forest and woodland with >90% in excellent to very good vegetation condition. The study site also makes up part of a regionally significant but not contiguous bushland linkage (*Bush Forever* 2000).

Jandakot Airport is listed on the Register of the National Estate for its 'Natural' values (Australian Heritage Database 2008). It is specifically described on the Register as being a significant remaining remnant of Banksia Woodland on the Swan Coastal Plain, and as having important feeding resources for Carnaby's Cockatoo, and being habitat for the Quenda and other ground-dwelling fauna.

3.3 RECORDED FAUNA

Seventy-three fauna species were recorded during the survey, consisting of four amphibian, 11 reptile, 46 bird and 12 mammal species (Appendix G).

3.3.1 Mammals

Twelve species of mammal were recorded during the current survey (Appendix K), including four species of bats recorded by AnaBat detectors (Appendix L).

Of the mammal species recorded during the survey, two are listed on the DEC Priority Fauna List and are considered locally significant, but none are protected by legislation.

DEC Priority List

Two mammal species recorded during the survey are listed on the DEC Priority Fauna List (Appendix G4):

- the Quenda (Southern Brown Bandicoot, *Isoodon obesulus fusciventer*); and
- the Western Brush Wallaby (*Macropus irma*).

The Quenda is classified as Priority 5 by the DEC, and is considered locally significant. This mammal typically seeks daytime refuge from predators in very thick ground-storey vegetation, usually associated with swamps or damplands (Strahan 1995). Major threats to the Quenda include habitat loss and fragmentation, and predation by feral fauna. Suitable habitat for this species occurs broadly throughout the project area.

Feeding evidence of the Quenda (conical holes in the soil) was found throughout the site, and several were caught in cage traps. They are likely to occur throughout the whole site. In particular, the Quenda is likely to shelter during the day in patches of denser groundcover, and forage at nearby open spaces at night.

The Western Brush Wallaby is listed as Priority 4 by the DEC, and is considered locally significant. The optimum habitat for this species is open forest or woodland, particularly open seasonally-wet flats with low grasses and open scrubby thickets (DEC 2008a). Suitable habitat for this species occurs broadly throughout the project area. Several individuals were observed during the survey foraging during the day in *Banksia* woodland.

Introduced

Of the 12 mammal species recorded, five are introduced species:

- House Mouse (*Mus musculus*);
- Black Rat (*Rattus rattus*);
- European Rabbit (*Oryctolagus cuniculus*);
- European Red Fox (*Vulpes vulpes*); and
- Cat (*Felis catus*).

These introduced mammal species are widespread across much of Australia, occurring in an extensive range of habitats (Strahan 1995). They are known to spread rapidly, occupying a varying of surroundings, preying on and competing with native species and destroying agricultural areas.

3.3.2 Birds

Forty-six species of bird were recorded during the survey (Appendix J). Of these, two are protected by legislation (i.e. the *EPBC Act* and/or the *WC Act*) and 12 are considered of local conservation significance. These species are discussed below.

EPBC Act

Carnaby's Cockatoo is listed as Endangered under the *EPBC Act* and as Schedule 1 (Endangered) under the *WC Act*. Carnaby's Cockatoo is endemic to south-west Western Australia, and is distributed from the Murchison River to Esperance and inland to Coorow, Kellerberrin and Lake Cronin (Cale 2003). It is uncommon to common in the subhumid zone and wetter parts of the semiarid zone, scarce and patchily distributed in the drier parts of its range (north of

Arrowsmith Lake and east of Marchagee, New Norcia, Toodyay, Tarin Rock and Lake Magenta) and scarce to moderately common in the deep south-west (Johnstone & Storr 1998). The species was once common, but the population has declined significantly in the last half century, and is now locally extinct in some areas (Shah 2006). In the last 45 years the species has suffered a 50% reduction in its abundance (Cale 2003).

This species is a postnuptial nomad, tending to move west with its young after breeding, often to non-breeding areas. In the non-breeding season (late spring to mid-winter), it congregates in large flocks of up to thousands of birds at major food sources (Johnstone & Storr 1998). In some areas these flocks forage within 50 km of their breeding areas, whilst in other areas the flocks move to the Swan Coastal Plain, where heath, *Banksia* woodland, Kwongan heaths and pine plantations are concentrated (Cale 2003). There are some exceptions to this westward and southward annual movement: some flocks remain in the Wheatbelt in autumn and winter (Johnstone & Johnstone 2008), and conversely, some flocks of Carnaby's (probably non-breeding birds) remain on the Swan Coastal Plain throughout the breeding period (spring-summer), (Ron Johnstone, pers. comm.).

Carnaby's Cockatoos feed on seeds, nuts and flowers of a variety of native proteaceous species (including *Banksia*, *Dryandra* and *Hakea)*, and *Grevillea*, *Allocasuarina, Eucalyptus* and *Corymbia calophylla* nuts, and seeds from the cones of *Pinus* spp. (Shah 2006). Pine (*Pinus* spp.) plantations in the coastal zone are now important feeding areas in the non-breeding season (Cale 2003).

Breeding has been recorded from early July to mid-December. Breeding occurs in the semi-arid and subhumid interior from the Three Springs district south to the Stirling Range, west to Cockleshell Gully, Cataby, Regan's Ford, Gingin, Yanchep, Serpentine, Mandurah, Lake Clifton, Bunbury, Nannup and Tone River, and east to Manmanning, Kellerberrin, Woolundra, Lake Cronin and near Ravensthorpe (Johnstone & Storr 1998). On the Swan Coastal Plain, Carnaby's Cockatoo are known to breed in small numbers at Regan's Ford, Yanchep, Gingin, Mandurah and Bunbury (Johnstone & Johnstone 2004). Carnaby's Cockatoos display strong pair bonds, and mate for life. Breeding begins at four years of age. They nest in hollows of smooth-barked eucalypts, especially Salmon Gum (*Eucalyptus salmonophloia)* and Wandoo (*Eucalyptus wandoo),* but nests have also been found in other eucalypts, including York Gum (*Eucalyptus loxophleba)*, Flooded Gum (*Eucalyptus rudis)*, Tuart (*Eucalyptus gomphocephala)* and the rough-barked Marri (*Corymbia calophylla)*. On the Swan Coastal Plain, most nests are in Tuart (Johnstone & Storr 1998). See Table 1 for more detail of Carnaby's Cockatoo nesting tree requirements. Eggs are laid on a mat of wood chips at the bottom of a large hollow (mostly top-entry hollows) generally ranging from 1.0–2.5 m deep, with a clutch of one to two (mostly two, but only one young is reared). Incubation lasts 29 days, and only the

female incubates and broods. The nestling period lasts for approximately 70 days, after which the fledgling is fed by both adults for a further four months (Johnstone & Storr 1998).

Carnaby's Cockatoo forages no more than approximately 20 km from its nesting hollows during the breeding season (Saunders 1980), so having sufficient foraging resources close to the breeding area (particularly within a 12km radius) is critical to its breeding success (Stojanovic 2008).

See section 3.5 for results of the White-tailed Black Cockatoo assessment.

WC Act

Two bird species recorded during the survey are listed as Scheduled species under the *WC Act*:

- Carnaby's Cockatoo (*Calyptorhynchus latirostris*); and
- Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*).

Carnaby's Cockatoo is listed as a Schedule 1 species under the *WC Act*. This species is also listed as Endangered under the *EPBC Act*, and is also considered of local conservation significance. It is discussed above (see *EPBC Act* section).

The Forest Red-tailed Black Cockatoo is listed as Schedule 1 under the *WC Act*, and is also considered of local conservation importance. This species was common in the south-west of Western Australia, but is now uncommon to rare because of habitat destruction (Johnstone & Storr 1998). The Forest Red-tailed Black Cockatoo inhabits woodland and open shrubland areas near water, feeding mainly on Marri seeds (Simpson & Day 2004). This cockatoo is a seasonal breeder, with individuals roosting in loose groups and nesting in large tree hollows (Johnstone & Storr 1998). One small flock of Forest Red-tailed Black Cockatoos was observed flying over the site at the north-eastern corner of the site, but no animals were seen feeding or roosting on the site.

Locally Significant

Twelve bird species recorded are considered of local conservation importance (see Appendix J). These are species with a restricted range, specialised habitat requirements or wide-ranging species with reduced populations on the Swan Coastal Plain.

Species such as the Collared Sparrowhawk (*Accipiter cirrocephalus cirrocephalus*) are widespread across Western Australia, but have restricted populations and have declined because of habitat removal (Government of Western Australia 2000), whilst other species, such as the Splendid Fairy-wren

(*Malurus splendens splendens*), are considered habitat specialists and are surviving on urban remnants (Government of Western Australia 2000). In addition, the Splendid Fairy-wren is identified by *Bush Forever* as having a significant population at Jandakot Airport.

3.3.3 Reptiles

Eleven species of reptiles were recorded during the current survey (Appendix I). None of the recorded reptile species are protected by legislation. One reptile species recorded during the survey, the Southwestern Cool Skink (*Acritoscincus trilineatum*), is considered of local conservation significance, and is discussed below.

It should be noted that the previously-recorded *Cryptoblepharus* species from the project area, the Fence Skink (*Cryptoblepharus plagiocephalus*), is now recognised as Buchanan's Snake-eyed Skink (*Cryptoblepharus buchananii*) (Horner 2007).

Locally Significant

The Southwestern Cool Skink (*Acritoscincus trilineatum*) is considered of local conservation importance, as it is restricted to Jarrah forest and/or *Banksia* woodland of coastal south-west of Western Australia (WAM 2008; Wilson & Swan 2003). This species was identified by *Bush Forever* as occurring in Ken Hurst Park and Jandakot Airport, and it was also recorded by the Dell & Cooper (1992) and Bamford (2002) surveys conducted at these sites.

3.3.4 Amphibians

During the current survey four species of amphibian were recorded (Appendix H): None of the amphibian species recorded is protected by legislation or is considered of conservation importance.

3.4 POTENTIALLY OCCURRING FAUNA

Species of conservation importance that potentially occur in the project area, in addition to those recorded, are discussed in the following sections. The list of potentially occurring species (Appendix G) was refined following assessment of the habitat in the project area. Any species that appeared in database searches that were clearly based on historic distributions of species or possibly erroneous (such as records of the Numbat and Red-tailed Phascogale from the EPBC search) were omitted from discussion below.

3.4.1 Mammals

The Chuditch (Western Quoll) (*Dasyurus geoffroii*) is listed as Vulnerable under the *EPBC Act* and as a Schedule 1 species under the *WC Act.* This species once occurred over 70% of Australia, but it has been reduced to a patchy distribution throughout the Jarrah and mixed forests of the south-west of Western Australia (DEC 2008a). The Chuditch is found in a wide range of habitats, including woodlands, dry sclerophyll forests and riparian vegetation that contain hollow-bearing trees and logs. Numbers have decreased because of habitat alteration, removal of suitable den logs and dens, and competition for food and predation by foxes and cats (DEC 2008a). Chuditch still occur in the Darling Range, but none have been recorded on the Swan Coastal Plain for many years (pers. comm., Rick How, WA Museum). Considering the current distribution of the species, the urban nature of the site, and the presence of foxes and cats on the site, it is unlikely this species occurs at Jandakot Airport.

The Wambenger (Southern Brush-tailed Phascogale) (*Phascogale tapoatafa*) is listed as Schedule 1 under the *WC Act*. The distribution of this species is believed to have been reduced to approximately 50% of its former range (DEC 2008a). This subspecies has been observed in dry sclerophyll forests and open woodlands containing hollow-bearing trees but a sparse ground cover. Habitat destruction, the loss of hollow-bearing trees and predation by feral animals are thought to be the major threats to surviving populations (DEC 2008a). Despite the use of tree-mounted Elliott traps, no Brush-tailed Phascogales were detected during the survey, none have previously been found in the area, and none are known from within approximately 10 km of the site from WA Museum records. Therefore it is unlikely that the Wambenger occurs at the site.

The Mardo (*Antechinus flavipes*) occurs in a variety of habitats. It mostly occupies dry sclerophyll forest and heath woodland areas with plentiful leaf litter for foraging for insects (Menkhorst & Knight 2004). This sub-species occurs only in the south-west region of Western Australia, and is isolated from the east coast sub-species (Strahan 1995). No Mardos were detected during the survey, despite the use of ground and tree-mounted Elliott traps, and none have been found in the immediate area in previous surveys, so it is unlikely they occur at the study site.

The Quokka (*Setonix brachyurus*) is listed as Vulnerable on the *EPBC Act* and as Schedule 1 by the DEC. It is found in the south-west regions of WA, mostly in densely vegetated swamps, tea tree thickets on sandy soils along creek lines and dense heath on slopes. Quokka numbers have declined because of predation by foxes and the clearing and burning of swamp habitats. This species is very rare on the mainland. It was not observed during the nocturnal or diurnal surveys or trapped during the survey, and has not been previously recorded on the site. It is therefore highly unlikely to occur at Jandakot airport.

The Honey Possum (*Tarsipes rostratus*) forages in areas of high diversity of shrubs. The species is locally common in the south-west of Western Australia. Its distribution is limited to areas in which it can obtain nectar all year round, as it does not have the mobility of other nectar-eating animals (Menkhorst & Knight 2004). Although it was not recorded during this survey, Bamford (2002) found it at the site. *Bush Forever* (2000) suggests that a significant population of the Honey Possum occurs at Jandakot Airport.

The Western False Pipistrelle (*Falsistrellus mackenziei*) is listed as Priority 4 by the DEC. This species prefers Karri forest, wetter stands of Jarrah and Tuart, and *Corymbia* woodlands. The Western False Pipistrelle roosts in tree hollows and forages mainly at canopy level (Strahan 1995). The major threat to this species is the loss of feeding grounds and suitable habitat to forestry and clearing for agriculture.

The Greater Long-eared Bat (*Nyctophilus timoriensis*) is listed as a Priority 4 species by the DEC. This species is considered widespread across southern Australia, but it is uncommon and localised. The Greater Long-eared Bat inhabits areas of tall forest in the south-west, roosting in tree hollows and under loose bark (Strahan 1995).

The Western False Pipistrelle and Greater Long-eared Bat have both been recorded in the region previously. However, none were recorded during this survey, and there are no confirmed records of these species from previous surveys at Jandakot Airport or Ken Hurst Park. It is therefore concluded that while these species may occur on the site from time to time, none are likely to roost or regularly forage on the site.

The Water Rat (*Hydromys chrysogaster*) is classified as Priority 4 by the DEC. This species occupies a wide variety of freshwater habitats, from subalpine streams and other inland waterways to lakes, drainage lines, swamps and farm dams (Strahan 1995). The Water Rat has not been recorded recently in the area (Appendix G). While the site has some small man-made ponds, none are permanent, so it is unlikely this species occurs on the site.

3.4.2 Birds

Baudin's Cockatoo (*Calyptorhynchus baudinii*), is listed as Vulnerable by the *EPBC Act*, as Schedule 1 by the *WC Act*, and is also considered locally significant. This species is distributed through the south-western humid and subhumid zones, from the northern Darling Range and adjacent far east of the Swan Coastal Plain (south of the Swan River), south to Bunbury and across to Albany (Johnstone & Storr 1998). Baudin's Cockatoo rarely occurs in Perth, or anywhere along the coast south to approximately Mandurah. Some records of Baudin's Cockatoo from Perth may be erroneous, since it is easily confused with

Carnaby's Cockatoo. It usually occurs in small flocks of up to 30, occasionally up to 50, or rarely in aggregations of up to 1200 (Johnstone & Kirkby 2008). This species forages primarily in eucalypt forest, where it feeds primarily on Marri (*Corymbia calophylla*) seeds, flowers, nectar and buds (Johnstone & Kirkby 2008). It also feeds on a wide range of seeds of *Eucalyptus*, *Banksia*, *Hakea* and *Dryandra,* as well as fruiting apples and pears and persimmons, as well as Pines, and beetle larvae from under the bark of trees (Johnstone & Kirkby 2008, Johnstone & Storr 1998). Baudin's Cockatoo nests in tree hollows, in spring in the deep south-west, north to Lowden. Its primary nesting trees are Karri (*Eucalyptus diversicolor*), Marri, and Wandoo (*Eucalyptus wandoo*). Baudin's Cockatoo is a postnuptial nomad, moving in March and September to the central and northern Darling Range and adjacent far east of the Swan Coastal Plain (Johnstone & Storr 1998).

The Great Egret, Cattle Egret, and ten species of wading birds from the families Scolopacidae and Charadriidae are listed as Migratory under the *EPBC Act* (Appendix G). Many of these are primarily marine species with an extensive (international) home range. Some of these species may occur in large freshwater ecosystems such as swamps and lakes (Geering *et al.* 2007). As there are no significant or permanent wetlands on the site, it is unlikely any of these species occur on the site, other than to fly over the site from time to time.

The Australasian Bittern (*Botaurus poiciloptilus*) is listed as Schedule 1 under the *WC Act*. Although this species is wide-ranging, it is considered of local conservation importance because it has a declining population in the south-west of Western Australia (Government of Western Australia 2000). The Australasian Bittern inhabits areas of dense vegetation (reeds, rushes and sedges) in or adjacent to freshwater streams, wetlands, drains and occasionally salt marshes (Simpson & Day 2004). However, as a result of land clearing, this species now appears to be restricted to semi-permanent freshwater swamps in coastal districts. Potential habitat for it in the study area appears very marginal, and therefore the likelihood of this species occurring in the project area is low.

The Peregrine Falcon (*Falco peregrinus*) is listed as Schedule 4 under the *WC Act*, as a Migratory species under the *EPBC Act*, and is considered of local conservation importance. Individuals of this species are uncommon but wide-ranging across Australia. The Peregrine Falcon nests in tall trees and on cliff faces and ledges (Johnstone & Storr 1998) as well as on ledges of tall buildings. This species may utilise the project area as part of its home range for foraging, but there is no suitable nesting habitat for the Peregrine Falcon.

The Black Bittern (*Ixobrychus flavicollis*) is listed as Priority 3 by the DEC. This species occurs north to Yanchep and Northam and south-east to Albany (Johnstone & Storr 1998). It is usually found near freshwater pools, swamps and lagoons, well screened with trees (Johnstone & Storr 1998).

The Little Bittern (*Ixobrychus minutus*) is listed as Priority 4 by the DEC. This species occurs north to Moora and south-east to Two Peoples Bay (Johnstone & Storr 1998). It is usually recorded on dense vegetation beds of freshwater pools, swamps and lagoons, well screened with trees. This species often shelters in dense beds of *Typha* ssp., *Baumea* ssp., and tall rushes in freshwater swamps around lakes and along rivers (Johnstone & Storr 1998).

Both the Black and Little Bittern are very difficult to observe, and there are few records of them. For both Bitterns, there appear to be no recent WAM, DEC or Birds Australia records from the area. Potential habitat for them in the study area appears very marginal, and the likelihood of these species occurring in the project area is low.

The Australian Bustard (*Ardeotis australis*) is listed as Priority 4 by the DEC. It is typically widespread and nomadic in open grassy woodlands, but locally scarce, and rare in south-western Western Australia, and is thought to be extinct in the Swan Coastal Plain (*Bush Forever* 2000). Therefore, it is highly unlikely this species occurs at the site.

The Eastern Curlew *(Numenius madagascariensis)* is a DEC Priority 4 species, and it is also listed as a Migratory species under the *EPBC Act*. The Eastern Curlew mainly inhabits tidal mudflats and mangrove areas, and is also known to occur at sandy beaches. The likelihood of this species occurring on the site is very low, although it may occasionally fly over the site.

The Brush Bronzewing (*Phaps elegans*) is a DEC Priority 4 species, and it is also considered of local conservation importance. It occurs in dense shrublands of *Acacia* and melaleucas close to water or the coast (Johnstone & Storr 1998). This species was formerly plentiful and widespread, and although common where it now occurs, it has a restricted distribution in the south-west of Western Australia (Johnstone & Storr 1998). This species was not detected at the site, although it may occur there intermittently.

The Masked Owl (*Tyto novaehollandiae*) is listed as DEC Priority 3, and is found in areas with tall trees with hollows suitable for roosting and nesting, and adjacent forested areas for foraging. The Masked Owl is very rare in Western Australia, and there is little or no suitable habitat for this species on the site, so it is unlikely it occurs there.

The Fork-tailed Swift (*Apus pacificus*) is listed as Migratory under the *EPBC Act*. It is a summer migrant (October-April) to Australia. This species is an aerial species, which forages high above the tree canopy, and is independent of terrestrial habitats. Although it may forage in the air above the site, it is not considered likely to occur at or near ground level, and so is unlikely to be affected by any development at the site.

The Rainbow Bee-eater (*Merops ornatus*) is a migratory species listed under the *EPBC Act*, which migrates to south-western Australia to breed in spring and summer. The Rainbow Bee-eater is a common and widespread species in Western Australia. It occurs throughout Western Australia except the drier interior of the State and the far south-west (Johnstone & Storr 1998). It occurs in lightly-wooded often sandy country, preferring areas near water. The Rainbow Bee-eater feeds on airborne insects, and nests throughout its range in Western Australia in burrows excavated in sandy ground or banks, often at the margins of roads and tracks (Johnstone & Storr 1998). The Rainbow Bee-eater is common in Perth in summer. It is likely this species forages at the site, and possibly breeds there.

Sixty-one bird species are considered of local conservation importance (Appendix G3). These species have restricted distributions and/or are confined to the south-west of Western Australia. Species such as the Grey Shrike-thrush (*Colluricincla harmonica*) and the Hooded Robin (*Melanodryas cucullata westralensis*) are uncommon in the Perth area (Government of Western Australia 2000), while species such as the Scarlet Robin (*Petroica multicolor campbelli*) have a distribution restricted to the Swan Coastal Plain (WAM 2008). In addition, *Bush Forever* (2000) notes a significant population of the Grey Shrike-thrush at Jandakot Airport.

3.4.3 Reptiles

The Southern Carpet Python (*Morelia spilota imbricata*), is listed as Schedule 4 under the *WC Act*, and is also listed as a Priority 4 species by the DEC. This sub-species has a wide distribution in the south-west, having been recorded from semi-arid coastal and inland woodland and grassland habitats. Although widespread, it is generally uncommon throughout its distribution. The Southern Carpet Python commonly utilises hollow logs for shelter (Wilson & Swan 2003). Local populations in the south-west have suffered because of extensive clearing and the removal of habitat. A reduction in habitat and shelter makes this species vulnerable to predation and severely limits its potential for radiation. Considering the habitat present on the site, this species potentially occurs there.

The Swan Coastal Plain population of *Ctenotus gemmula* is listed as Priority 3 by the DEC, and is also considered locally significant because of its disjunct populations in the south-west of the State. This species inhabits sand-plains supporting heaths in association with *Banksia* or Mallee woodlands (Wilson & Swan 2003). However, none were found during this survey or from other surveys of Jandakot Airport, Ken Hurst Park and the nearby area (Appendix G). It is therefore unlikely that *Ctenotus gemmula* occurs on the site.

The skink *Lerista lineata* is listed as a Priority 3 species by the DEC, and is also considered of local conservation importance because of its disjunct and isolated

populations (Wilson & Swan 2003; WAM 2008). This burrowing species is found in loose soil or sand beneath logs and termite mounds, where it feeds on termites and other small insects (Cogger 2000). *Lerista lineata* occurs in sandy coastal heath and shrubland areas in isolated populations in the south-west and mid-west coast of Western Australia (Wilson & Swan 2003). *Bush Forever* (2000) notes *Lerista lineata* as being one of the significant reptiles at Jandakot Airport. It has previously been found at Jandakot Airport (Bamford 2002) and at Ken Hurst Park (Dell & Cooper 1992).

The Black-striped Snake is listed as Priority 3 by the DEC Priority Fauna List, and is endemic to the south-west of Western Australia (Storr *et al.* 2002). This burrowing species is restricted to sandy coastal and near-coastal areas (Cogger 2000). This snake is under threat from increasing development in its restricted range (Wilson & Swan 2003). This species was not found during this survey, but has previously been found at Jandakot Airport (Bamford 2002).

Eleven reptile species potentially occurring in the project area are considered of local conservation importance (Appendix G2). These species have restricted distributions and/or are confined to the south-west of Western Australia. Species such as Bynoe's Gecko (*Heteronotia binoei*) and the Crowned Snake (*Elapognathus coronatus*) are uncommon in the Perth area, but are much more abundant elsewhere (Government of Western Australia 2000), while species such as the Javelin Legless Lizard (*Aclys concinna concinna*) have a restricted distribution, occurring only on the Swan Coastal Plain (WAM 2008).

3.4.4 Amphibians

Two amphibian species, the Squelching Frog (*Crinia insignifera*) and Western Marsh Frog (*Heleioporus barycragus*) potentially occurring in the project area are considered of local conservation importance. Both species have a restricted distribution in the south-west of the State, and are therefore considered of local conservation importance. The Squelching Frog resides along coastal plains around swamps, and shelters under logs and other debris, while the Western Marsh Frog burrows in non-perennial swamps or creeks (Cogger 2000; WAM 2008). Habitat in the project area is suitable for the Squelching Frog, which inhabits areas of temporary waterlogging, while the habitat is less suitable for the Western Marsh Frog, which prefers ephemeral watercourses that flow in winter.

3.4.5 Invertebrates

The cricket *Throscodectes xiphos* is known only from its holotype from Cutler Road, Jandakot (pers. comm, Terry Houston, WAM), and little is known of its life history and habits. It is possibly threatened by clearing for housing and altered fire regimes (DEC 2008b). Jandakot Airport is within 2 km of the location of the

holotype (Cutler Road) population, so it is possible this species occurs on the site.

The Graceful Sun Moth (*Synemon gratiosa*) is a diurnal moth from the family Castniidae, a small family of medium to large moths found only in Australia and southern Asia. These moths are often mistaken for butterflies due to their day-flying habit. Prior to metamorphosis, the larvae of Graceful Sun Moths will feed on the roots of epiphytic plants as well as monocotyledon seedlings (DEC 2009). After metamorphosis, the adult moth is believed to travel only within a range of 300 metres, significantly limiting its potential to disperse or re-colonize disturbed sites (DEC 2009).

The Graceful Sunmoth is a diurnal moth that was once relatively widespread in the Swan Coastal Plain (pers. comm., Terry Houston, WA Museum), but now appears restricted to Banksia woodlands on sandy soils in Perth's northern metropolitan area (DEC 2008c). The species is active only from March to early April. It has been recorded in low densities at eight sites in the northern suburbs of Perth, typically in open Banksia woodlands (DEC 2009).

At present, the Graceful Sunmoth is known from eight sites in the northern suburbs of Perth, including Neerabup and Whiteman Park (DEC 2009) and it has also recently been found in coastal heath vegetation at Sorrento (DEC 2008c). The Graceful Sun Moth is a relatively little known species and may persist in other areas of Banksia Woodland not surveyed. The Graceful Sunmoth (*Synemon gratiosa*) is probably locally extinct through much of its previous range. No survey for the Graceful Sunmoth have been conducted at Jandakot Airport, however, so it could still potentially occur there (pers. com., Terry Houston, Australian Museum).

3.5 WHITE-TAILED BLACK COCKATOO ASSESSMENT RESULTS

As mentioned above, two species of White-tailed Black Cockatoos occur in the south-west of Western Australia: Carnaby's Cockatoo (*Calyptorhynchus latirostris*) and Baudin's Cockatoo (*Calyptorhynchus baudinii*), both of which are protected by the *EPBC Act*. A cockatoo survey was undertaken to assess if and how these species used the project area.

Other than areas cleared for tracks and firebreaks the majority of the *Banksia* Woodland habitat remains uniform throughout the project area. *Banksia* species (*Banksia attenuata*, *B*. *ilicifolia*, and *B*. *menziesii*) are the dominant overstorey species on the site, providing a canopy cover of typically 30-40%. There are isolated pockets of Jarrah (*Eucalyptus marginata*) towards the north-west and east of the project area, where they make up approximately 10% of the canopy cover.

3.5.1 Foraging Potential / Evidence

The open *Banksia* woodland was the dominant vegetation community in the project area. Many of the plant species in this habitat type are important food sources for White-tailed Black Cockatoos, e.g. *Banksia attenuata*, *Banksia menziesii*, *Banksia ilicifolia*, *Banksia sessilis Eucalyptus gomphocephala*, *Eucalyptus marginata*, and *Xanthorrhoea preissii*.

Evidence of White-tailed Black Cockatoo feeding was abundant across the site, in the form of bitten-off *Banksia* fruit and flowers, *Eucalyptus* flowers, or new growth. This evidence was found across the site in *Banksia* woodland, and was very common, so individual finds of feeding evidence were not recorded or mapped. Carnaby's Cockatoos were also observed foraging around the site, including flocks of up to approximately 100 birds. Baudin's Cockatoo is very uncommon in this part of the Swan Coastal Plain (Johnstone & Storr 1998), so it is likely that most, if not all, of the abovementioned foraging evidence was from Carnaby's Cockatoo.

All foraging habitat for Carnaby's Cockatoo in the study area is mapped in Figure 6. This area is approximately 327.5 ha.

3.5.2 Roosting Potential / Evidence

The study area has limited potential for use as an overnight roosting site for White-tailed Black Cockatoos because of the scarcity of large trees. The few large *Eucalyptus marginata* on the site have branches high enough and a crown sufficiently dense for White-Tailed Black Cockatoos to roost in. There are enough trees to support a small to medium-sized flock, probably of up to 150 birds.

The breeding season for both White-tailed Black Cockatoo species begins in July and continues until September-October (Pizzey & Knight 2007). Most birds that use the area in the non-breeding season would be expected to have already migrated to their traditional breeding areas, i.e. the Wheatbelt to the east. The flock observed at the site may have consisted of non-breeding (young) birds that had not returned to their breeding grounds for the breeding season, or the birds may have been from a locally-breeding population.

One roosting location was recorded at Jandakot Airport during the survey (Figure 6). As many as 100 individuals were roosting in large planted non-native *Eucalyptus* trees next to the airport infrastructure. These trees were 30 m tall, and Carnaby's Cockatoos have previously been seen roosting in them (pers. comm. Jim Hocking, Jandakot Airport 2008). Roosting survey locations are presented in Table 3, and potential roosting habitat for Carnaby's Cockatoos is mapped in Figure 6.

Table 3: Roosting Survey Locations of White-tailed Black Cockatoos in the Project Area

Date	*GPS Coordinates	
	Easting	Northing
2 September 2008	395155	6449783
	394319	6448856
3 September 2008	392743	6448637

*Australian Geocentric 1994 (MGA94) Zone 50H

3.5.3 Nesting Potential and Nesting Evidence

The two White-tailed Black Cockatoo species have fairly distinct requirements with respect to potential breeding hollows. Carnaby's Cockatoo prefers a hollow with an entrance size of at least 15 cm in diameter, 25-250 cm deep and from two metres to more than 10 metres above the ground (Cale 2003). Baudin's Cockatoo prefers a hollow with an entrance size of 30-40 cm, more than 30 cm deep, and 8-14 metres above the ground (Chapman 2007). Based on these nesting habitat requirements, no tree hollows were identified during the survey as potential nesting sites for White-tailed Black Cockatoos.

4 DISCUSSION AND RECOMMENDATIONS

4.1 THE EXTENT OF POTENTIAL IMPACTS FROM THE PROPOSED DEVELOPMENT

The bushland that occurs at Jandakot Airport makes up a relatively large remnant of *Banksia* woodland. This is one of the reasons the site was listed as a place of 'Natural' value on the Register of the National Estate. The Australian Heritage Database (2008) describes the remnant *Banksia* woodland as: 'one of the best remaining examples of this vegetation type in the Swan Coastal Plain and as such is important in maintaining the ecological processes of the region.'

The proposed development includes the clearing of approximately 167 ha of native vegetation, out of approximately 338 ha present in the study area. Most of the clearing of fauna habitat for the proposal is *Banksia* woodland in Areas 4 and 5, and beyond the south-eastern end of the runway in the south-eastern part of the site (Figure 7).

4.2 IMPACTS ON FAUNA

This clearing will result in the death of some animals and the removal of some habitat for the fauna on the site.

The clearing of Areas 4 and 5 will reduce the usefulness of the site as a wildlife corridor. Removing these patches of *Banksia* woodland may prevent some species from moving in an east-west path through the site. *Bush Forever* suggested the site is part of a regionally '*significant but not contiguous bushland linkage*'. Most of the fauna likely to use this linkage would be highly mobile species such as birds.

While there may be localised impacts on common or locally significant species, the focus of the following discussion is on *EPBC Act*, *WC Act* or DEC Priority species.

4.2.1 Mammals

Quenda and Western Brush Wallaby

Two mammals of conservation importance recorded during the current survey most likely to be affected by the proposed development are the Quenda and the Western Brush Wallaby. These species are listed as Priority 5 and Priority 4 respectively by the DEC. Both species are ground-dwelling mammals, and given the size and position of the property, are likely to survive at Jandakot Airport as relatively small, isolated populations.

For part of Jandakot Airport (sections 5, 6, 6a, 2, 1a and 1b - see Figure 7) these animals (as well as Western Grey Kangaroos) are completely contained by a fence, which essentially makes them a captive population. Hence, any proposed development in this area has the potential to significantly affect these populations. The clearing of Area 5 is unlikely to restrict the movement of these species around the site, since this area is fenced in and is currently a 'dead-end' for both species.

At total of 167 ha of habitat for the Quenda and Western Brush Wallaby will be cleared as a result of the proposed development (49% of the habitat on the site).

This level of clearing and disturbance should be considered to be significant for the local populations of the Quenda and Western Brush Wallaby, unless a detailed study of these populations is undertaken and proves otherwise.

Honey Possum

While not found during this survey, the Honey Possum has been found in previous surveys of Jandakot Airport. Considering the scarcity of large remnants of *Banksia* woodland in the Swan Coastal Plain, the removal of 167 ha may be a significant area of foraging habitat for this species. This level of clearing and disturbance may be significant for the local populations of the Honey Possum. It should be noted, however, that Honey Possums are likely to be small enough to pass through the fence surrounding the site, and so it is not expected to be a 'captive' population at the site.

4.2.2 Birds

Carnaby's Cockatoo

In the Jandakot area, Carnaby's Cockatoo is considered moderately common, and is known to occur in pairs and small flocks of up to 50, and occasionally up to 175 (and in mid-winter to late spring, congregations of up to 500) (Johnstone & Johnstone 2004).

Carnaby's Cockatoos were recorded foraging in the project area and roosting in trees among the buildings and infrastructure at Jandakot Airport. There was also ample evidence of feeding by Carnaby's Cockatoos at the site. No potential nesting habitat was found on the study site, and only a few patches of potential roosting habitat were found.

Carnaby's Cockatoos do not display a high degree of roost site fidelity, and numbers of birds counted during roost surveys can vary significantly from night to night at all times of the year. There are many other potential roosting places in the region, and few suitable roosting places at Jandakot airport, and even fewer

in the study area. The study area is therefore unlikely to be an important roosting site for Carnaby's Cockatoo.

Carnaby's Cockatoos breed in relatively small numbers on the Swan Coastal Plain. There are records of Carnaby's Cockatoo with young at Baldivis, Fremantle Golf Course and around Ken Hurst Park (Ron Johnstone, pers. comm.), however the nearest confirmed place where breeding is known to occur each year is at Mandurah (Johnstone & Johnstone 2004). The survey was conducted during what is considered the breeding season for Carnaby's Cockatoos. The flock feeding on the site during the survey would be made up of non-breeding individuals (animals under four years old) and/or breeding individuals. Flocks consisting mostly of young adults have previously been observed in the area (Johnstone & Johnstone 2004). Considering the scarcity of breeding Carnaby's Cockatoos in the region, it is not likely that many (if any) of the animals seen on the site were breeding animals.

The proposed development will result in the removal of approximately 165.5 ha of foraging habitat for Carnaby's Cockatoos, out of approximately 327 ha present in the study area (51%). The results of this study, as well as of others (Johnstone & Johnstone 2004), suggest that in the non-breeding season (autumn-winter) significant numbers of Carnaby's Cockatoos may forage at the site. More discussion of this, in the context of regionally available foraging habitat is made in the referral for the *EPBC Act* for the proposed development.

Baudin's Cockatoo

The *Banksia* woodland on the site provides potential foraging habitat for Baudin's Cockatoo. The species is known to forage in *Banksia* woodland, feeding on similar plants to that of Carnaby's Cockatoo (Johnstone & Kirby 2008). However, Baudin's Cockatoo is considered rare in the Perth Metropolitan area. In the Perth region it generally occurs only on the eastern edge of the Swan Coastal Plain and the adjacent Darling Ranges (Johnstone & Kirby 2008). The results of this survey showed that the site provides no potential nesting habitat and little potential roosting habitat for Baudin's Cockatoo.

While Jandakot Airport may have potential foraging habitat, considering the scarcity of Baudin's Cockatoo in the area, it is unlikely to be used sufficiently regularly to be considered significant habitat for the species. Therefore the proposed development is unlikely to significantly affect Baudin's Cockatoo.

Red-tailed Black Cockatoo

One small flock of Red-tailed Black Cockatoos was observed during the survey. Previous fauna surveys in the area noted similar flocks (Johnstone & Johnstone 2004). This species is considered rare in the Swan Coastal Plain (Johnstone & Storr 1998, Bush Forever 2000). This species forages primarily on Marri fruit

(Johnstone & Storr 1998). The site lacks large stands of Marri, and *Banksia* woodland is unsuitable foraging habitat for Forest Red-tailed Cockatoos. It is worth noting that the flock of Red-tailed Cockatoos was observed in the far north corner of the site, where the habitat consists of Paperbark Woodland, a habitat type that will not be significantly reduced by the proposed development.

The site lacks foraging habitat, as well as nesting or roosting habitat, for Red-tailed Black Cockatoos. Therefore the proposed development is unlikely to have an impact on this species.

Rainbow Bee-eater

This species was observed feeding on the site in open areas and over *Banksia* woodland, and nests in sandy banks and along the edges of tracks and roads. Considering the ecology of the species, clearing of woodland at Jandakot Airport will not reduce the amount of foraging or nesting habitat for the Rainbow Bee-eater. The proposed development is unlikely to have any impact on the local population of Rainbow Bee-eaters.

4.2.3 Reptiles

The Southern Cool Skink, the skink *Lerista lineata*, the Black-striped Snake and the Southern Carpet Python occur or are considered likely to occur on the site. All the native vegetation on the site is likely to be potential habitat for these species. The proposed development will result in the removal of approximately 167 ha of habitat for these species.

Considering the scarcity of large remnants of *Banksia* woodland in the Swan Coastal Plain, the removal of this habitat and other disturbances relating to the proposed development may be significant for the local populations of these reptiles. It should be noted, however, that these reptiles are likely to be small enough to pass through the fence surrounding the site, so are not expected to occur as 'captive' populations.

4.2.4 Frogs

The patches of Paperbark woodland are likely to make up the only significant frog habitat on the site. Some frogs may pass through and occasionally forage in the *Banksia* woodland on the site. Based on the current development proposal, a small amount of Paperbark woodland in Area 6 may be removed. This may reduce the quality of the frog habitat in the general area, but no conservation-significant frog species are likely to occur on the site.

4.2.5 Invertebrates

The cricket *Throscodectes xiphos* may occur on the site. The proximity of Jandakot Airport to the halotype site for this species suggests that there is a real

chance of them occurring at Jandakot. The habitat requirements of this species are poorly understood (pers. comm. Terry Houston, WAM), so it is difficult to predict what impacts the proposed development may have on this species. Considering the limited known distribution of this species, if it does occur at Jandakot Airport, the site could be significant for *Throscodectes xiphos*.

The Graceful Sunmoth (*Synemon gratiosa*) may occur on the site. The habitat requirements of this species are poorly understood (pers. comm. Terry Houston, WAM), so it is difficult to predict what impacts the proposed development may have on this species. Considering the limited distribution of the Graceful Sunmoth, if it does occur at Jandakot Airport, the site could be significant for the species.

The proposed development will result in the removal of approximately 167 ha of habitat for these invertebrates. Considering the scarcity of large remnants of *Banksia* woodland in the Swan Coastal Plain, the removal of this habitat and other disturbances relating to the proposed development may be significant for the local populations of these invertebrates.

4.3 MANAGEMENT OF IDENTIFIED IMPACTS

To reduce the impact of feeding habitat loss for Carnaby's Cockatoo in the long term, it is proposed that nearby land be revegetated to replace that removed by the proposed development. Plants used in any such revegetation should include locally-occurring, known feed trees for Carnaby's Cockatoo, in particular: *Banksia attenuata*, *Banksia menziesii*, *Banksia ilicifolia*, *Banksia sessilis* and *Eucalyptus gomphocephala*.

To manage the impact of habitat removal for Western Brush-wallabies and Quenda, ENV recommends modification of the fences around the airport to permit the movement of wildlife. This modification could be in the form of grilles or 'fauna gates' sufficiently large to enable fauna movement, but not human movement. There is a large patch of *Banksia* woodland to the east of the site, so the eastern boundary may be one appropriate place for such fauna gates. In addition, retention of corridors of native vegetation that provide access to any fauna gate should be considered. Relocation of these two species would be very difficult and expensive, and is rarely successful in the long term, so is not recommended.

Managing the impacts of the development upon threatened invertebrates may be more difficult until further surveys are conducted. Surveys for Graceful Sunmoths should be carried out in March to early April. Once the presence or absence of these species has been determined, the regional significance of any existing population can be examined, and on-site mitigation or impact minimisation can be explored.

5 REFERENCES

Bamford MJ (2002*). Fauna Survey of Jandakot Airport*. Unpubl. Report for Jandakot Airport Holdings.

Bamford, MJ (2003a). *Champion Lakes Master Plan – Fauna*. Unpubl. report for BBG.

Bamford, MJ (2003b). *Roe Highway Stage 7 Review of Fauna Investigations*. Unpubl. report for GHD.

Beard, JS (1990). Plant Life of Western Australia. Kangaroo Press

Bureau of Meteorology (2008). *Daily Weather Observations,* Commonwealth of Australia. Online: *www.bom.gov.au/climate*

Cale, B (2003). *Carnaby's Black-Cockatoo* (Calyptorhynchus latirostris) *Recovery Plan*. Department of Conservation and Land Management, Perth.

Chapman, T (2007). *Forest Black Cockatoo, Baudin's Black Cockatoo* Calyptorhynchus baudinii *and Forest Red-Tailed Black Cockatoo* Calyptorhynchus banksii naso) *Recovery Plan*. Department of Environment & Conservation, Perth.

Cogger, HG (2000). *The Reptiles of Australia*. Reed New Holland Publishers. Sydney.

Davies, S. (2003). Some Practical Steps for enhancing the Status of Carnaby's Black-Cockatoo. In: *Conserving Carnaby's Black-Cockatoo, Future Directions*. Proceedings from a conservation symposium. Perth, July 2003.

Dell, J & Cooper, NK (1992) *Vertebrate Fauna of Ken Hurst Park, city of Melville.* Unpubl. report to the city of Melville.

Department of Environment & Conservation (2008a). *NatureBase Species Profile.* Online:*http://www.dec.wa.gov.au/*

Department of Environment and Conservation (2008b) *Threatened and Priority Fauna Database*. Unpublished database.

Department of Environment and Conservation (2009) Changes to threatened species lists. Retrieved 3rd February 2009 from (website): https://www.dec.wa.gov.au/news/department-of-environment-and-conservation/index/Page-4.html

Department of Environment and Conservation (2008c) DEC website: *www.dec.wa.gov.au/news/department-of-environment-and-conservation/rare-sunmoth-discovered-in-sorrento.html*

Department of the Environment & Water Resources (2007). *The Interim Biogeographic Regionalisation for Australia (IBRA).* Online: *www.environment.gov.au* [May 2007]

Environmental Protection Authority (2002). *Terrestrial Biological Surveys as an Element of Biodiversity Protection. Position Statement No. 3*. EPA, Perth, Western Australia.

Environmental Protection Authority (2004). *Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia, No. 56.* EPA, Perth, Western Australia.

Geering, A, Agnew L & Harding, S (2007). *Shorebirds of Australia*. CSIRO Publishing, Collingwood, Vic.

GHD (2006). *Fiona Stanley Health Precinct Site Investigation: Fauna Assessment.*unpubl. report for Department of Housing and Works.

Gibbons, P & Lindenmayer, D (2002). *Tree Hollows and Wildlife Conservation in Australia*. CSIRO Publishing, Collingwood, Vic.

Government of Western Australia (2000). *Bush Forever Volume 2: Directory of Bush Forever Sites.* Department of Environmental Protection.

Horner, P & Adams, M (2007). *A molecular-systematic assessment of species boundaries in Australian* Cryptoblepharus *(Reptilia: Squamata: Scincidae) — A case study for the combined use of allozymes and morphology to explore cryptic biodiversity.* The Beagle, Records of the Museums & Art Galleries of the Northern Territory, Suppl. 3, December 2007.

Johnstone, R & Kirkby, T (2008). Distribution, status, social organisation, movements and conservation of Baudin's Cockatoo (*Calyptorhynchus baudinii*) in South-west Western Australia. *Records of the Western Australian Museum* 25: 107-118.

Johnstone, RE & Storr, GM (1998). *Handbook of Western Australian Birds: Volume 1 - Non-passerines (Emu to Dollarbird).* Western Australian Museum, Perth, Western Australia.

Johnstone, RE & Johnstone, C (2004). 'Review of Carnaby's Cockatoo, *Calyptorhynchus latirostris* within the Proposed Roe Highway Stage 7 Area Jandakot', In: *Roe Highway Stage 7 Extension (South St to Kwinana Freeway) Public Environmental Review Assessment Number 1466*, Report prepared for Main Roads, Western Australia, January 2004.

Johnstone, RE & Johnstone, C (2008). *Distribution, status and movements of Carnaby's Black Cockatoo in Lancelin Region*. Unpublished consulting report.

Menkhorst, P & Knight, F (2004). *A Field Guide to the Mammals of Australia.* (2nd ed.) Oxford University Press, South Melbourne.

Morcombe, M (2004). *Field Guide to Australian Birds*. Steve Parish Publishing, Archerfield, Queensland.

Pizzey, G & Knight, F (2007). *The Field Guide to the Birds of Australia*. Harper Collins, Sydney.

Shah, B (2006). *Conservation of Carnaby's Black-Cockatoo on the Swan Coastal Plain, Western Australia*. Birds Australia, WA.

Shepherd DP, Beeston GR, & Hopkins AJM (2002). *Native Vegetation in Western Australia*. Resource Management Technical Report 249. Department of Agriculture, Western Australia.

Simpson, K & Day, N (2004). *A Field Guide to the Birds of Australia*. Penguin Books Australia Ltd, Melbourne.

Sounders, DA (1980). Food and movements of the short-billed form of the White-tailed Black Cockatoo. *Australian Wildlife Research* 7. p257-269.

Stojanovic, Dejan (2008) Remnant vegetation and cockatoos. *Cocky Notes*. Issue 13, June 2008. Birds Australia.

Storr, GM, Smith, LA & Johnstone, RE (2002). *Snakes of Western Australia.* Western Australian Museum, Perth Western Australia.

Strahan, R (1995). *The Mammals of Australia*. Reed New Holland Publishers. Sydney.

Strahan, R (2004). *The Mammals of Australia*. Revised Ed. Reed New Holland Publishers. Sydney.

Thackway, R & Cresswell, ID (1995). *An Interim Biogeographic Regionalisation for Australia: A framework for setting priorities in the National Reserves System Cooperative Program, Version 4.0.* Australian Nature Conservation Agency, Canberra.

Western Australian Museum (2008). *FaunaBase - Collections Database.* Online: *www.museum.wa.gov.au/faunabase* [October 2008].

Wilson, S & Swan, G (2003). *Reptiles of Australia.* New Holland Publishers, Australia.

FIGURES

env Australia

Client: JANKAKOT AIRPORT HOLDINGS PTY LTD

Project: JANDAKOT AIRPORT FAUNA SURVEY

REGIONAL LOCATION

08.240 A4

Date: 3 October 2008

Scale: 1:150 000

Author: M.Love

Figure No. 1

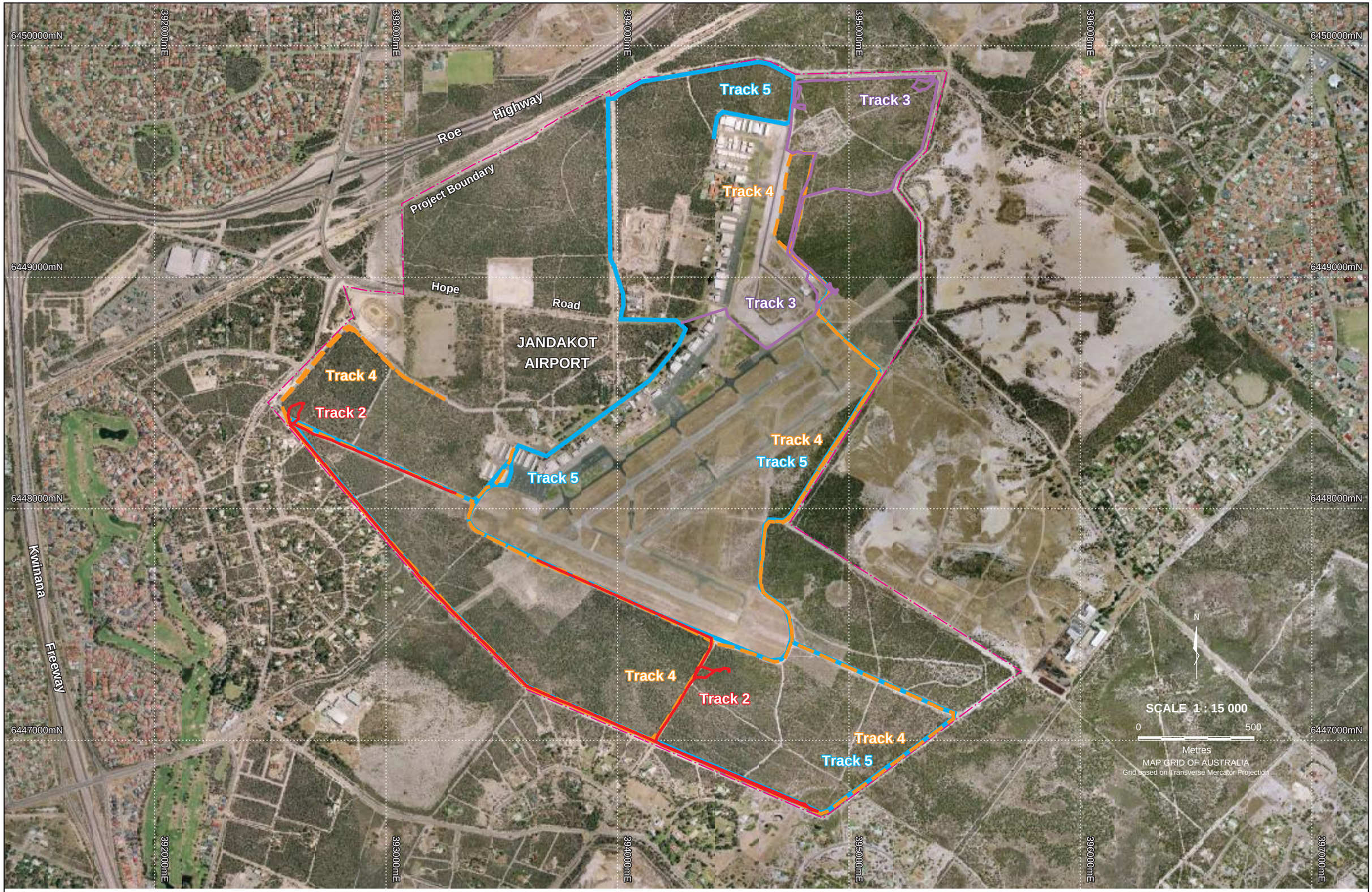
Plan No. JKT-001

Legend

- Trap Location

Author: M.Love	Client: JANKAKOT AIRPORT HOLDINGS PTY LTD	TRAP LOCATIONS FOR THE JANDAKOT AIRPORT HOLDINGS PROJECT AREA	Date: 2 October 2008
Drawn: S.Coleman			Scale: 1:15 000
Status:	Project: JANDAKOT AIRPORT FAUNA SURVEY		Figure No. 3
Job Number: 08.240		A3	Plan No. JKT-002

env Australia



Legend

Nocturnal Spotlighting Routes

- 2 September 2008
- 3 September 2008
- 4 September 2008
- 5 September 2008

env Australia

Author: M.Love	Client: JANKAKOT AIRPORT HOLDINGS PTY LTD	NOCTURNAL SPOTLIGHTING ROUTES FOR THE JANDAKOT AIRPORT HOLDINGS PROJECT AREA	Date: 2 October 2008
Drawn: S.Coleman			Scale: 1:15 000
Status:	Project: JANDAKOT AIRPORT FAUNA SURVEY		Figure No. 4
Job Number: 08.240		A3	Plan No. JKT-003

Legend

△ Bat Recording Location

Author: M.Love	Client: JANKAKOT AIRPORT HOLDINGS PTY LTD	BAT RECORDING LOCATIONS FOR THE JANDAKOT AIRPORT HOLDINGS PROJECT AREA	Date: 2 October 2008
Drawn: S.Coleman			Scale: 1:15 000
Status:	Project: JANDAKOT AIRPORT FAUNA SURVEY	A3	Figure No. 5
Job Number: 08.240			Plan No. JKT-004

PRINTED: Mon 16 Feb 09

AUTHOR: MW 3-12-08

DRAWN: TE 3-12-08

08-240-F6.dgn

Jandakot Airport Holdings Pty Ltd
JANDAKOT AIRPORT
FAUNA ASSESSMENT

CARNABY'S COCKATOO FEEDING AND ROOSTING HABITAT

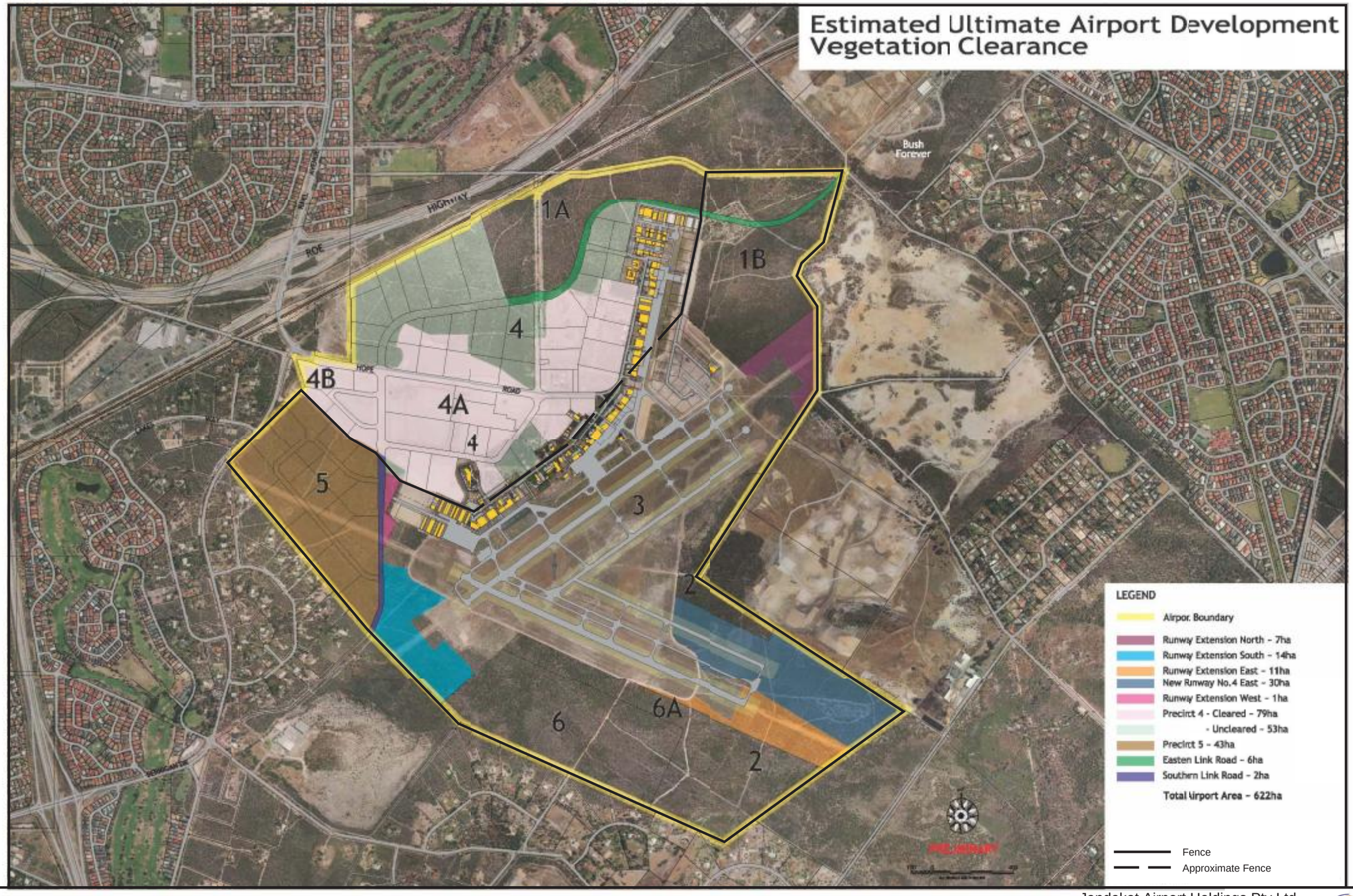
Aerial photography supplied by Landgate

FIGURE 6

env Australia

PRINTED: Mon 16 Feb 09

Estimated Ultimate Airport Development Vegetation Clearance



SOURCE: McMullen Nolan, Jandakot Airport -Estimated Ultimate Airport Development Vegetation Clearance 12-12-08

Jandakot Airport Holdings Pty Ltd
JANDAKOT AIRPORT
FAUNA ASSESSMENT

ESTIMATED ULTIMATE AIRPORT DEVELOPMENT VEGETATION CLEARANCE

FIGURE 7

env Australia

08-240-f7.dgn DRAWN: TE 3-12-08 AUTHOR: MW 2-12-08

APPENDIX A

DEFINITION OF CONSERVATION CODES FOR FAUNA OF CONSERVATION SIGNIFICANCE

JANDAKOT AIRPORT FAUNA SURVEY

APPENDIX A

Definition of Conservation Codes for Fauna of Conservation Significance

Environment Protection and Biodiversity Conservation Act 1999 (Cth): Threatened Species and Threatened Ecological Communities Codes

The EPBC Act prescribes seven matters of national environmental significance:-

- World Heritage properties
- National Heritage places
- Wetlands of international importance
- Threatened species and ecological communities
- Migratory species
- Commonwealth marine areas
- Nuclear actions (including uranium mining)

Species in the categories ExW, CE, E and V (see below), and *Threatened Ecological Communities* in the CE and E categories are protected as matters of national environmental significance under the EPBC Act.

Category	Code	Description
Extinct	**Ex**	Taxa for which there is no reasonable doubt that the last member of the species has died.
Extinct in the Wild	**ExW**	Taxa known to survive only in cultivation, in captivity or as a naturalised population well outside its past range; or not recorded in its known and/or expected habitat at appropriate seasons anywhere in its past range despite exhaustive surveys over a timeframe appropriate to its life cycle and form.
Critically Endangered	**CE**	Taxa facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered	**E**	Taxa not critically endangered and facing a very high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
Vulnerable	**V**	Taxa not critically endangered or endangered and facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria**.**
Conservation Dependent	**CD**	Taxa which are the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within five years.
Migratory	**Mi**	Taxa that migrate to Australia and its external territories, or pass though or over Australian waters during their annual migrations, that are included in an international agreement approved by the Minister, such as the Bonn Convention, the China-Australia Migratory Bird Agreement (CAMBA), or Japan-Australia Migratory Bird Agreement (JAMBA).

Category	Code	Description
Marine	**Ma**	Taxa protected in or on a Commonwealth area (Commonwealth Marine Protected Area). These species are not protected outside of Commonwealth areas.

Western Australian Threatened Fauna Categories

Wildlife Conservation Act 1950 (WA)

Category	Code	Description
Schedule 1	S1	Rare or likely to become extinct.
Schedule 2	S2	Presumed extinct.
Schedule 3	S3	Birds subject to an agreement between the governments of Australia and Japan, the People's Republic of China & the Republic of Korea relating to the protection of migratory birds and birds in danger of extinction.
Schedule 4	S4	Other specially protected fauna.

Department of Environment and Conservation (DEC) Fauna Priority Codes

Category	Code	Description
Priority 1	P1	Taxa with few, poorly known populations on threatened lands.
Priority 2	P2	Taxa with few, poorly known populations on conservation lands.
Priority 3	P3	Taxa with several, poorly known populations, some on conservation lands.
Priority 4	P4	Taxa in need of monitoring: not currently threatened or in need of special protection, but could become so. Usually represented on conservation lands.
Priority 5	P5	Taxa in need of monitoring: not considered threatened, but the subject of a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

APPENDIX B
TRAPPING PROGRAM

JANDAKOT AIRPORT FAUNA SURVEY

APPENDIX B

TRAPPING PROGRAM

Appendix B1 - Trap Site Locations

Trap Number	#GPS Coordinates	
	Easting	Northing
1.01	394918	6448973
1.02	394924	6448990
1.03	394925	6449007
1.04	394922	6449021
1.05	394925	6449045
1.06	394936	6449064
1.07	394934	6449088
1.08	394926	6449112
1.09	394908	6449136
1.10	394891	6449150
2.01	394248	6447398
2.02	394282	6447389
2.03	394302	6447376
2.04	394318	6447343
2.05	394355	6447329
2.06	394369	6447314
2.07	394397	6447314
2.08	394421	6447302
2.09	394452	6447302
2.10	394470	6447278
3.01	392743	6448637
3.02	392765	6448631
3.03	392796	6448630
3.04	392817	6448608
3.05	392841	6448595
3.06	392866	6448584
3.07	392887	6448579
3.08	392913	6448579
3.09	392924	6448587
3.10	392941	6448594
4.01	393402	6447570
4.02	393390	6447557
4.03	393372	6447542
4.04	393382	6447516
4.05	393390	6447488
4.06	393402	6447470
4.07	393419	6447459
4.08	393435	6447439
4.09	393467	6447417
4.10	393482	6447399
E5.01	395315	6449855

Trap Number	#GPS Coordinates	
	Easting	Northing
E5.02	395293	6449842
E5.03	395291	6449829
E5.04	395304	6449805
E5.05	395306	6449792
E5.06	395328	6449781
E5.07	395348	6449789
E5.08	395358	6449796
E5.09	395356	6449820
E5.10	395360	6449856
E6.01	395506	6447420
E6.02	395499	6447405
E6.03	395491	6447398
E6.04	395488	6447385
E6.05	395501	6447377
E6.06	395513	6447370
E6.07	395530	6447374
E6.08	395543	6447389
E6.09	395538	6447400
E6.10	395532	6447407

Australian Geocentric 1994 (GDA94) Zone 50H

Appendix B2 - Major Habitat Types and Vegetation Descriptions of Trap Sites

Site Number	Habitat Type	Vegetation Description
1	*Banksia* Woodland	Very open *Banksia* sp. woodland over close *Melaleuca* sp. tall shrubland over mixed scattered grasses.
2	*Banksia* Woodland	*Banksia* sp. woodland over open grasstree shrubland over mixed closed grassland and scattered herbs.
3	*Banksia* Woodland	Open *Banksia* sp. woodland with scattered *Eucalyptus marginata* trees over open mixed shrubland over mixed low shrubs and grasses.
4	*Banksia* Woodland	Scattered *Banksia* sp. *Eucalyptus marginata* with *Melaleuca* sp. over open grasstree shrubland over closed mixed grassland.
5	Open *Melaleuca* Woodland	Low open *Melaleuca* sp. woodland over open grasstree shrubland over open mixed grasses.
6	*Banksia* Woodland	Open *Banksia* sp. woodland over low open mixed shrubland over mixed grasses.

Appendix B3 - Traps and Number of Replicates Used at Each Site

Site Number	# Cage Traps	# Elliott Traps	# Funnel Traps	# Bucket Traps	Total
1	3	10	20	10	**43**
2	3	10	20	10	**43**
3	3	10	20	10	**43**
4	3	10	20	10	**43**
5	-	10	-	-	**10**
6	-	10	-	-	**10**
TOTAL	**12**	**60**	**80**	**40**	**192**

Appendix B4 - Systematic Trapping Program

Site Number	# trap-nights for Cage Traps	# trap-nights for Elliott Traps	# trap-nights for Funnel Traps	# trap-nights for Bucket Traps	Total trap-nights
1	15	50	100	50	**215**
2	15	50	100	50	**215**
3	15	50	100	50	**215**
4	12	40	80	40	**172**
5	-	40	-	-	**40**
6	-	40	-	-	**40**
TOTAL	**57**	**270**	**380**	**190**	**897**

APPENDIX C
SITE PHOTOGRAPHS

JANDAKOT AIRPORT FAUNA SURVEY

APPENDIX C

Site Photographs

Site 1 - *Banksia* Woodland

Site 2 - *Banksia* Woodland

Site 3 - *Banksia* Woodland

Site 4 - *Banksia* Woodland

Site 5 - Open *Melaleuca* woodland

Site 6 - *Banksia* Woodland

APPENDIX D
OPPORTUNISTIC SEARCHES

JANDAKOT AIRPORT FAUNA SURVEY

APPENDIX D

Opportunistic Searches

Appendix D1 - Opportunistic Diurnal Searching Program for Jandakot Airport

Date	Location	Duration (Person-Hours)
2 September 2008	Site 1	1 h
	Site 3	1.5 h
	Southern Section of project area	2 h
3 September 2008	Site 2	1 h
	South eastern end	2 h
4 September 2008	Near site 2 (rubbish pile)	1.5 h
	Site 4	1 h
5 September 2008	Near plane wreck in north of project area	1.5 h
	Site 5	1 h
	Site 6	1 h
TOTAL		**13.5 h**

Appendix D2 - Nocturnal Searching Program for Jandakot Airport

Date	Location	Duration (Person-Hours)
2 September 2008	Southern Section of project area along boundary fence.	7 h
3 September 2008	Northern Section of project area (Near Site 1)	6 h
4 September 2008	Vegetation corridor east of runway	6 h
5 September 2008	North West section of project area (outside airside)	4 h
TOTAL		**23 h**

APPENDIX E
BAT RECORDINGS

JANDAKOT AIRPORT FAUNA SURVEY

APPENDIX E

Bat Recordings

Appendix E1 - AnaBat SD1 unit Recording Locations

Date	*GPS Coordinates	
	Easting	Northing
1 September 2008	392743	6448637
	393402	6447570
2 September 2008	394751	6446773
	395328	6449874
3 September 2008	394248	6447398
	394926	6446731
4 September 2008	395389	6447462
	394770	6449201
5 September 2008	394369	6449881
	392948	6448465

* Australian Geocentric 1994 (MGA94) Zone 50H

Appendix E2 - AnaBat SD1 unit Recording Details

Date	No. of AnaBat units	Habitat Type / Location
1 September 2008	2	*Banksia* Woodland
		Banksia Woodland
2 September 2008	2	*Melaleuca* Woodland
		Melaleuca Woodland
3 September 2008	2	*Banksia* Woodland
		Banksia Woodland
4 September 2008	2	*Banksia* Woodland
		Banksia Woodland
5 September 2008	2	*Banksia* Woodland
		Banksia Woodland

APPENDIX F
SITE-SPECIFIC CAPTURES

JANDAKOT AIRPORT FAUNA SURVEY

APPENDIX F

Site-Specific Information

Jandakot Airport **Site** 1

Described by MB **Date** 1/09/2008 **Type:** Fauna Trap Site
Season: **Uniformity** Changes in understorey
Location *Banksia* Woodland
MGA Zone **mE** **mN**
Habitat *Banksia* Woodland
Soil Sandy
Rock Type
Vegetation Very open *Banksia* woodland over closed *Melaleuca* tall shrubland and scattered grasses
Veg Condition Very Good
Fire Age
Notes Aspect = flat; Canopy 10-20%;
Habitat: SAN **Logs:** 2 **Leaves:** 5 **Twigs:** 2 **Rocks:** 0 **Rock** 0 **Litter:** **Bare:** 10

Effort:

Species List: Number of individuals by Observed

Name	Pit	Pot	Ca	Ell	Fu	Ne	No	Opp
Amphibia								
Heleioporus psammophilus	3				1			
Mammals								
Isoodon obesulus subsp. fusciventer			4					
Rattus rattus			2					
Reptiles								
Demansia psammophis subsp. reticulata					1			
Pogona minor subsp. minor	1							
Pygopus lepidopodus					1			

Jandakot Airport Site 2

Described by MB **Date** 1/09/2008 **Type:** Fauna Trap Site
Season: **Uniformity**
Location *Banksia* Woodland
MGA Zone **mE** **mN**
Habitat *Banksia* Woodland
Soil Sandy
Rock Type
Vegetation *Banksia* woodland over open grasstree shrubland over mixed closed grassland and herbs
Veg Condition Very good condition
Fire Age
Notes Aspect =flat;
Habitat: SAN **Logs:** 2 **Leaves:** 5 **Twigs:** **Rocks:** **Rock** 0 **Litter:** **Bare:** 10

Effort:

Species List: Number of individuals by Observed

Name	Pit	Pot	Ca	Ell	Fu	Ne	No	Opp
Amphibia								
Limnodynastes dorsalis	1							
Mammals								
Isoodon obesulus subsp. fusciventer			3					
Reptiles								
Demansia psammophis subsp. reticulata					2			
Menetia greyii	1							
Pygopus lepidopodus					2			
Tiliqua rugosa subsp. rugosa			1					

Jandakot Airport Site 3

Described by MB **Date** 1/09/2008 **Type:** Fauna Trap Site
Season: **Uniformity**
Location *Banksia* Woodland
MGA Zone **mE** **mN**
Habitat *Banksia* Woodland
Soil Sandy
Rock Type
Vegetation Open *Banksia* woodland over scattered large jarrah trees over open mixed shrubland over mixed low shrubs and grasses
Veg Condition Good Condition
Fire Age
Notes Aspect = west;
Habitat: SAN **Logs:** 3 **Leaves:** 4 **Twigs:** 2 **Rocks:** 0 **Rock** 0 **Litter:** **Bare:** 20

Effort:

Species List: Number of individuals by Observed

Name	Pit	Pot	Ca	Ell	Fu	Ne	No	Opp
Amphibia								
Limnodynastes dorsalis	1							
Mammals								
Isoodon obesulus subsp. fusciventer			6	1				
Mus musculus	1							
Reptiles								
Delma fraseri					1			
Demansia psammophis subsp. reticulata					2			
Hemiergis quadrilineata					1			
Lerista elegans	1				1			
Menetia greyii	1							
Pseudonaja affinis					1			
Tiliqua rugosa subsp. rugosa					1			

Jandakot Airport Site 4

Described by MB **Date** 1/09/2008 **Type:** Fauna Trap Site
Season: **Uniformity**
Location *Banksia* Woodland
MGA Zone **mE** **mN**
Habitat Open *Banksia* woodland with jarrah ad *Melaleuca* scattered throughout, over open grasstree shrubland over closed mixed grassland.
Soil Sandy
Rock Type
Vegetation
Veg Condition Good Condition
Fire Age
Notes Aspect = flat,
Habitat: SAN **Logs:** 2 **Leaves:** 3 **Twigs:** 1 **Rocks:** 0 **Rock** 0 **Litter:** **Bare:** 20

Effort:

Species List: Number of individuals by Observed

Name	Pit	Pot	Ca	Ell	Fu	Ne	No	Opp
Reptiles								
Acritoscincus trilineatum					1			
Cryptoblepharus buchananii	1							1
Hemiergis quadrilineata	1							
Menetia greyii	1				1			
Pogona minor subsp. minor				1				
Pygopus lepidopodus					1			

Jandakot Airport Site 5

Described by MB **Date** 1/09/2008 **Type:** Fauna Trap Site
Season: **Uniformity**
Location Open *Melaleuca* woodland
MGA Zone **mE** **mN**
Habitat Low open *Melaleuca* woodland over open grasstrees shrubland over open mixed grasses
Soil Sandy
Rock Type
Vegetation Low open *Melaleuca* woodland over open grasstree shrubland over open mixed grasses
Veg Condition Good Condition
Fire Age
Notes Aspect = flat;
Habitat: SAN **Logs:** 2 **Leaves:** 3 **Twigs:** 2 **Rocks:** 0 **Rock** 0 **Litter:** **Bare:** 20

Effort:

Species List: Number of individuals by Observed

Name	Pit	Pot	Ca	Ell	Fu	Ne	No	Opp

Jandakot Airport Site 6

Described by MB **Date** 1/09/2008 **Type:** Fauna Trap Site
Season: **Uniformity**
Location *Banksia* Woodland/ hill top
MGA Zone **mE** **mN**
Habitat *Banksia* Woodland
Soil
Rock Type
Vegetation Open *Banksia* woodland over low open mixed shrubland over mixed grasses
Veg Condition Good Condition
Fire Age
Notes Aspect = flat,
Habitat: SAN **Logs:** 2 **Leaves:** 4 **Twigs:** 1 **Rocks:** 0 **Rock** 0 **Litter:** **Bare:** 20

Effort:

Species List: Number of individuals by Observed

Name	Pit	Pot	Ca	Ell	Fu	Ne	No	Opp
Mammals								
Mus musculus				2				

APPENDIX G

FAUNA SPECIES EXPECTED AND OBSERVED IN THE PROJECT AREA AND IN ITS VICINITY

APPENDIX G

Fauna Species Previously Recorded in the Region, and Those Recorded During the Survey

Key: A= Western Australian Museum Records; B= EPBC Act Protected Matters Search Tool, C= DEC Threatened and Priority Fauna Database.

For Definitions of Conservation Codes see Appendix A.

D= Fauna Survey of Jandakot Airport (Bamford, Saffer & Wilcox 2002); E= Champion Lakes Fauna Assessment (Bamford 2003); F= Vertebrate Fauna of Ken Hurst Park (Dell & Cooper 1992); G= Fiona Stanley Hospital Fauna Assessment (GHD 2006), H= This survey

* = Introduced species, o = found outside the study area, u= unconfirmed.

Note. List of insects is not complete- only contains conservation significant fauna from database searches.

		Conservation Codes											
Common Name	**Scientific Name**	**EPBC**	**WC**	**DEC**	**Local**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**
MAMMALS	**MAMMALIA**												
Tachyglossidae													
Short-beaked Echidna	*Tachyglossus aculeatus*	-	-	-	-	x							
Dasyuridae													
Mardo	*Antechinus flavipes leucogaster*	-	-	-	✓	x							
Western Quoll / Chuditch	*Dasyurus geoffroii*	VU	S1	-	-	x	x						
Southern Brush-tailed Phascogale	*Phascogale tapoatafa* ssp. (WAM M434)	-	S1	-	✓								
Red-tailed Phascogale	*Phascogale calura*	EN	S1	-	-		x						
Fat-tailed Dunnart	*Sminthopsis crassicaudata*	-	-	-	-	x							
Little Long-tailed Dunnart	*Sminthopsis dolichura*	-	-	-	-	x							
Gilbert's Dunnart	*Sminthopsis gilberti*	-	-	-	-	x							
Grey-bellied Dunnart	*Sminthopsis griseoventer griseoventer*	-	-	-	-	x							
Myrmecobiidae													
Numbat, Walpurti	*Myrmecobius fasciatus*	VU	S1	-	-			x					
Peramelidae													
Quenda, Southern Brown Bandicoot	*Isoodon obesulus fusciventer*	-	-	P5	✓	x		x	x	x	x	x	x
Macropodidae													

Common Name	Scientific Name	Conservation Codes EPBC	WC	DEC	Local	A	B	C	D	E	F	G	H
Western Grey Kangaroo	*Macropus fuliginosus*	-	-	-	-	x			x		x		x
Western Brush Wallaby	*Macropus irma*	-	-	P4	✓	x		x	x		x		x
Euro	*Macropus robustus erubescens*	-	-	-	-	x							
Quokka	*Setonix brachyurus*	VU	S1	-	-		x						
Burramyidae													
Western Pygmy-possum	*Cercartetus concinnus*	-	-	-	✓	x							
Tarsipedidae													
Honey Possum	*Tarsipes rostratus*	-	-	-	✓	x			x				
Vespertilionidae													
Gould's Wattled Bat	*Chalinolobus gouldii*	-	-	-	-	x			x	x			x
Chocolate Wattled Bat	*Chalinolobus morio*	-	-	-	-	x			x				
Western False Pipistrelle	*Falsistrellus mackenziei*	-	-	P4	-	x			u				
Lesser Long-eared Bat	*Nyctophilus geoffroyi*	-	-	-	-	x			x	x			
Gould's Long-eared Bat	*Nyctophilus gouldi*	-	-	-	✓	x							
Greater Long-eared Bat	*Nyctophilus timoriensis timoriensis*	-	-	P4	-	x				x			
Long-eared Bat	*Nyctophilus* sp.	-	-	-	-								x
Southern Forest Bat	*Vespadelus regulus*	-	-	-	-	x			x				x
Molossidae													
White-striped Freetail-bat	*Tadarida australis*	-	-	-	-	x			x	x			x
Muridae													
Water Rat	*Hydromys chrysogaster*	-	-	P4	✓	x							
Ash-grey Mouse	*Pseudomys albocinereus*	-	-	-	✓	x							
House Mouse	**Mus musculus*	-	-	-	-	x			x		x	x	x
Brown Rat	**Rattus norvegicus*	-	-	-	-	x							
Bush Rat	*Rattus fuscipes*	-	-	-	-								
Black Rat	**Rattus rattus*	-	-	-	-	x			x			x	x
Leporidae													
European Rabbit	**Oryctolagus cuniculus*	-	-	-	-	x			x	x	x	x	x
Canidae													
Dog	**Canis lupus*	-	-	-	-							x	

Common Name	Scientific Name	Conservation Codes EPBC	WC	DEC	Local	A	B	C	D	E	F	G	H
European Red Fox	**Vulpes vulpes*	-	-	-	-	x			x	x	x	x	x
Felidae													
Cat	**Felis catus*	-	-	-	-	x			x	x	x		x
Mustelidae													
European Polecat / Ferret	**Mustela putorius*	-	-	-	-	x							
Equidae													
Horse	**Equus caballus*	-	-	-	-	x							
Bovidae													
European Cattle	**Bos taurus*	-	-	-	-	x							
Goat	**Capra hircus*	-	-	-	-							x	
BIRDS	**AVES**												
Casuariidae													
Emu	*Dromaius novaehollandiae*	-	-	-	✓	x							
Phasianidae													
Stubble Quail	*Coturnix pectoralis*	Ma	-	-	-	x			x				
Brown Quail	*Coturnix ypsilophora*	-	-	-	-	x							x
Anatidae													
Chestnut Teal	*Anas castanea*	-	-	-	-	x							
Grey Teal	*Anas gracilis*	-	-	-	-	x				x			
Australasian Shoveller	*Anas rhynchotis*	-	-	-	✓					x			
Pacific Black Duck	*Anas superciliosa*	-	-	-	-	x				x		x	x
Hardhead	*Aythya australis*	-	-	-	✓	x				x			
Musk Duck	*Biziura lobata*	Ma	-	-	✓	x				x			
Australian Wood Duck	*Chenonetta jubata*	-	-	-	-	x						x	
Black Swan	*Cygnus atratus*	-	-	-	-	x				x			
Pink-eared Duck	*Malacorhynchus membranaceus*	-	-	-	✓	x				x			
Blue-billed Duck	*Oxyura australis*	-	-	-	✓	x							
Freckled Duck	*Stictonetta naevosa*	-	-	-	✓	x							
Australian Shelduck	*Tadorna tadornoides*	-	-	-	-					x			

Common Name	Scientific Name	Conservation Codes EPBC	WC	DEC	Local	A	B	C	D	E	F	G	H
Podicipedidae													
Great Crested Grebe	*Podiceps cristatus australis*	-	-	-	-	x							
Hoary-headed Grebe	*Poliocephalus poliocephalus*	-	-	-	-	x				x			
Australasian Grebe	*Tachybaptus novaehollandiae*	-	-	-	-	x				x		x	
Anhingidae													
Darter	*Anhinga melanogaster novaehollandiae*	-	-	-	-	x							
Phalacrocoracidae													
Great Cormorant	*Phalacrocorax carbo novaehollandiae*	-	-	-	-	x							
Little Pied Cormorant	*Phalacrocorax melanoleucos melanoleucos*	-	-	-	-	x				x		x	
Little Black Cormorant	*Phalacrocorax sulcirostris*	-	-	-	-	x							
Pied Cormorant	*Phalacrocorax varius hypoleucos*	-	-	-	-	x							
Pelecanidae													
Australian Pelican	*Pelecanus conspicillatus*	-	-	-	-	x			x			x	
Ardeidae													
Great Egret	*Ardea alba*	Mi, Ma	-	-	-		x			x			
Cattle Egret	*Ardea ibis*	Mi, Ma	-	-	-		x						
White-necked Heron	*Ardea pacifica*	-	-	-	-	x							
Little Egret	*Egretta garzetta*	Ma	-	-	-								
White-faced Heron	*Egretta novaehollandiae*	-	-	-	-	x				x		x	
Australasian Bittern	*Botaurus poiciloptilus*	-	S1	-	✓	x							
Little Bittern	*Ixobrychus flavicollis australis*	-	-	P4	✓	x							
Black Bittern	*Ixobrychus minutus dubius*	-	-	P3	✓	x							
Rufous Night Heron	*Nycticorax caledonicus hilli*	Ma	-	-	✓	x							
Threskiornithidae													
Yellow-billed Spoonbill	*Platalea flavipes*	-	-	-	-	x						x	
Australian White Ibis	*Threskiornis molucca*	Ma	-	-	-				x	x		x	x
Straw-necked Ibis	*Threskiornis spinicollis*	Ma	-	-	-	x			x			x	x

Common Name	Scientific Name	Conservation Codes EPBC	WC	DEC	Local	A	B	C	D	E	F	G	H
Accipitridae													
Collared Sparrowhawk	*Accipiter cirrocephalus cirrocephalus*	-	-	-	✓	x			x				x
Brown Goshawk	*Accipiter fasciatus fasciatus*	Ma	-	-	✓	x			x		x		
Wedge-tailed Eagle	*Aquila audax*	-	-	-	✓	x			x	x			
Swamp Harrier	*Circus approximans*	-	-	-	-	x							
Black-shouldered Kite	*Elanus caeruleus axillaris*	-	-	-	-	x					x		x
Whistling Kite	*Haliastur sphenurus*	Ma	-	-	✓	x							
Square-tailed Kite	*Hamirostra isura*	-	-	-	✓	x							
Little Eagle	*Hieraaetus morphnoides*	-	-	-	✓				x				x
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	Mi, Ma	-	-	-		x						
Falconidae													
Brown Falcon	*Falco berigora berigora*	-	-	-	✓	x			x				
Nankeen Kestrel	*Falco cenchroides cenchroides*	Ma	-	-	-	x			x	x	x	x	x
Australian Hobby	*Falco longipennis longipennis*	-	-	-	-	x							x
Peregrine Falcon	*Falco peregrinus macropus*	-	S4	-	✓	x							
Rallidae													
Eurasian Coot	*Fulica atra australis*	-	-	-	-	x				x		x	
Dusky Moorhen	*Gallinula tenebrosa tenebrosa*	-	-	-	✓	x						x	
Black-tailed Native-hen	*Gallinula ventralis*	-	-	-	-	x							
Buff-banded Rail	*Gallirallus philippensis mellori*	Ma	-	-	-	x							
Purple Swamphen	*Porphyrio porphyrio bellus*	Ma	-	-	-	x				x		x	
Australian Spotted Crake	*Porzana fluminea*	-	-	-	-	x							
Baillon's Crake	*Porzana pusilla palustris*	-	-	-	-	x							
Spotless Crake	*Porzana tabuensis*	Ma	-	-	-	x							
Turnicidae													
Painted Button-Quail	*Turnix varia varia*	-	-	-	✓	x			x		x		
Little Bustard-Quail	*Turnix velox*	-	-	-	-	x							
Scolopacidae													
Common Sandpiper	*Actitis hypoleucos*	Mi, Ma	-	-	✓								
Sharp-tailed Sandpiper	*Calidris acuminata*	Mi, Ma	-	-	✓	x							
Curlew Sandpiper	*Calidris ferruginea*	Mi, Ma	-	-	✓		x						
Red-necked Stint	*Calidris ruficollis*	Mi, Ma	-	-	✓	x							
Black-tailed Godwit	*Limosa limosa melanuroides*	Mi, Ma	-	-	✓	x							

Common Name	Scientific Name	Conservation Codes EPBC	WC	DEC	Local	A	B	C	D	E	F	G	H
Eastern Curlew	*Numenius madagascariensis*	Mi, Ma	-	P4	✓	x							
Wood Sandpiper	*Tringa glareola*	Mi, Ma	-	-	✓	x	x						
Common Greenshank	*Tringa nebularia*	Mi, Ma	-	-	✓	x							
Marsh Sandpiper	*Tringa stagnatilis*	Mi, Ma	-	-	✓	x							
Recurvirostridae													
Banded Stilt	*Cladorhynchus leucocephalus*	-	-	-	-	x							
Black-winged Stilt	*Himantopus himantopus leucocephalus*	Ma	-	-	-	x							
Red-necked Avocet	*Recurvirostra novaehollandiae*	Ma	-	-	-	x							
Charadriidae													
Greater Sand Plover	*Charadrius leschenaultii leschenaultii*	Mi, Ma	-	-	✓								
Hooded Plover	*Charadrius rubricollis rubricollis*	Ma	-	P4	✓								
Red-capped Plover	*Charadrius ruficapillus*	Ma	-	-	-	x				x			
Black-fronted Dotterel	*Elseyornis melanops*	-	-	-	-					x			
Red-kneed Dotterel	*Erythrogonys cinctus*	-	-	-	✓	x							
Masked Lapwing	*Vanellus miles*	-	-	-	-	x							
Banded Lapwing	*Vanellus tricolor*	-	-	-	-	x			x				x
Laridae													
Whiskered Tern	*Chlidonias hybridus*	Ma	-	-	-								
Silver Gull	*Larus novaehollandiae novaehollandiae*	Ma	-	-	-					x		x	
Columbidae													
Domestic Pigeon	**Columba livia*	-	-	-	-	x				x	x		
Crested Pigeon	*Ocyphaps lophotes*	-	-	-	-					x			x
Common Bronzewing	*Phaps chalcoptera*	-	-	-	✓	x			x	x	x	x	x
Brush Bronzewing	*Phaps elegans*	-	-	P4	✓	x							
Spotted Turtle-dove	**Streptopelia chinensis tigrina*	-	-	-	-	x			x	x		x	x
Laughing Turtle-dove	**Streptopelia senegalensis*	-	-	-	-	x			x	x	x	x	x
Cacatuidae													
Sulphur-crested Cockatoo	*Cacatua galerita*	-	-	-	-	x							
Galah	*Cacatua roseicapilla assimilis*	-	-	-	-				x	x		x	x

Common Name	Scientific Name	Conservation Codes EPBC	WC	DEC	Local	A	B	C	D	E	F	G	H
Western Corella	*Cacatua pastinator butleri*	-	-	-	-	x							
Little Corella	*Cacatua sanguinea westralensis*	-	-	-	-	x							
Long Billed Corella	*Cacatua tenuirostris*	-	-	-	-								
Corella sp.	*Cacatua* sp.	-	-	-	-				x				x
Forest Red-tailed Black Cockatoo	*Calyptorhynchus banksii naso*	-	S1	-	✓	x							x
Baudin's Cockatoo	*Calyptorhynchus baudinii*	VU	S1	-	✓	x	x						
Carnaby's Cockatoo	*Calyptorhynchus latirostris*	EN	S1	-	✓	x	x		x		x	x	x
Psittacidae													
Australian Ringneck	*Barnardius zonarius semitorquatus*	-	-	-	-				x	x	x	x	x
Purple-crowned Lorikeet	*Glossopsitta porphyrocephala*	-	-	-	-	x							
Budgerigar	*Melopsittacus undulatus*	-	-	-	-	x							
Elegant Parrot	*Neophema elegans*	-	-	-	-	x							
Rock Parrot	*Neophema petrophila*	Ma	-	-	✓								
Western Rosella	*Platycercus icterotis icterotis*	-	-	-	✓	x							
Red-capped Parrot	*Platycercus spurius*	-	-	-	-	x			x		x		x
Regent Parrot	*Polytelis anthopeplus anthopeplus*	-	-	-	-	x							
Rainbow Lorikeet	*Trichoglossus haematodus rubritorquis*	-	-	-	-	x			x	x	x	x	x
Cuculidae													
Fan-tailed Cuckoo	*Cacomantis flabelliformis*	Ma	-	-	-								x
Horsfield's Bronze-cuckoo	*Chrysococcyx basalis*	Ma	-	-	-	x			x				x
Shining Bronze-Cuckoo	*Chalcites lucidus plagosus*	Ma	-	-	-						x		x
Pallid Cuckoo	*Cuculus pallidus*	Ma	-	-	-	x			x				
Strigidae													
Southern Boobook Owl	*Ninox novaeseelandiae boobook*	Ma	-	-	-	x			x				
Tytonidae													
Barn Owl	*Tyto alba delicatula*	-	-	-	-	x							
Masked Owl	*Tyto novaehollandiae novaehollandiae*	-	-	P3	✓	x							
Podargidae													

Common Name	Scientific Name	Conservation Codes EPBC	WC	DEC	Local	A	B	C	D	E	F	G	H
Tawny Frogmouth	*Podargus strigoides brachypterus*	-	-	-	-	x			x				
Aegothelidae													
Australian Owlet Nightjar	*Aegotheles cristatus cristatus*	-	-	-	-	x							
Apodidae													
Fork-tailed Swift	*Apus pacificus pacificus*	Mi, Ma	-	-	-	x	x						
Halcyonidae													
Laughing Kookaburra	*Dacelo novaeguineae novaeguineae*	-	-	-	-	x			x	x		x	
Sacred Kingfisher	*Todiramphus sanctus sanctus*	-	-	-	-	x					x		
Meropidae													
Rainbow Bee-eater	*Merops ornatus*	Mi, Ma	-	-	-	x	x		x		x	x	
Climacteridae													
Rufous Treecreeper	*Climacteris rufa*	-	-	-	✓	x							
Maluridae													
Red-winged Fairy-wren	*Malurus elegans*	-	-	-	✓	x							
Variegated Fairy-wren	*Malurus lamberti*	-	-	-	✓								
White-winged Fairy-wren	*Malurus leucopterus*	-	-	-	✓								
Splendid Fairy-wren	*Malurus splendens splendens*	-	-	-	✓	x			x	x	x		x
Southern Emu-wren	*Stipiturus malachurus westernensis*	-	-	-	✓	x							
Pardalotidae													
Spotted Pardalote	*Pardalotus punctatus punctatus*	-	-	-	-	x							
Striated Pardalote	*Pardalotus striatus westraliensis*	-	-	-	-	x			x		x		x
Acanthizidae													
Inland Thornbill	*Acanthiza apicalis*	-	-	-	✓	x			x	x			
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	-	-	-	✓	x			x	x	x		x
Western Thornbill	*Acanthiza inornata*	-	-	-	✓	x			x				
Chestnut-rumped Thornbill	*Acanthiza uropygialis*	-	-	-	-	x							

Common Name	Scientific Name	Conservation Codes											
		EPBC	WC	DEC	Local	A	B	C	D	E	F	G	H
Western Warbler	*Gerygone fusca fusca*	-	-	-	-	x			x				x
White-browed Scrubwren	*Sericornis frontalis maculatus*	-	-	-	✓	x							
Weebill	*Smicrornis brevirostris*	-	-	-	✓	x			x			x	
Meliphagidae													
Western Spinebill	*Acanthorhynchus superciliosus*	-	-	-	-	x			x		x		x
Red Wattlebird	*Anthochaera carunculata*	-	-	-	-	x			x	x	x	x	x
Western Little Wattlebird	*Anthochaera lunulata*	-	-	-	✓	x			x			x	x
White-fronted Chat	*Epthianura albifrons*	-	-	-	-	x						x	
Yellow-plumed Honeyeater	*Lichenostomus ornatus*	-	-	-	✓	x							
Singing Honeyeater	*Lichenostomus virescens*	-	-	-	-	x			x		x	x	x
Brown Honeyeater	*Lichmera indistincta indistincta*	-	-	-	-	x			x	x	x	x	x
Yellow-throated Miner	*Manorina flavigula*	-	-	-	✓	x							
Brown-headed Honeyeater	*Melithreptus brevirostris leucogenys*	-	-	-	-	x							
Western White-naped Honeyeater	*Melithreptus chloropsis*	-	-	-	✓	x							
Tawny-crowned Honeyeater	*Phylidonyris melanops*	-	-	-	✓	x			x				
White-cheeked Honeyeater	*Phylidonyris nigra gouldii*	-	-	-	✓	x			x		x	x	x
New Holland Honeyeater	*Phylidonyris novaehollandiae*	-	-	-	✓	x			x		x	x	x
Petroicidae													
Western Yellow Robin	*Eopsaltria australis griseogularis*	-	-	-	✓	x							
White-breasted Robin	*Eopsaltria georgiana*	-	-	-	✓	x							
Jacky Winter	*Microeca fascinans*	-	-	-	-								
Hooded Robin	*Melanodryas cucullata westralensis*	-	-	-	✓				x				
Red-capped Robin	*Petroica goodenovii*	-	-	-	-	x							
Scarlet Robin	*Petroica multicolor campbelli*	-	-	-	✓	x			x				
Neosittidae													
Varied Sittella	*Daphoenositta chrysoptera pileata*	-	-	-	✓	x			x				
Pachycephalidae													
Grey Shrike-thrush	*Colluricincla harmonica rufiventris*	-	-	-	✓	x			x		x	x	x
Golden Whistler	*Pachycephala pectoralis fuliginosa*	-	-	-	✓	x			x				x

Common Name	Scientific Name	Conservation Codes EPBC	WC	DEC	Local	A	B	C	D	E	F	G	H
Rufous Whistler	*Pachycephala rufiventris rufiventris*	-	-	-	-	x			x		x	x	x
Dicruridae													
Magpie-lark	*Grallina cyanoleuca*	-	-	-	-	x			x	x	x	x	x
Restless Flycatcher	*Myiagra inquieta*	-	-	-	✓								
Grey Fantail	*Rhipidura fuliginosa preissi*	-	-	-	-	x			x	x	x		
Willie Wagtail	*Rhipidura leucophrys leucophrys*	-	-	-	-	x			x	x	x	x	x
Campephagidae													
Black-faced Cuckoo-shrike	*Coracina novaehollandiae novaehollandiae*	-	-	-	-	x			x	x	x	x	x
White-winged Triller	*Lalage tricolor*	-	-	-	-	x			x				
Artamidae													
Black-faced Woodswallow	*Artamus cinereus cinereus*	-	-	-	✓				x	x	x	x	
Dusky Woodswallow	*Artamus cyanopterus*	-	-	-	✓	x							
Masked Woodswallow	*Artamus personatus*	-	-	-	-	x							
Grey Butcherbird	*Cracticus torquatus*	-	-	-	-	x			x	x	x		x
Australian Magpie	*Gymnorhina tibicen dorsalis*	-	-	-	-				x	x	x	x	x
Grey Currawong	*Strepera versicolor*	-	-	-	✓	x							
Corvidae													
Australian Raven	*Corvus coronoides perplexus*	-	-	-	-	x			x	x	x	x	x
Hirundinidae													
White-backed Swallow	*Cheramoeca leucosternus*	-	-	-	-								
Fairy Martin	*Hirundo ariel*	-	-	-	-	x							
Welcome Swallow	*Hirundo neoxena*	Ma	-	-	-	x			x		x	x	
Tree Martin	*Hirundo nigricans nigricans*	Ma	-	-	-	x			x		x	x	x
Zosteropidae													
Silvereye	*Zosterops lateralis gouldi*	-	-	-	-	x			x	x	x	x	x
Sylviidae													
Brown Songlark	*Cincloramphus cruralis*	-	-	-	-	x							
Rufous Songlark	*Cincloramphus mathewsi*	-	-	-	-	x							

Common Name	Scientific Name	Conservation Codes EPBC	WC	DEC	Local	A	B	C	D	E	F	G	H
Little Grassbird	*Megalurus gramineus gramineus*	-	-	-	-	x							
Dicaeidae													
Mistletoebird	*Dicaeum hirundinaceum*	-	-	-	-	x			x				
REPTILES	**REPTILIA**												
Agamidae													
Bearded Dragon	*Pogona minor minor*	-	-	-	-	x			x		x	x	x
Western Heath Dragon	*Rankinia adelaidensis adelaidensis*	-	-	-	-	x			x		x		
Gekkonidae													
Marbled Gecko	*Christinus marmoratus*	-	-	-	-	x							
Clawless Gecko	*Crenadactylus ocellatus ocellatus*	-	-	-	-	x							
Wheatbelt Stone Gecko	*Diplodactylus granariensis granariensis*	-	-	-	-	x							
Speckled Stone Gecko	*Diplodactylus polyophthalmus*	-	-	-	-	x							
Beautiful Gecko	*Diplodactylus pulcher*	-	-	-	-	x							
Tree Dtella	*Gehyra variegata*	-	-	-	-	x							
Asian House Gecko	**Hemidactylus frenatus*	-	-	-	-	x							
Bynoe's Gecko	*Heteronotia binoei*	-	-	-	✓	x							
White-spotted Ground Gecko	*Lucasium alboguttatum*	-	-	-	-	x							
Soft Spiny-tailed Gecko	*Strophurus spinigerus inornatus*	-	-	-	-	x							
Barking Gecko	*Underwoodisaurus milii*	-	-	-	-	x							
Pygopodidae													
Javelin Legless Lizard	*Aclys concinna concinna*	-	-	-	✓								
Sandplain Worm Lizard	*Aprasia repens*	-	-	-	-	x					x		
Fraser's Legless Lizard	*Delma fraseri fraseri*	-	-	-	-	x			x		x		x
Side-barred Delma	*Delma grayii*	-	-	-	-	x			x		x		
Burton's Legless Lizard	*Lialis burtonis*	-	-	-	-	x			x				
Keeled Legless Lizard	*Pletholax gracilis gracilis*	-	-	-	✓	x			x				
Common Scaly-foot	*Pygopus lepidopodus*	-	-	-	-	x			x		x		x
Scincidae													

Common Name	Scientific Name	Conservation Codes											
		EPBC	WC	DEC	Local	A	B	C	D	E	F	G	H
Southwestern Cool Skink	*Acritoscincus trilineatum*	-	-	-	✓	x			x		x		x
Fence Skink	*Cryptoblepharus plagiocephalus*	-	-	-	-	x			x		x	x	
Buchanan's Snake-eyed Skink	*Cryptoblepharus buchananii*	-	-	-	-								x
Western Limestone Ctenotus	*Ctenotus australis*	-	-	-	-	x			x		x	x	
	Ctenotus catenifer	-	-	-	-								
	Ctenotus fallens	-	-	-	-	x						x	
	Ctenotus gemmula	-	-	P3	✓	x							
Odd-striped Skink	*Ctenotus impar*	-	-	-	-	x							
Coastal Slender Bluetongue	*Cyclodomorphus celatus*	-	-	-	-	x							
King's Skink	*Egernia kingii*	-	-	-	-	x							
Southwestern Crevice Skink	*Egernia napoleonis*	-	-	-	-	x			x				
Spectacled Rock Skink	*Egernia pulchra pulchra*	-	-	-	-	x							
Banded Skink	*Eremiascincus richardsonii*	-	-	-	-	x							
Southwestern Mulch Skink	*Glaphyromorphus gracilipes*	-	-	-	-								
Five-toed Earless Skink	*Hemiergis initialis initialis*	-	-	-	-	x							
Three-toed Earless Skink	*Hemiergis peronii tridactyla*	-	-	-	-								
Two-toed Earless Skink	*Hemiergis quadrilineata*	-	-	-	-	x			x			x	x
	Lerista christinae	-	-	-	✓								
	Lerista distinguenda	-	-	-	-	x							
West Coast Four-toed Lerista	*Lerista elegans*	-	-	-	-	x			x		x	x	x
	Lerista lineata	-	-	P3	✓	x			x		x	x	
	Lerista lineopunctulata	-	-	-	-	x		x				x	
	Lerista praepedita	-	-	-	✓	x							
Common Dwarf Skink	*Menetia greyii*	-	-	-	-	x			x		x	x	x
Western Pale-flecked Morethia	*Morethia lineoocellata*	-	-	-	-	x							
Woodland Flecked Skink	*Morethia obscura*	-	-	-	-	x							
Western Blue-tongue	*Tiliqua occipitalis*	-	-	-	-	x			x		x	x	
Southwestern Bobtail	*Tiliqua rugosa rugosa*	-	-	-	-	x			x		x	x	x
Varanidae													
Gould's Sand Monitor	*Varanus gouldii*	-	-	-	-	x			x				
Southern Heath Monitor	*Varanus rosenbergi*	-	-	-	-	x							
Black-headed Monitor	*Varanus tristis tristis*	-	-	-	-	x							
Typhlopidae													
Southern Blind Snake	*Ramphotyphlops australis*	-	-	-	-	x			x				
	Ramphotyphlops bituberculatus	-	-	-	-	x							

Common Name	Scientific Name	Conservation Codes EPBC	WC	DEC	Local	A	B	C	D	E	F	G	H
	Ramphotyphlops pinguis	-	-	-	-	x							
	Ramphotyphlops waitii	-	-	-	-	x							
Boidae													
Southern Carpet Python	*Morelia spilota imbricata*	-	S4	P4	-	x							
Elapidae													
Southern shovel-nosed snake	*Brachyurophis semifasciata*	-	-	-	-	x							
Western Reticulated Whip-snake	*Demansia psammophis reticulata*	-	-	-	-	x			x				x
Bardick	*Echiopsis curta*	-	-	-	-	x							
Crowned Snake	*Elapognathus coronatus*	-	-	-	✓	x							
Black-naped Snake	*Neelaps bimaculatus*	-	-	-	-	x					x		
Black-striped Snake	*Neelaps calonotos*	-	-	P3	✓	x			x				
Tiger Snake	*Notechis scutatus*	-	-	-	-	x							
Gould's Snake	*Parasuta gouldii*	-	-	-	✓	x			x		x		
Black-backed Snake	*Parasuta nigriceps*	-	-	-	-	x							
Mulga Snake	*Pseudechis australis*	-	-	-	-	x							
Dugite	*Pseudonaja affinis affinis*	-	-	-	-	x			x		x	x	x
Ringed Brown Snake	*Pseudonaja modesta*	-	-	-	✓	x							
Gwardar	*Pseudonaja nuchalis*	-	-	-	-	x							
Jan's Banded Snake	*Simoselaps bertholdi*	-	-	-	-	x							
AMPHIBIANS (FROGS)	**AMPHIBIA**												
Hylidae													
Slender Tree Frog	*Litoria adelaidensis*	-	-	-	-	x						x	o
Motorbike Frog / Bell Frog	*Litoria moorei*	-	-	-	-	x							
Myobatrachidae													
Quacking Frog	*Crinia georgiana*	-	-	-	-	x						x	o
Glauert's Froglet	*Crinia glauerti*	-	-	-	-	x							
Squelching Froglet	*Crinia insignifera*	-	-	-	✓	x						x	
Bleating Froglet	*Crinia pseudinsignifera*	-	-	-	-	x							
Lea's Frog	*Geocrinia leai*	-	-	-	-	x							
Western Spotted Frog	*Heleioporus albopunctatus*	-	-	-	-	x							
Western Marsh Frog	*Heleioporus barycragus*	-	-	-	✓	x							
Moaning Frog	*Heleioporus eyrei*	-	-	-	-	x			x		x		

Common Name	Scientific Name	Conservation Codes											
		EPBC	WC	DEC	Local	A	B	C	D	E	F	G	H
Whooping Frog	*Heleioporus inornatus*	-	-	-	-	x							
Sand Frog	*Heleioporus psammophilus*	-	-	-	-	x							x
Bullfrog / Banjo Frog	*Limnodynastes dorsalis*	-	-	-	-	x			x		x	x	x
Turtle Frog	*Myobatrachus gouldii*	-	-	-	-	x			x		x		
Wheatbelt Frog	*Neobatrachus kunapalari*	-	-	-	-	x							
Humming Frog	*Neobatrachus pelobatoides*	-	-	-	-	x							
Crawling Frog	*Pseudophryne guentheri*	-	-	-	-	x					x		
INSECTS	**INSECTA**												
Cricket	*Throscodectes xiphos*	-	-	P1	-			x					

APPENDIX H
AMPHIBIAN INVENTORY

JANDAKOT AIRPORT FAUNA SURVEY

APPENDIX H

Amphibian Species Inventory

Family	Common Name	Species Name
Hylidae	Slender Tree Frog	*Litoria adelaidensis*
Myobatrachidae	Quacking Frog	*Crinia georgiana*
	Sand Frog	*Heleioporus psammophilus*
	Bullfrog / Banjo Frog	*Limnodynastes dorsalis*

APPENDIX I
REPTILE INVENTORY

JANDAKOT AIRPORT FAUNA SURVEY

APPENDIX I

Reptile Species Inventory

Family	Common Name	Species Name
Agamidae	Bearded Dragon	*Pogona minor minor*
Pygopodidae	Fraser's Legless Lizard	*Delma fraseri fraseri*
	Common Scaly-foot	*Pygopus lepidopodus*
Scincidae	Southwestern Cool Skink	*Acritoscincus trilineatum*
	Buchanan's Snake-eyed Skink	*Cryptoblepharus buchananii*
	Two-toed Earless Skink	*Hemiergis quadrilineata*
	West Coast Four-toed Lerista	*Lerista elegans*
	Common Dwarf Skink	*Menetia greyii*
	Southwestern Bobtail	*Tiliqua rugosa rugosa*
Elapidae	Western Reticulated Whip-snake	*Demansia psammophis reticulata*
	Dugite	*Pseudonaja affinis affinis*

APPENDIX J
BIRD INVENTORY

JANDAKOT AIRPORT FAUNA SURVEY

APPENDIX J

Bird Species Inventory

Family	Common Name	Species Name
Phasianidae	Brown Quail	*Coturnix ypsilophora*
Anatidae	Pacific Black Duck	*Anas superciliosa*
Threskiornithidae	Australian White Ibis	*Threskiornis molucca*
	Straw-necked Ibis	*Threskiornis spinicollis*
Accipitridae	Collared Sparrowhawk	*Accipiter cirrocephalus cirrocephalus*
	Black-shouldered Kite	*Elanus caeruleus axillaris*
	Little Eagle	*Hieraaetus morphnoides*
Falconidae	Nankeen Kestrel	*Falco cenchroides cenchroides*
	Australian Hobby	*Falco longipennis longipennis*
Charadriidae	Banded Lapwing	*Vanellus tricolor*
Columbidae	Crested Pigeon	*Ocyphaps lophotes*
	Common Bronzewing	*Phaps chalcoptera*
	Spotted Turtle-dove	**Streptopelia chinensis tigrina*
	Laughing Turtle-dove	**Streptopelia senegalensis*
Cacatuidae	Galah	*Cacatua roseicapilla assimilis*
	Western Corella	*Cacatua pastinator pastinator*
	Forest Red-tailed Black Cockatoo	*Calyptorhynchus banksii naso*
	Carnaby's Cockatoo	*Calyptorhynchus latirostris*
Psittacidae	Australian Ringneck	*Barnardius zonarius semitorquatus*
	Red-capped Parrot	*Platycercus spurius*
	Rainbow Lorikeet	**Trichoglossus haematodus rubritorquis*
Cuculidae	Fan-tailed Cuckoo	*Cacomantis flabelliformis*
	Horsfield's Bronze-cuckoo	*Chrysococcyx basalis*

Family	Common Name	Species Name
	Shining Bronze-Cuckoo	*Chalcites lucidus plagosus*
Maluridae	Splendid Fairy-wren	*Malurus splendens splendens*
Pardalotidae	Striated Pardalote	*Pardalotus striatus westraliensis*
Acanthizidae	Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*
	Western Warbler	*Gerygone fusca fusca*
Meliphagidae	Western Spinebill	*Acanthorhynchus superciliosus*
	Red Wattlebird	*Anthochaera carunculata*
	Western Little Wattlebird	*Anthochaera lunulata*
	Singing Honeyeater	*Lichenostomus virescens*
	Brown Honeyeater	*Lichmera indistincta indistincta*
	White-cheeked Honeyeater	*Phylidonyris nigra gouldii*
	New Holland Honeyeater	*Phylidonyris novaehollandiae*
Pachycephalidae	Grey Shrike-thrush	*Colluricincla harmonica rufiventris*
	Golden Whistler	*Pachycephala pectoralis fuliginosa*
	Rufous Whistler	*Pachycephala rufiventris rufiventris*
Dicruridae	Magpie-lark	*Grallina cyanoleuca*
	Willie Wagtail	*Rhipidura leucophrys leucophrys*
Campephagidae	Black-faced Cuckoo-shrike	*Coracina novaehollandiae novaehollandiae*
Artamidae	Grey Butcherbird	*Cracticus torquatus*
	Australian Magpie	*Gymnorhina tibicen dorsalis*
Corvidae	Australian Raven	*Corvus coronoides perplexus*
Hirundinidae	Tree Martin	*Hirundo nigricans nigricans*
Zosteropidae	Silvereye	*Zosterops lateralis gouldi*

Introduced species are denoted by [*].

APPENDIX K
MAMMAL INVENTORY

JANDAKOT AIRPORT FAUNA SURVEY

APPENDIX K

Mammal Species Inventory

Family	Common Name	Species Name
Peramelidae	Southern Brown Bandicoot	*Isoodon obesulus fusciventer*
Macropodidae	Western Grey Kangaroo	*Macropus fuliginosus*
	Western Brush Wallaby	*Macropus irma*
Vespertilionidae	Gould's Wattled Bat	*Chalinolobus gouldii*
	Long-eared Bat	*Nyctophilus* sp.
	Southern Forest Bat	*Vespadelus regulus*
Molossidae	White-striped Freetail-bat	*Tadarida australis*
Muridae	House Mouse	**Mus musculus*
	Black Rat	**Rattus rattus*
Leporidae	European Rabbit	**Oryctolagus cuniculus*
Canidae	European Red Fox	**Vulpes vulpes*
Felidae	Cat	**Felis catus*

Introduced species are denoted by [*].

APPENDIX L

BAT CALL IDENTIFICATION FROM JANDAKOT, WESTERN AUSTRALIA

Specialised Zoological

Bat call identification

from Jandakot, WA

Type:	Bat Call Analysis
Prepared for:	ENV Australia
Date:	24 September 2008
Job No.:	SZ065
Prepared by:	Specialised Zoological Kyle Armstrong and Yuki Konishi ABN 92 265 437 422 0404 423 264 kyle.armstrong@graduate.uwa.edu.au kyle.n.armstrong@gmail.com

SUMMARY

Bat identifications from Anabat echolocation call recordings are provided from near Jandakot Airport, Perth, Western Australia. Four species were identified with a 'medium' to 'high' level of confidence (Table 1).

The calls of *Nyctophilus* are typically difficult to identify to species, and those recorded may be attributed to the lesser long-eared bat *Nyctophilus geoffroyi*, Gould's long-eared bat *Nyctophilus gouldi* or the central greater long-eared bat *Nyctophilus timoriensis* (central form), which is listed under Priority 4 of the WA Department of Environment and Conservation's Priority Fauna List. It is still unclear whether this central form represents a subspecies of *Nyctophilus timoriensis* or a distinct species (McKenzie and Parnaby 2008).

Details supporting the identifications are provided, as recommended by the Australasian Bat Society (ABS 2006). A summary of pulse parameters is provided in Table 2, and representative call sequences are illustrated in Figure 1. Further data is available should verification be required.

METHODS

Signals as recorded with an Anabat SD1 unit were supplied as downloaded sequences, which were examined in AnalookW 3.5f software. Three call variables were measured on good quality search phase pulses in representative call sequences: pulse duration (milliseconds), maximum frequency (kHz) and characteristic frequency (equivalent to minimum frequency; kHz). Species were identified based on information in Fullard et al. (1991). Nomenclature follows Armstrong and Reardon (2006).

REFERENCES

ABS (2006). Recommendations of the Australasian Bat Society Inc for reporting standards for insectivorous bat surveys using bat detectors. *The Australasian Bat Society Newsletter* 27: 6–9. [ISSN 1448-5877]

Armstrong, K. and Reardon, T. (2006). Standardising common names of bats in Australia. *The Australasian Bat Society Newsletter* 26: 37–42.

Fullard, J.H., Koehler, C., Surlykke, A. and McKenzie, N.L. (1991). Echolocation ecology and flight morphology of insectivorous bats (Chiroptera) in south-western Australia. *Australian Journal of Zoology* 39: 427–438.

McKenzie, N.L. and Parnaby, H. (2008). Central long-eared bat *Nyctophilus* sp. pp. 525–526. In: Mammals of Australia 3rd edition (ed. S. Van Dyck). Australian Museum.

TABLE 1. Species identifications, with the degree of confidence indicated by a code. Date correlates with site; see Table 2 for full species names.

Date	*C. gouldii*	*Nyctophilus* sp.	*T. australis*	*V. regulus*
Serial 3691				
1/09/2008	H	M	H	H
2/09/2008	H	—	—	H
3/09/2008	H	M	—	H
4/09/2008	H	M	—	H
5/09/2008	H	M	—	H

Definition of confidence level codes:

R Reference. Capture of the species was made at the site, and the identification is supported by measurements, a *Reference* call recording, and/or submission of a specimen/tissue to a museum.

H High. Unambiguous identification of the species at the site based on measured call characteristics and comparison with available reference material.

M Medium. Either call quality was poor, or the species cannot be distinguished reliably from another that makes similar calls. Alternative identifications are indicated in the Summary section of this report. If this is a species of conservation significance, further survey work might be required to confirm the record.

TABLE 2. Summary of variables from representative call sequences.

Species	s,p[1]	Duration (msec)[2]	Max Frequency (kHz)[2]	Char frequency (kHz)[2]
Gould's wattled bat *Chalinolobus gouldii*	4,31	6.7 ± 1.2 4.7 – 9.3	33.6 ± 5.3 29.1 – 57.1	27.7 ± 1.8 25.7 – 31.5
Unidentified long-eared bat *Nyctophilus* sp.	3,33	3.5 ± 0.7 2.3 – 5.0	72.2 ± 11.5 55.2 – 99.4	42.0 ± 3.6 35.6 – 47.6
White-striped free-tailed bat *Tadarida australis*	1,4	13.4 ± 2.5 11.0 – 15.7	11.2 ± 1.1 10.5 – 12.8	10.5 ± 0.7 10.0 – 11.6
Southern forest bat *Vespadelus regulus*	5,59	4.9 ± 1.0 2.9 – 7.6	61.9 ± 8.2 46.0 – 82.9	42.6 ± 0.7 40.8 – 44.2

[1] s,p: number of sequences measured, combined total number of pulses measured;

[2] Mean ± SD; range.

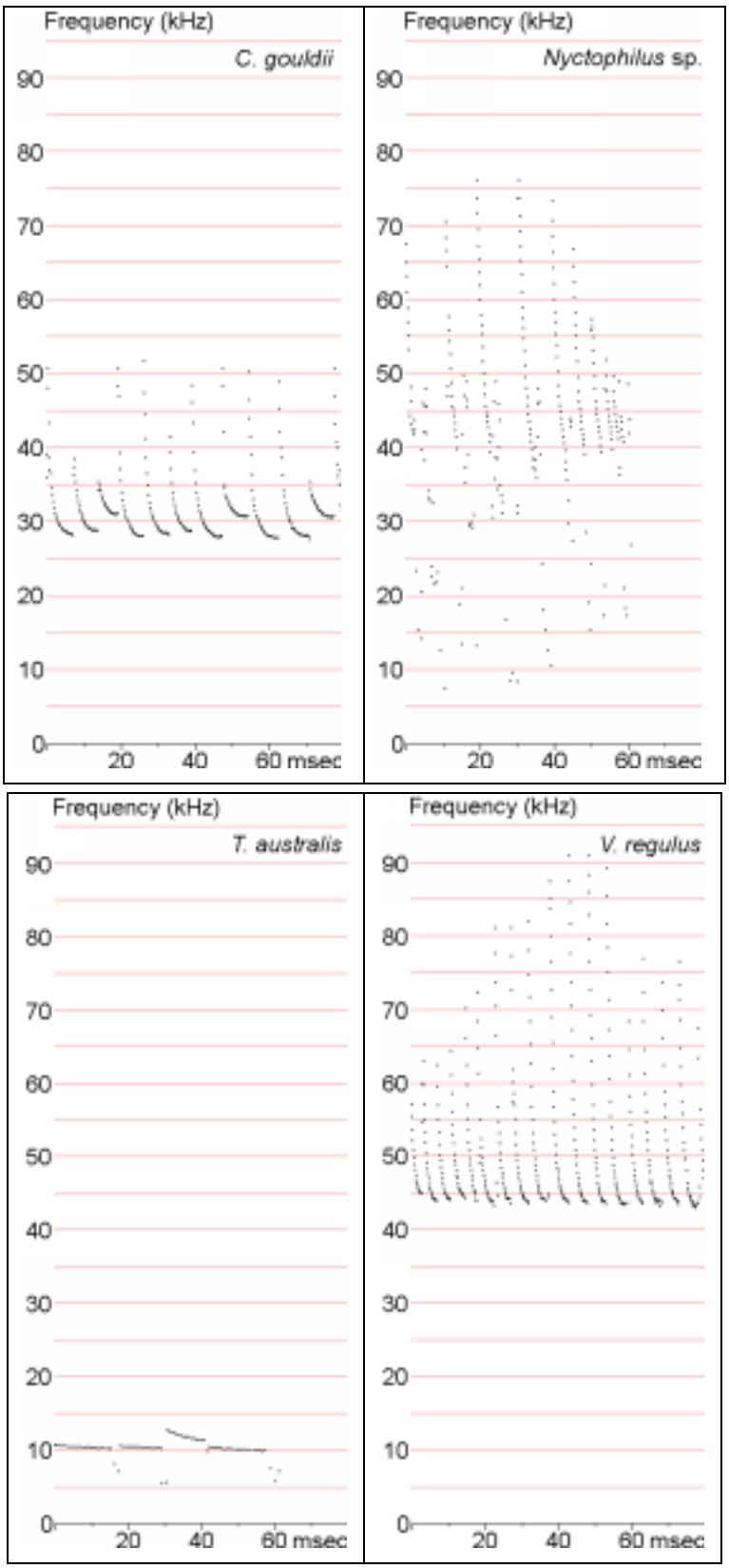


FIGURE 1. Representative call sequences of the four species identified (time is compressed between pulses).