



# **JANDAKOT AIRPORT CONSERVATION MANAGEMENT PLAN**

Jandakot Airport Holdings Pty Ltd  
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## Amendment History

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12.2	03/06/2019	General updates to reflect completed actions and new information from monitoring reports.	Joanne Wann (JAH EM)	J. Fraser	TBA

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**Note:** Content that includes location data for Declared Rare Flora (e.g. Figure 5) is not included in publicly available versions of this plan.

## 1 INTRODUCTION

Jandakot Airport is leased from the Commonwealth Government by Jandakot Airport Holdings (JAH) and is an important piece of state infrastructure, being Western Australia's major general aviation airport. The airport covers an area of approximately 622 ha which has been developed over a period of more than 50 years. Of this 622 ha, approximately 119 ha is zoned by JAH as conservation.

This Conservation Management Plan has been prepared to aid in protecting the areas designated in the Jandakot Airport Master Plan as Conservation Precincts (refer to Section 3). The Plan summarises the existing environment within Jandakot Airport, outlines the associated issues and the measurable management actions that can be implemented in both the short and long term. The Plan does not apply to those areas located outside the Conservation Precincts.

Jandakot Airport has a responsibility to aviation business and the community to ensure that infrastructure including the construction and widening of runways, taxiways and aprons is in place to meet aviation demand and ensure the safety, efficiency and regularity of aviation and other traffic on and around the Airport. In 2008/2009 the Airport undertook extensive consultation and obtained approval of the Jandakot Airport Master Plan 2009 for Runway and Taxiway upgrades and a commercial development Precinct.

*Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) approval 2009/4796 (refer Section 2.3 and Appendix A) was granted in March 2010 for the clearing of vegetation in accordance with the Jandakot Airport Master Plan 2009 and the Jandakot Airport Offset Plan.

Jandakot Airport's overarching legislative framework is the Commonwealth *Airports Act 1996*. JAH is also required to comply with State Government legislation as far as this legislation does not conflict with the Act. For this reason, issues associated with State legislation are also addressed within this Conservation Management Plan.

This Conservation Management Plan may be amended from time to time in response to new information and results of actions outlined in this document.

## 2 LEGISLATIVE REQUIREMENTS

The key pieces of legislation controlling the environment operations of the Airport are the *Airports Act 1996*, *Airports (Environment Protection) Regulations 1997* and the *Environment Protection and Biodiversity Conservation Act 1999*.

### 2.1 Airports Act 1996

The *Airports Act 1996* requires the operator of an airport to prepare an Airport Master Plan (which includes an Environment Strategy) every five years. This Conservation Management Plan complements the approved Jandakot Airport Master Plan 2014.

### 2.2 Airports (Environment Protection) Regulations 1997

The *Airports (Environment Protection) Regulations 1997* requires the development and adoption of a comprehensive environmental management system (EMS). Environmental management at the Airport is the responsibility of Jandakot Airport Holdings. The Jandakot Airport EMS comprises policies and procedures that ensure the protection of the environment within the airport, including preparation of management plans, incident reporting systems, awareness training, auditing, monitoring and reporting within a context of continuous improvement.

## **2.3 Environment Protection and Biodiversity Conservation Act 1999**

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides for the protection of the environment, especially matters of national environmental significance (NES). Under the EPBC Act, a person must not take action that has, will have, or is likely to have a significant impact on any matters of NES without approval from the Australian Government Environment Minister.

On the 17 March 2009 Jandakot Airport Holdings lodged a referral, '*Jandakot Airport Expansion, Commercial Development and Clearance of Native Vegetation, WA EPBC 2009/4796*', for construction of a fourth runway and associated taxiways, runway extensions, and development of aviation and commercial precincts as described in the Jandakot Airport Master Plan 2009.

On 17 April 2009, the Department of Environment, Water, Heritage and the Arts (DEWHA), (now the Department of the Environment and Energy (DOEE) deemed the Action 'Controlled'. The proposal was then assessed on Preliminary Documentation as per s95A of the EPBC Act.

EPBC referral 2009/4796 was initially approved by the Minister in March 2010. Conditions of approval were later amended and approved by DOEE in April 2014. A copy of the approval is included as Appendix A.

This Conservation Environment Management Plan has been prepared to satisfy Condition 6 of EPBC 2009/4796 approval.

## **3 CONSERVATION PRECINCTS**

### **3.1 Conservation Precincts**

The Conservation Precincts are to be managed in accordance with the Jandakot Airport Master Plan 2014. The Precincts are listed below and are illustrated in Figure 1:

- Precinct 1A: Existing Conservation, 48 ha
- Precinct 1B: Existing Conservation, 31 ha
- Precinct 2A: Existing Conservation, 29 ha
- Precinct 2B: Existing Conservation, 11 ha

### **3.2 Environmentally Significant Areas**

Jandakot Airport Master Plan 2014 identifies Conservation Precincts as areas of environmental significance (excluding approved development under the EPBC 2009/4796 approval). This is due to the presence of banksia woodland, which provides foraging habitat for Carnaby's Black-Cockatoos (*Calyptorhynchus latirostris*) and the presence of the Grand Spider Orchid (*Caladenia huegelii*) in Precinct 1A and to a lesser extent 1B and 2A.

### **3.3 Precincts 7 and 8**

Precinct 7 is currently owned by the Crown and is reserved for management with the City of Canning. Precinct 8 is owned freehold by the City of Canning. A proposal by Jandakot Airport to rehabilitate Precincts 7 and 8 in accordance with Conditions 4a and 5 of EPBC 2009/4796 approval was not accepted by the City of Canning, and as such, these Precincts are no longer a component of the Jandakot Airport Conservation Management Plan.

### **3.4 Ken Hurst Park**

To date, the City of Melville has not agreed to incorporate neighbouring Ken Hurst Park into this Conservation Management Plan (as originally intended and as described in previous versions of this plan). As such, Ken Hurst Park is not a component of this Conservation Management Plan. However, JAH will continue to liaise with the City of Melville when

required on matters relating to the consistent management of Ken Hurst Park and neighbouring Jandakot Airport Conservation Precincts.

## 4 NATIVE VEGETATION MANAGEMENT

### 4.1 Vegetation Communities

Four vegetation communities have been defined and mapped within the Jandakot Airport Conservation Precincts (Mattiske 2017; Figure 2):

- H2 - Open woodland of *Banksia attenuata* and *Banksia menziesii* over low shrubs on white to grey sand on slopes and ridges;
- J1 – Low open woodland of *Banksia ilicifolia* with *Banksia menziesii* and *Banksia attenuata* over *Xanthorrhoea preissii*, *Lyginia barbata*, *Patersonia occidentalis* and *Dasypogon bromeliifolius* on grey to brown sand on lower slopes, flats and depressions;
- K2 - Woodland of *Melaleuca preissiana* and some *Banksia ilicifolia* over *Regelia ciliata* and *Hypocalymma angustifolium* on white to grey sand on seasonally moister lower slopes within Precincts (similar to FCT4 and FCT5 – Gibson *et al.* 1994); and
- K2 (d) – Degraded low open woodland of *Melaleuca preissiana* with some *Banksia ilicifolia* over *Regelia ciliata* and *Hypocalymma angustifolium* on white to grey sand on seasonally moister lower slopes.

#### 4.1.1 Threatened and Priority Ecological Communities

On advice from the Threatened Species Scientific Committee, the *Banksia Woodlands of the Swan Coastal Plain* ecological community was listed as a threatened ecological community under section 184 of the EPBC Act in the 'Endangered' category in September 2016. It is acknowledged that vegetation communities delineated and mapped within relevant Precincts namely H2, J1 and K2 satisfy key diagnostic characteristics, condition thresholds, and minimum patch sizes outlined in guidance documents for determining the presence of *Banksia Woodlands of the Swan Coastal Plain* ecological community (Mattiske 2017).

### 4.2 Bushland Condition

Condition, in an environmental context, is a rating given to vegetation to categorise disturbance related to human activities. This rating refers to the degree of change in the structure, density and species present in vegetation in relation to undisturbed vegetation of the same type. The most widely used condition system is that defined by Keighery (1994) (DER 2014).

Vegetation (or 'Bushland') Condition is influenced by edge effects from airport operations, including tracks and firebreaks, the presence of weeds, the effects of grazing by herbivores (native and feral) and *Phytophthora cinnamomi* (dieback). The condition of the vegetation within the conservation areas of the airport was assessed by Mattiske Consulting in 2001, 2006 and again in 2016. For the 2016 assessment, Mattiske Consulting utilised sixteen 10 x 10 m quadrats, with sites selected in order to target and adequately sample the dominant vegetation communities. Assessment of vegetation condition was based on Keighery's (1994) condition ratings, which found only 1.8 ha (1.5%) of vegetation within Conservation Precincts was Degraded, with the remainder assessed as being between Good and Excellent (Figure 3).

For the purposes of compliance within this Management Plan, JAH has adopted a method of condition assessment (referenced herein as 'Bushland Condition') developed by Ecoscape (2011). The assessment method is also based on Keighery's (2014) condition system, but has been modified to be grid-point based, implemented systematically across

all bushland areas, and to generate detailed results applicable to the Jandakot Airport Weed Management Plan (Appendix B).

Bushland Condition was assessed by Ecoscape in 2011 (to develop the initial detailed baseline) and reassessed in 2016 (Ecoscape 2011, 2017). The results indicated that changes in vegetation condition between 2011 and 2016 had been negligible (Figure 4). Overall most (93.7%) of the grid points were in Very Good to Excellent condition. Nearly 4.8% of the grid points were 'Good'. Only 1.6% of the grid points were 'Degraded' and none were 'Completely Degraded'. One 'Degraded' location correlated with the Degraded area mapped by Mattiske (2017) in Precinct 2B, caused by edge effects from the adjoining airfield and *Ehrharta calycina* invasion. The second Degraded location was in a dieback infested area of Precinct 1A and an associated increase in *Leptospermum laevigatum*.

Bushland Condition is a useful assessment to determine that the habitat is being maintained for significant fauna and flora species, particularly in the absence of species-specific monitoring. As Bushland Condition monitoring at Jandakot Airport is inextricably linked with weed monitoring, it is addressed further in the Jandakot Airport Weed Management Plan (Appendix B).

### **4.3 Weed Control**

The Jandakot Airport Weed Management Plan (Appendix B) is a component of this Jandakot Airport Conservation Management Plan.

The Weed Management Plan establishes goals and objectives, and prioritises responses to the control of weeds based on the threat posed by each species.

The Jandakot Airport Weed Management Plan sets a target of maintaining weed cover at or below 20% with stable or declining weed diversity. Further information associated with weed management and control measures is detailed in Appendix B.

### **4.4 *Phytophthora cinnamomi* Dieback Control**

A Dieback Management Plan has been prepared for Jandakot Airport and forms a component of the Jandakot Airport Conservation Management Plan. Refer to Appendix C for details associated with dieback assessment, treatment and prevention.

### **4.5 Rehabilitation and Revegetation Guidelines**

The need to undertake rehabilitation or revegetation within the Conservation Precincts of Jandakot Airport may be triggered by the following scenarios:

- Bushfires (where natural regeneration has not been successful).
- Impacts of weeds on vegetation condition are not successfully managed by weed control (i.e. areas defined as degraded in 2016 bushland condition survey show further decline in subsequent 5-yearly survey despite weed treatment).
- Impacts of dieback on vegetation condition are not successfully managed by phosphite and other dieback management measures (i.e. areas defined as degraded in 2016 survey show further decline in subsequent 5-yearly survey despite dieback treatment).
- The closure of surplus or non-essential firebreaks and access tracks.
- Verge impacts from the construction of new roads as detailed in Master Plan 2014.
- The creation of wildlife corridors.

To date, no areas within the Jandakot Airport Conservation Precincts have been identified as requiring rehabilitation or revegetation. However, in the event that revegetation is required to be undertaken at some future point, the Rehabilitation and Revegetation Guidelines (Appendix D) have been developed to assist in planning. As the rehabilitation

and revegetation requirements of a specific area will be determined by many factors, including the vegetation community in which works are to occur and the cause of the vegetation condition loss (e.g. dieback, bushfire etc.), it is not possible to develop a site-specific revegetation plan in advance.

The Rehabilitation and Revegetation Guidelines (Appendix D) will be reviewed (and if required, updated) every 5 years to coincide with the Conservation Management Plan review.

#### **4.6 Monitoring Regimes and Survey Methods**

Bushland Condition has been determined to be the most appropriate and practical measure for ensuring that the vegetation within Jandakot Airport's Conservation Precincts is maintained appropriately in order to provide suitable habitat for significant fauna and flora species.

Bushland Condition of the Jandakot Airport Conservation Precincts will be reassessed every 5 years. If consultants undertaking weed quadrat surveys or dieback assessments conclude that there have been significant unexpected detrimental changes (as determined by scientific analysis), vegetation condition will be reassessed at the earliest possible opportunity in the affected area(s).

Further monitoring and survey regimes associated with maintaining bushland condition are detailed within the Weed Management Plan (Appendix B) and Dieback Management Plan (Appendix C).

#### **4.7 Thresholds for Triggering Further Management Intervention**

Bushland Condition will be maintained at levels of "Good" or above as defined by the modified Keighery Condition Scale for Jandakot Airport (Ecoscape 2017) or an equivalent comparable scale. Bushland condition that is assessed as being "Degraded" or "Completely Degraded" will trigger management intervention. The specific management intervention actions will be dependent on the primary cause of the impacted bushland condition, but may include weed control, dieback treatment, revegetation or a combination of the three.

Further details on thresholds for triggering management intervention associated with maintaining bushland condition are detailed within the Weed Management Plan (Appendix B), Dieback Management Plan (Appendix C) and Bushland Rehabilitation and Revegetation Guidelines (Appendix D).

### **5 ORCHID MANAGEMENT**

Two Endangered species pursuant to the EPBC Act and gazetted as Declared Rare Flora pursuant to the *Wildlife Conservation Act 1950* (WC Act) have previously been recorded within Jandakot Airport. These are:

- *Drakaea elastica* (Glossy-leaved Hammer Orchid) and
- *Caladenia huegelii* (Grand Spider Orchid).

No Priority Flora species have been recorded within Jandakot Airport.

#### **5.1 *Drakaea elastica* - Survey Results and Future Requirements**

*Drakaea elastica* is known to occur on the Swan Coastal Plain in low-lying areas, adjacent to winter swamps (Hoffman and Brown 1992) and may also occur in isolated patches on deep sandy soils in Banksia Woodlands. Surveys of the site in 2003 by the Department of Biodiversity, Conservation and Attractions (DBCA, formerly the Department of Parks and Wildlife (DPAW)) identified four *D. elastica* plants in Precinct 4 near the Conservation Precinct 1A boundary. Following a survey undertaken by Mattiske Consulting (2010b), it was concluded that "despite extensive searches from trained and experienced botanists, no

recordings of *D. elastica* were made in the 2007, 2008, 2009 and 2010 field searches. Therefore further searches appear unwarranted at this juncture". Additional surveys in 2016 (Mattiske 2017) also failed to locate *D. elastica*.

Given the species is primarily associated with low-lying damp areas associated with winter wet depressions, swamps and water courses (habitat that is not present in the area where plants were initially identified), it is possible that the species may have been misidentified in the 2003 DBCA survey and may never have been present on Jandakot Airport. In the event that *D. elastica* is opportunistically identified in the Jandakot Airport Conservation Precincts at any time, the plants will be recorded and Botanic Parks and Gardens Authority (BGPA), the Department of Biodiversity, Conservation and Attractions (DBCA) or other orchid experts will be consulted to determine the most appropriate ongoing management and monitoring requirements. The CMP will be appropriately updated if required.

## **5.2 *Caladenia huegelii* - Survey Results and Future Requirements**

A large number of surveys had been previously carried out for *Caladenia huegelii* at Jandakot Airport. These included surveys by Mattiske Consulting in 2001, 2006, 2007, 2008 and 2009 (Mattiske 2001, 2006, 2007, 2010a), the then Department of Conservation and Land Management (CALM) in 2005 and Cardno BSD consultants in 2005 (Cardno BSD 2005). Those survey efforts identified locations of approximately 223 *C. huegelii* plants on the Jandakot Airport site. The majority of occurrences were found in Conservation Precincts 1A and 1B. A single orchid (which has since been identified as *C. paludosa*) was located in Precinct 2B.

Each individual *C. huegelii* plant at Jandakot Airport is identified in the field with a labelled pin tag (located approximately 20cm to the south of the plant to avoid tuber damage) and GPS coordinates are recorded on a database managed by the JAH Environment Manager. A photographic record is also be taken when a flower is present in order to definitively confirm the species identification (noting *C. longicauda*, *C. discoides* and *C. paludosa*, which have been found in several locations in Precincts 1A, 1B and 2B, have a similar appearance to *C. huegelii* in the sterile leaf-only stage).

In 2012 and 2013, attempts to locate the plants identified in previous surveys (of which only a proportion had been previously identified with stakes or pin tags) were made using known GPS coordinates. In addition, searches were undertaken for new individuals that had not been recorded in previous surveys. Following the completion of spring flowering in 2013, all data gathered during the previous two years was used to compile new *C. huegelii* location mapping at Jandakot Airport. There were 354 confirmed and suspected (i.e. yet to be confirmed via photographic record of flower) *C. huegelii* individuals located within Precincts 1A and 1B.

From 2014 onwards, new *C. huegelii* plants opportunistically observed were identified via labelled pin tags and GPS locations added to the database.

### ***Caladenia huegelii* Census 2016-18**

Researchers from the BGPA Integrated Research Program advised that a population census should be undertaken within 5 years of the previous 2012-13 census; and noting that as not all plants emerge in a single year, the census should occur throughout two subsequent leaf emergence and flowering periods. JAH chose to expand the census to cover three years (2016-2018), as it was apparent from the quadrat monitoring program results that it was possible for plants to emerge after two (and occasionally three) years of dormancy. Methodology was similar to that used in the 2012-13 census. If results of the census revealed that the population of confirmed and suspected *C. huegelii* had fallen by more than 25% below its 2013 estimate, then the population could be considered to be in significant decline and the relevant orchid experts will be consulted regarding necessary management actions to be implemented.

All known plant locations (as recorded on the database) were visited each year of the census to record the presence or absence of individual plants, and additional searches of the bushland were conducted for any new individuals that have not been recorded in previous surveys. Individuals transplanted from BGPA were excluded from the analysis.

Of the 354 confirmed and suspected *C.huegelii* on the JAH database at the end of 2013; results at the end of 2018 showed:

- 274 (77.4%) emerged at least once;
- 80 (22.6%) failed to emerge or were not located;
- 179 (50.56%) emerged every year;
- 60 (16.96%) emerged twice from; and
- 35 (9.89%) emerged once.

Of the 465 confirmed and suspected *C.huegelii* on the JAH database at the end of 2018 (i.e. including new plants located between 2014 and 2018), the 2016-2018 census revealed:

- 383 (82.15%) emerged at least once;
- 83 (17.85%) failed to emerge or were not located;
- 220 (47.31%) emerged every year;
- 92 (19.78%) emerged twice; and
- 70 (15.05%) emerged once.

The majority of these plants are located in precinct 1A (94.8%), a small number are within 1B (4.9%) and a single individual has been located within 2A (Figure 5).

The results show that the population has not triggered the threshold of falling more than 25% below the 2013 population estimate of 354, and therefore is not in significant decline. A further 111 confirmed or suspected *C. huegelii* plants were located between 2014 and 2018. No natural pollination was observed during the significant amount of field work undertaken to complete this census, so it is likely that these 111 new plants are not juveniles that have germinated in recent years. The new individuals are likely to have been present for a number of years but, for various reasons, have not previously been emergent and identified.

JAH will complete another *C. huegelii* census by the end of 2023, assessing emergence over a minimum of two consecutive years, and results will be assessed against a similar threshold.

### **Quadrat Monitoring Program**

The timing of *C. huegelii* field work/monitoring is aligned with the peak flowering period, which varies each year in response to rainfall but typically occurs in mid-September.

In 2011, BGPA established three monitoring quadrats in Precinct 1A. In 2012, Mattiske Consulting were engaged to undertake the annual quadrat monitoring program until 2015.

Within each defined 20m x 20m quadrat, each individual *C. huegelii* plant was identified with a labelled pin tag and GPS coordinates were recorded. In 2011 25 individuals were tagged within the three monitoring quadrats. Details of plant growth, herbivory impact, and flowering status were recorded for each individual. By the completion of 2012 monitoring 74 individual plants had been identified, culminating in 85 plants in the 5<sup>th</sup> year of monitoring, of which 43 were located in a single quadrat. Assuming all plants within the quadrat were identified by the 5<sup>th</sup> season and no recruitment was occurring, it could be calculated that with the exception of 2011 when quadrats were established, between 65-81% of all known plants emerged each year. This suggests that a large proportion of a population would be

emergent each spring, and the absence of individuals is likely to suggest the absence of the species in a particular area.

Of the 85 plants, 25 were continuously monitored from 2011 to 2015 and revealed that:

- 8 (32%) emerged each year
- 10 (40%) emerged for 4 of the 5 years
- 3 (12%) emerged for 3 of the 5 years
- 2 (8%) emerged for 2 of the 5 years
- 2 (8%) emerged in 2011 and have not been observed since.

Of plants monitored over the five years that were found to enter a period of prolonged dormancy (i.e. not emerge as either a leaf or leaf and flower in winter/spring) but re-emerge in a subsequent year, the majority (79%) re-emerged after 1 year. Only one individual was observed to re-emerge after more than two years of dormancy.

Flower emergence ranged from 31-41% of the total population within quadrats, with 46-56% of the emerged population flowering in any given year. Pollination success rates were low or totally absent, which is consistent with the findings from BGPA research that the pollinator wasp is not present in any bushland remnants in urban Perth.

A high incidence of herbivory was detected during the surveys, with many suffering slight to moderate forms of leaf grazing. In order to better understand the impacts of grazing, an herbivore-proof fence was installed around Quadrat 1 prior to leaf emergence in 2013. Grazing pressure appeared stable over the years, with the exception of Quadrat 1 showing a reduction after the installation of exclusion fencing.

Taking into account the findings of the BGPA research (see Section 5.3 below), the final and consolidating monitoring report (Mattiske 2016) makes the following recommendations:

- Restrict access to the conservation precincts to enable protection of the Banksia woodlands near the established populations;
- As part of a wider research program on *Caladenia* species, review the potential impact of controlled burning on *Caladenia huegelii* prior to undertaking any fuel reduction burning in the Banksia woodlands;
- Integrate native species into rehabilitation activities that support the pollinating wasp, following consideration of BGPA research findings;
- Facilitate research and monitoring of the known locations with other researchers of orchids to better understand emergence, local mortality, recruitment, flower development, pollination, and seed production patterns; and
- Investigate grazing and if warranted implement appropriate management strategies to reduce potential impacts.

JAH has continued to undertake the annual quadrat monitoring with results reported within the AER. An additional 7 plants have been found within the quadrats between 2016 and 2018.

The analysis of this additional data, along with the results obtained from Mattiske (2017) has revealed a key finding in relation to herbivory impacts on the survival of individual plants. Noting that the monitoring has shown that *C. huegelii* may remain dormant for three consecutive years and re-emerge, one may consider that an individual that has not emerged for four consecutive years is likely dead. When assumed deaths within each quadrat are compared, the proportion of deaths in the fenced quadrat is unexpectedly higher (26.1% of the known population within the quadrat) compared to the unfenced quadrats (15.4% and 20%). This suggests that, whilst fencing plants may reduce herbivory impacts which may in turn increase the proportion of emerged individuals that produce

flowers in any given year, fencing and reduced herbivory rates does not appear to increase the survival of *C. huegelii*. However, it should be noted that very little is known about dormancy and long term survival rates of *C. huegelii*, and plants assumed to have died may in fact still be alive, waiting for suitable conditions or triggers in order to re-emerge.

Mattiske (2017) concluded that it was unlikely that the *C. huegelii* population at Jandakot Airport (or any other location where the natural pollinator no longer exists) will be able to survive without management and human intervention. If these populations are to be naturally sustainable, research into the pollinator and re-introduction of the pollinator will be required. JAH considers such actions to be the responsibility of the relevant authorities and researchers, and not the responsibility of landholders who maintain habitat that supports remaining *C. huegelii* populations. Therefore there is a need to consider ceasing monitoring and assume that the decline will continue, or undertake an amended monitoring program with amended thresholds. JAH will continue to monitor all three quadrats for emergence and flowering, but future monitoring requirements will be reviewed following the approval of Master Plan 2019 when the CMP is next revised.

### **Herbivory Impacts**

Considering the potential grazing impacts noted during the annual monitoring of orchid quadrats, JAH utilised motion-sensitive cameras outside of the enclosed quadrat to attempt to determine which herbivores are likely responsible for the grazing impacts. Motion-sensitive cameras were deployed in 10 different locations for varying periods between July and October 2016. Grazing species that were observed to be present included Western Grey Kangaroos, wallabies and to a lesser extent quenda and rabbits. However, it was evident that the Western Grey Kangaroos are the species most likely to graze on *C. huegelii*.

However, the grazing habits of the kangaroos did not appear to have an immediate and direct impact on the mortality of the *C. huegelii* plants. Only the above-ground portions of the orchids were eaten; the below-ground tubers did not appear to be impacted. Grazing does reduce the ability of *C. huegelii* to reproduce, although pollination is unlikely to occur regardless due to the absence of the pollinator. Perhaps more relevant is the fact that grazing of the leaf impacts the ability of the orchid to photosynthesize and replenish the 'food store' in the underground tuber. Should the emerged leaf be impacted over numerous consecutive years, the ongoing depletion of the tuber may impact the long term survival of the individual plant. However, given that fencing of one of the monitoring quadrats to prevent herbivory impacts has failed to reduce apparent plant deaths in comparison to unfenced quadrats, it is likely that herbivory (at least at current levels) is not a threat to *C. huegelii* survival.

### ***Caladenia huegelii* Translocation and Monitoring**

In 2010 BGPA attempted to salvage approximately 40 *C. huegelii* plants located within Precincts 3, 4 and 5 prior to clearing and development (BGPA 2010). Twenty plants were located in the initial search in June 2010, with an additional 4 plants found in August 2010 resulting in 24 plants being located and removed. The salvaged *C. huegelii* plants have been maintained within a purpose-built glasshouse at the BGPA facility in Kings Park.

In 2014 BGPA determined that sufficient information had been obtained to ensure the likely success of the translocation of genetic progeny from the salvaged individuals into Precinct 1A at Jandakot Airport. Thirty five individuals were translocated into the fenced 20m x 20m orchid monitoring quadrat. The fenced location was chosen in order to exclude the impacts of herbivory (primarily quenda, macropods and rabbits) on subsequent survival. Plants were labelled in the field with a pin tag and GPS coordinates recorded on the Jandakot Airport *Caladenia* database.

JAH Environment staff have monitored the translocated individuals annually for survival (i.e. annual emergence, noting not all plants emerge every year) and flowering status (noting not all emergent plants flower). This data has been recorded and provided to Professor Kingsley Dixon (formerly of BGPA, currently based at Curtin University). The proportion of plants that emerged in a single year reduced annually, but appears to have stabilised in 2017 and 2018 at 28%. Annual monitoring of translocated plants will continue until the CMP is next reviewed following the approval of Master Plan 2019, when ongoing requirements will be re-assessed.

### **Ongoing *Caladenia huegelii* Management**

In addition to the surveys and monitoring detailed above, the following policies will contribute towards the ongoing protection and management of the species at Jandakot Airport:

- Access to Conservation Precincts containing *C. huegelii* will be restricted to staff, contractors and researchers with a valid reason for entry.
- Airport staff and contractors working in and around the populations of the orchids will be made aware of their significance and the need to avoid disturbance to the plants and their supporting habitat through either CEMPs, inductions, toolbox meetings, signage or other relevant methods.
- Prohibit the use of controlled burning as a fuel reduction technique in the Jandakot Airport Bushfire Management Plan unless sound evidence can be obtained from orchid specialists to demonstrate that the intensity and season of a proposed burn is not detrimental to the survival of the population.

Additional management requirements identified as a result of the Integrated Research Program (see Section 5.3) are detailed below:

- As studies have shown the pollinating wasp has a preference for nectar of open flowered members of Myrtaceae, perimeter planting (and where required, rehabilitation) will include a selection of these plants amongst other suitable species.
- Prior to commencement of peak flowering season, JAH will confirm the requirement for seed collection with BGPA (or the relevant research institution). If seed is required for research or seed-banking, JAH Environment staff or a consultant will undertake hand pollination of the plants located within the fenced orchid monitoring quadrat. Once seed pods mature, they will be collected and forwarded to the research institution. Hand pollination (if required) will continue until the CMP is next reviewed following the approval of Master Plan 2019.

### **5.3 Integrated Research Program for *Caladenia huegelii***

Consistent with Condition 6e of EPBC 2009/4796 approval and the Jandakot Airport Offset Plan, a research proposal titled “Integrated Conservation and Translocation Research Program for *C. huegelii*” was developed by orchid specialists at the Kings Park Botanic Gardens and Parks Authority (BGPA 2010), and funded by Jandakot Airport. The five-year program was linked with existing research being undertaken as part of the Roe 7 Highway development. A key aspect of the program was the development of a state-wide conservation initiative for *C. huegelii*. The Key Project Outcomes of the research were:

1. Genetic fingerprints of targeted *C. huegelii* plants and indicative rare and threatened taxa (benchmarked as appropriate with common spider orchid taxa for comparative purposes).
2. Determination of key individuals or groups of plants considered genetically significant.

3. Optimisation of the propagation of orchids from seed through *ex situ* and *in vitro* methodologies.
4. Optimisation of the reintroduction and survival of orchid seedlings to field sites through scientific research and monitoring.
5. *Ex situ* conservation of genetically significant material (orchid seed and mycorrhizal fungi), identified from molecular genetics work.
6. Development of evolutionary studies and conservation initiatives for *Caladenia* pollination agents: thynnid wasps and host plants.
7. Development of a *Caladenia* phylogeny with an extension to *Arachnorchis* sub-genus and resolution of species complexes in problematic species.
8. Collection and maintenance of the rescued plant material undertaken in summer/autumn 10/11 with plants to be maintained as a seed orchard for conservation production of seed for both reintroduction and long-term seed banking.

This research proposal was submitted to DOE in June 2010 and approved in November that year. The research program began in 2010 and was completed in 2015 (BGPA 2015). The key findings of the research are summarised in Appendix E.

#### **5.4 Thresholds for Triggering Further Management Intervention**

Following the release of the final report and key findings from BGPA, JAH met with research co-ordinator Professor Kingsley Dixon to determine future monitoring requirements and management actions. These are detailed in Section 5.2. Thresholds for triggering future management intervention are difficult to determine, given many of the resulting recommended actions relate to further research and management of the species from a research and recovery perspective and are not directly applicable or achievable by land managers responsible for discrete populations, such as at Jandakot Airport.

The key triggering threshold in terms of how the current Jandakot Airport *C. huegelii* population is being managed will be directly linked to the next census. Taking into account the absence of the pollinator wasp (i.e. no natural recruitment is anticipated) and the likelihood that some of the 383 emergent individuals identified in the 2016-2018 census are likely to eventually flower and be identified as species other than *C. huegelii*, a drop in the population estimate is anticipated. However, if results of the census reveal that the population of confirmed and suspected *C. huegelii* has fallen by more than 25% below its 2018 estimate, then the population can be considered to be in significant decline and the relevant orchid experts will be consulted regarding necessary management actions to be implemented. Should this eventuate, the CMP will be reviewed within 12 months of the completion of the 2023 census to incorporate management recommendations.

As research continues within the scientific community, JAH will continue to liaise with research institutions and orchid experts and review thresholds and management requirements for intervention if new information, applicable to management of *C. huegelii* at Jandakot Airport, becomes available.

#### **5.5 Road Alignment Precinct 1B**

To ensure safe and efficient transport links to Jandakot Airport, additional transport links to the Perth Metropolitan Region are essential and therefore included in the approved Master Plan 2014. These road links are important for emergency access and for egress for emergency services such as the Royal Flying Doctor Service and the Police Airwing.

Although the alignment of the East Link Road is indicated in the Jandakot Airport Master Plan 2014, the final location will be resolved in discussion with the Western Australian Department of Planning, the Western Australian Department of Transport, Main Roads Western Australia and the City of Canning. Should the road alignment within the airport

change in order to align with the State's preferred route to the east, Jandakot Airport Holdings will liaise with DOEE to determine whether additional approvals are required.

The East Link Road, as detailed in Master Plan 2014, will not directly impact *C. huegelii* plants (as determined via the Caladenia database, which is based on the various targeted surveys referenced in section 5.2 above). The Jandakot Airport Caladenia database will be searched prior to the commencement of any works to confirm the absence of *C. huegelii* plants in the project area (in the event new plants have been located in the interim). Noting that BGPA has already had proven success with *C. huegelii* salvage and 100% ex-situ survival rates after two years, it is proposed that any plants likely to be impacted will be salvaged and kept ex-situ at a research facility until such time as they (or their progeny) can be successfully transferred back into Precinct 1A. If plants are salvaged from within a dieback infested area, the research institution will be consulted regarding appropriate translocation methods, which may include direct translocation into a dieback infested site.

## **6 FAUNA MANAGEMENT**

A fauna assessment was carried out at Jandakot Airport in 2002 by Bamford Consulting Ecologists and a follow up fauna survey was undertaken by ENV in September 2008 (ENV 2009a). Numerous species-specific surveys have since been undertaken to meet EPBC 2009/4796 approval conditions and more recently, a desktop review of conservation significant fauna was undertaken (Western Wildlife 2017a). The information from these sources has been used to produce the following section.

### **6.1 Habitat Types**

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

#### **6.1.1 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.

#### **6.1.2 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. 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 potential habitat for frogs.

### **6.2 Species of Significance**

Western Wildlife (2017a) have identified two EPBC listed fauna species that are known to occur or potentially occur at Jandakot Airport:

- Carnaby's Black-cockatoo (*Calyptorhynchus latirostris*)
- Forest Red-tailed Black-cockatoo (*Calyptorhynchus banksii naso*)

Other conservation significant fauna potentially occurring at Jandakot Airport include:

- The EPBC Act listed migratory species, the Fork-tailed Swift (*Apus pacificus*) – likely to fly over the airport rather than visit and utilise habitat noting there are no records of this species at the airport or nearby
- The Rainbow Bee-eater (*Merops ornatus*) – seasonal visitor listed under the Wildlife Conservation Act Schedule 5
- The Peregrine Falcon (*Falco peregrinus*) - listed under the Wildlife Conservation Act Schedule 7, has not previously been recorded at Jandakot Airport but may potentially occur as a foraging, non-breeding visitor

Eight Priority Species listed by DBCA that occur, or potentially occur, at Jandakot Airport are:

- Western Brush Wallaby (*Macropus irma*) - a Priority 4 species present in Precincts 1A, 1B and 2A
- Quenda (*Isoodon obesulus*) - a Priority 4 species common throughout much of the airport, including developed areas
- Graceful Sun-moth (*Synemon gratiosa*) - a Priority 4 species previously recorded
- Katydid or Bush Cricket (*Throscodectes xiphos*) - a Priority 1 species not previously recorded
- Perth Lined Lerista (*Lerista lineata*) – a Priority 3 species previously recorded
- Jewelled Ctenotus (*Ctenotus gemmula*) - a Priority 3 species not previously recorded
- Black-striped Snake (*Neelaps calonotos*) - a Priority 3 species previously recorded
- Western False Pipistrelle (*Falsistrellus mackenziei*) - a Priority 4 species not previously recorded

The section 6.2.1 – 6.2.6 addresses the management of the specific species identified in EPBC 2009/4796 conditions of approval. For the other conservation significant species (including species identified as locally significant by Western Wildlife (2017a)), additional monitoring regimes, survey methods and thresholds for triggering further management intervention are not required. Existing actions, including those listed below, are considered adequate in order to, where applicable, manage these species' habitats and local populations.

- Vegetation management (refer Section 4.7), primarily via weed control (Appendix B) and Dieback Control (Appendix C). Key thresholds include maintaining Bushland Condition at levels of "Good" or above, and restricting weed cover to a maximum of 20%.
- Rehabilitation/revegetation of habitats (Appendix D).
- Feral animal control; maintaining or reducing on-site predators or competitors (Appendix F).
- Fencing strategy; to minimise risk of road deaths (Appendix H).

### 6.2.1 Carnaby's Black-Cockatoo

Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*) has been recorded at Jandakot Airport and is listed as Threatened (Endangered) under the EPBC Act and under Schedule 2 (Endangered) of the WA WC Act. Western Wildlife (2011a) were engaged to undertake a Carnaby's Black-Cockatoo survey in 2011, and again in 2016 (Western Wildlife 2017a) as part of a Level 1 review.

The majority of the Conservation Precincts are Banksia woodland, and this is foraging habitat for Carnaby's Black-Cockatoo. The paperbark woodland is low quality foraging habitat where it includes some *B. ilicifolia* (see Figure 6). The main food plants identified from the conservation zones were *B. attenuata*, *B. menziesii*, *B. ilicifolia* and *Eucalyptus marginata*, and there was evidence of cockatoos foraging on *B. attenuata* and *B. menziesii* (Western Wildlife 2011a). No Carnaby's Black-Cockatoos were recorded in the Conservation Precincts during the 2011 survey, though they are likely to be regular seasonal visitors.

No roosting habitat has been identified in the Conservation Precincts, but there is one area at Jandakot Airport that has supported roosting birds in the past. About 100 Carnaby's Black-Cockatoos were recorded in a stand of tall eucalypts (*Corymbia citriodora*) on Eagle Drive in 2008 (ENV 2009a). In addition to annual monitoring during the Great Cocky Count, this area is regularly inspected by Jandakot Airport staff and no roosting has been observed since monitoring commenced in 2013.

The Conservation Precincts at Jandakot Airport represent a local foraging resource for Carnaby's Black-Cockatoo. The lack of records of birds during the 2011 study and during the annual Great Cocky Counts highlight the variability of the cockatoo population in the area. When foraging, birds may roost in the large trees on Eagle Drive, though cockatoos are highly mobile and may roost at other sites in the surrounding area.

#### Monitoring Regimes and Survey Methods

Unlike other less mobile bird species, Carnaby's Black-Cockatoo is widespread and its range covers many different land tenures and vegetation types. Therefore, given the comprehensive knowledge already obtained from previous Carnaby's Black-Cockatoo surveys at Jandakot Airport, future survey and monitoring effort is best directed at methods that contribute to wider studies aimed at monitoring the species over a wider area.

Jandakot Airport will continue ongoing monitoring of Carnaby's Black-Cockatoo by participation in the Great Cocky Count, which is undertaken annually. The Great Cocky Count is essentially a regional census and provides a snapshot count of the population and provides information about use of known roosting sites. Methodology will be according to that specified by the coordinators the Great Cocky Count. The potential roosting site identified by Western Wildlife (2011a) at Jandakot Airport will be monitored. In the event that the Great Cocky Count is no longer undertaken, relevant organisations will be consulted to determine an appropriate alternative monitoring program.

Management of Carnaby's Black-Cockatoo is inextricably linked with management of its habitat. In foraging locations lacking roosting and nesting sites (i.e. Jandakot Airport), Bushland Condition is an appropriate aspect to monitor to ensure that habitat is maintained, as it compares vegetation structure (along with other variables) in relation to undisturbed bushland of the same type (DER 2014). A Bushland Condition assessment is undertaken every five years. Bushland Condition assessment and monitoring methods are described above in Section 4.2 and further detailed within the Weed Management Plan (Appendix B).

#### Thresholds for Triggering Further Management Intervention

Management for maintenance of Carnaby's Black-Cockatoo habitat and populations will be primarily through actions relating to other sections of this plan, including:

- Bushland Condition will be maintained at levels of "Good" or above. Where Bushland Condition is assessed as being below "Good", further management intervention will be undertaken as detailed within the Weed Management Plan (Appendix B).
- Weed Management, restricting weed cover to a maximum of 20% (Appendix B) and Dieback Control (Appendix C).
- Rehabilitation/revegetation of habitats (Appendix D).

It is anticipated these actions will be adequate to maintain habitat for Carnaby's Black-Cockatoo within the airport's Conservation Precincts and no species-specific thresholds for triggering management intervention are warranted at this stage.

The CMP will be reviewed to incorporate updated thresholds should the findings of ongoing research, such as the Great Cocky Count, assist in identifying relevant species-specific thresholds that can be applied at Jandakot Airport.

### **6.2.2 Forest Red-Tailed Black-Cockatoo**

The Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*) is listed as Threatened (Vulnerable) under the EPBC Act and Schedule 3 under the WC Act. 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 is most common in the Darling Range between Mundaring and Collie (Garnett *et al.* 2011). It also ranges onto the Swan Coastal Plain (Figure 7). In recent times the movements have changed from irregular forays to feed on the seeds of the introduced Cape Lilac (*Melia azedarach*) (Johnstone and Kirkby 1999), to regular movements onto the Swan Coastal Plain, including the establishment of feeding and breeding sites (Johnstone *et al.* 2013).

The Forest Red-tailed Black-Cockatoo inhabits the Jarrah, Marri and Karri forests of the south west but may also occur in other woodlands including Tuart, Wandoo and Flooded Gum (Johnstone and Kirkby, 1999). They feed primarily on the seeds of Marri, but will also feed on the seeds of other eucalypts such as Jarrah, and Blackbutt, as well as Forest Sheoak, Snottygobble and Cape Lilac (Johnstone and Storr 1998).

This cockatoo is a seasonal breeder, with individuals roosting in loose groups and nesting in large tree hollows (Johnstone & Storr 1998). The Forest Red-tailed Black-Cockatoo was recorded on site during the 2008 survey when one small flock was observed flying over the north-eastern corner of the site, but no animals were seen feeding or roosting on the site.

The Forest Red-tailed Black-Cockatoo is likely to be an occasional non-breeding visitor to the Conservation Precincts, but there is no significant foraging habitat present for this species and they would not breed on site due to the lack of large tree hollows (Western Wildlife 2017a).

#### Monitoring Regimes and Survey Methods

In the absence of core habitat, no ongoing monitoring is warranted. However, Forest Red-tailed Black-Cockatoos observed opportunistically during Carnaby's Black-Cockatoo surveys will be recorded.

#### Thresholds for Triggering Further Management Intervention

In the absence of core habitat, specifying thresholds for triggering further management intervention within this plan is not warranted at this stage. The findings of ongoing research targeted at Carnaby's Black-Cockatoo, such as the Great Cocky Count, which should also capture Forest Red-tailed Black-Cockatoo observations, is expected to confirm the relevance or otherwise of this species to airport conservation management. If established as relevant, this research is also expected to assist in identifying any required thresholds and triggers for management intervention for this species.

### **6.2.3 Quenda**

The quenda (*Isodon obesulus fusciventer*) is listed as Priority 4 by DBCA. This mammal typically seeks daytime refuge from predators in very thick ground-storey vegetation, usually associated with swamps or damplands (Strahan 1995). Quenda are likely to occur

in all native vegetation at Jandakot Airport, as well as in any densely planted gardens around airport buildings.

Western Wildlife were engaged to undertake a quenda survey in 2011 and again in 2014 (Western Wildlife 2012a, 2015a), and again in 2016 (Western Wildlife 2017a) as part of a Level 1 review. Records in and around Jandakot Airport are shown in Figure 8, noting that some of the records relate to areas that have since been cleared and developed under EPBC approvals.

Surveys were conducted in October 2011 and October 2014 involved caged trapping and microchipping techniques along with motion sensitive cameras. Fifteen individuals (plus 6 recaptures) were trapped during the 2011 study whilst 42 individuals (plus 15 recaptures) were trapped in 2014. In 2014 quenda were trapped in all Conservation Precincts, whereas in 2011 no quenda were trapped from Precinct 1A and Precinct 2B. Quenda were found to favour low-lying areas with dense understorey vegetation. No quenda captured in 2011 were recaptured in 2014, which is not surprising given they have a life span of around three to four years. The population increase between 2011 and 2014 was thought to be a reflection of climatic variation, whereby conditions that create greater productivity (i.e. habitat and food sources) support more quenda. Considering quenda have the capability to breed prolifically in good conditions (all females captured in 2014 had pouch young) the population size is anticipated to fluctuate from season to season and year to year, depending on conditions.

Management recommendations to protect quenda included:

- Maintain fox control in quenda habitat, as foxes prey on young quenda (refer Appendix F).
- Where possible allow movement of quenda between the inside and outside of the fence, to avoid the fenced population becoming genetically isolated (refer Appendix H).
- Capture and relocate quenda from large bushland areas prior to undertaking clearing.

#### Monitoring Regimes and Survey Methods

Quenda will be monitored passively via the use of motion-sensitive cameras to confirm their continued presence within the Conservation Precincts using methods similar to that applied by Western Wildlife (2015a) in the 2014 monitoring survey. This equates to 6 motion-sensitive cameras, each deployed for a minimum of 4 days to achieve a minimum of 576 monitoring hours. The cameras will be located in all 4 Conservation Precincts with specific locations being as close as practicably possible to the locations previously utilised by Western Wildlife (2015a). Monitoring will occur at least triennially, and will be undertaken by JAH Environment staff, with advice sought from fauna experts/consultants if required. If passive monitoring reveals the absence of quenda within a Conservation Precinct, a fauna expert/consultant will be engaged to investigate further (see below Thresholds for Triggering Management Intervention).

JAH conducted the first passive Quenda survey in spring 2017. Utilising motion-sensitive cameras, JAH were able to confirm the presence of quenda in all Conservation Precincts at Jandakot Airport.

#### Thresholds for Triggering Further Management Intervention

Maintaining quenda populations at Jandakot Airport is a function of maintaining quenda habitat (Western Wildlife 2015a). Maintenance of quenda habitat is primarily through actions relating to other sections of this plan, including:

- Vegetation management (refer Section 4.7), primarily via weed control (Appendix B) and Dieback Control (Appendix C). Key thresholds include maintaining Bushland Condition at levels of "Good" or above, and restricting weed cover to a maximum of 20%.

- Rehabilitation/revegetation of habitats (Appendix D).
- Feral animal control; maintaining or reducing on-site predators or competitors (Appendix F).
- Fencing strategy; to minimise risk of road deaths (Appendix H).

The absence of quenda within a Conservation Precinct during passive surveys will trigger the need to engage a fauna expert/consultant to investigate further. This may involve additional surveys or monitoring and potentially include recommended management actions in addition to those listed above.

#### 6.2.4 Western Brush Wallaby

The Western Brush Wallaby (*Macropus irma*) is listed as Priority 4 by the DBCA. Although it has decreased in range, its abundance has increased within its remaining range due to fox control (Woinarski *et al.* 2014). The optimum habitat for this species is open forest or woodland, particularly open seasonally-wet flats with low grasses and open scrubby thickets. Suitable habitat for this species occurs broadly throughout the native vegetation of the airport (Figure 9).

Following the installation of exclusion fencing and the completion of the majority of approved clearing, wallabies have been confined to Conservation Precincts 1A, 1B and 2A since 2017.

Whilst Western Brush Wallabies are identified as an environmental value to be managed within this CMP (which is certainly the case in Conservation Precincts physically isolated by fencing from aircraft movement areas), they are also recognised as posing a high risk to aircraft and personnel in air movement areas (refer also to Overabundant Native Species Section within Appendix F, Feral Animal Management Plan).

Jandakot Airport controls macropods in air movement areas using methods of exclusion, deterrents and harassment. Exclusion (primarily through fencing or trapping and relocation) is the preferred approach, with various exclusion fences installed between 2014 and 2017.

Lethal control measures are rarely employed to manage the risks posed by wallabies to aircraft safety. JAH will continue to liaise with DBCA in order to assess the problem and obtain the necessary permits should wallabies ever breach exclusion fencing and access areas where they pose an unacceptable risk to air safety/human lives that cannot be mitigated by other means.

Western Wildlife conducted a Western Brush Wallaby survey in April 2011 (Western Wildlife 2011b) and again in spring 2014 (Western Wildlife 2015b).

The studies consisted of recording all observations of wallabies (including those captured on motion-sensitive cameras) and carrying out transects to calculate the density of wallabies in the conservation areas.

The population density of wallabies at Jandakot Airport was estimated to be between 0.24 and 0.3 wallabies per hectare in 2011 and between 0.24 and 0.33 wallabies per hectare in 2014. These results indicate a higher density than Whiteman Park, where the wallabies have been calculated at 0.16 per hectare (Bamford and Bamford 1999). Of note in 2014, no wallabies were observed in Precinct 1A during the transects although they were recorded on the motion-sensitive cameras. Noting Precinct 1A was the only Conservation Precinct with a macropod connectivity (via a stock fence) to neighbouring bushland (i.e. Ken Hurst Park) at the time, it is suggested that:

- Wallabies move between Jandakot Airport and Ken Hurst Park, possibly preferring to shelter in Ken Hurst Park during the day when transects were conducted.
- As Western Grey Kangaroos (*Macropus fuliginosus*) also populate Precinct 1A and Ken Hurst Park, the potential exists for competition between the species (Wann and

Bell 1997), potentially resulting in fewer wallabies in areas where kangaroos are numerous.

A Translocation Plan for wallabies displaced by approved clearing has been developed and approved by DBCA. The plan was prepared following collaboration between JAH, DBCA, Murdoch University and the University of Western Australia. The associated research project, which commenced in 2015, included various trapping trials, capture and offsite relocation of wallabies, and post-translocation monitoring.

The research showed that the wallabies could not be trapped using conventional trapping techniques. Anecdotally, whilst wallabies could be attracted to an area using baits high in moisture (e.g. apples, pear and watermelon), the same baits could not entice wallabies to enter traps. In addition, the presence of non-target species, particularly Quenda, removing bait before it was located by wallabies proved problematic. As a result, a herding lift net technique (Bamford and Bamford 1999) and hand capture (Lentle *et al.*, 1997) was employed. These capture methods required a large number of people and proved to be extremely labour-intensive. As such it is unlikely that this method would be effective in large, unfenced habitats.

In October 2015 14 adults (seven males and seven females) were captured, and all but one were fitted with state of the art radio tracking collars. The wallabies were translocated to nearby Harry Waring Marsupial Reserve, a 260 ha reserve where these animals had been recorded previously. Six months of post-translocation monitoring was undertaken. Five sub-adults were also captured and relocated without collars.

The post translocation monitoring via radio tracking was the focus of the resulting published research (Pohv *et al.* 2018). Key findings included:

- Nine of the 13 wallabies survived 10 weeks post-release; of those that died, the cause of death could not be determined.
- Weekly mean home-range estimates did not differ between males and females.
- Some males has 67-70% overlap in home range with some females, but the substantial distances maintained between individuals confirmed the solitary nature of the species.
- Wallabies selected banksia woodland with dense understorey habitats reflecting the presence of their preferred food, while they avoided *Malaleuca rapiophylla/Eucalyptus rudis* and recently-burnt areas.

This study highlighted the importance of understanding the home-range establishment and vegetation preferences of translocated animals that will inform the planning is future translocations are required.

The Translocation Plan also addressed the establishment of a future fauna corridor between Precinct 2A and neighbouring Jandakot Regional Park's Acourt Reserve to allow for the dispersion of remaining wallabies throughout a larger area of bushland. Western Wildlife (2017b) estimated that the wallaby density in Precinct 2A following the completion of surrounding clearing was 0.74 wallabies/ha, which equated to a population of 21-22 wallabies. This was more than twice the density calculated in 2014, but the increase was expected following the mustering of wallabies from neighbouring areas (i.e. not included in the translocation project) prior to clearing. The corridor was formally established in early 2018 with the installation of two purpose-built 'wallaby gates'. The gates have been monitored with motion-sensitive cameras since installation. Monitoring has shown that the gates are being utilised by both wallabies and Western Grey Kangaroos.

#### Monitoring Regimes and Survey Methods

Western Wildlife (2015b) considered future monitoring and thresholds for triggering further management intervention. It was concluded that following the management recommendations below (see Thresholds for Triggering Future Management Intervention) is likely to protect wallabies and wallaby habitat without the need for further monitoring, at least in the short term. However, it should be noted that:

- The passive quenda monitoring is also likely to opportunistically yield information regarding the presence of wallabies and other macropods within the Conservation Precincts.
- Monitoring by JAH environment staff using motion-sensitive cameras and/or other passive methods will occur in the vicinity of newly established points of connectivity with surrounding properties following their installation. For the 'wallaby gates' linking Precinct 2A to Acourt Road Reserve, JAH will continue to inform DBCA of the outcomes of the motion-sensitive camera monitoring.

JAH will engage a consultant to undertake a wallaby survey in 2019. The survey methodology will be as close as practicably possible to that employed by Western Wildlife in previous wallaby surveys at Jandakot Airport. The resulting report will take into consideration the effects of wallaby gates and other fauna corridors, and include recommendations for ongoing monitoring and applicable thresholds for triggering management intervention.

In addition, incidents of wallabies in air movement areas where they are deemed a potential risk to aircraft safety are recorded in the Jandakot Airport Safety Management System register as a Wildlife Incident. These incidents are investigated and reported within the Annual Environment Report.

Monitoring regimes and survey methods will be again revisited when the CMP is next reviewed following the approval of Master Plan 2019.

#### Thresholds for Triggering Further Management Intervention

Management for maintenance of Western Brush Wallaby habitat and populations will continue to be primarily through actions relating to other sections of this plan, including:

- Vegetation management (refer Section 4.7), primarily via weed control (Appendix B) and Dieback Control (Appendix C). Key thresholds include maintaining Bushland Condition at levels of "Good" or above, and restricting weed cover to a maximum of 20%.
- Rehabilitation/revegetation of habitats (Appendix D).
- Feral animal control; maintaining or reducing on-site predators or competitors (Appendix F).
- Fencing strategy; to minimise risk of road deaths (Appendix H).

It is anticipated these actions will be adequate to maintain habitat for Western Brush Wallabies within the airport's Conservation Precincts and no species-specific thresholds for triggering management intervention are warranted at this stage. This position was reviewed and remains unchanged following the completion of the collaborative research project involving JAH, DBCA, Murdoch University and the University of Western Australia and the post-Stage 3 clearing wallaby survey.

If wallabies are found to have breached exclusion fences and entered the air movement areas where they pose a risk to aircraft safety, management actions will be taken in accordance with the overabundant native species section of the Feral Animal Management Plan (Appendix F).

Thresholds for triggering further management intervention will be again revisited when the CMP is next reviewed following the approval of Master Plan 2019.

### 6.2.5 Graceful Sun-moth

The Graceful Sun-moth (*Synemon gratiosa*) is a day-flying moth endemic to south-west Western Australia.

Previous surveys at Jandakot Airport reported that while habitat for the moth exists, no individuals had been recorded within the Airport (ENV 2009b). Additional surveys were conducted over four days in March 2011, in conservation zones 1A, 1B, 2 and a runway overshoot area (Western Wildlife 2011c). Graceful Sun-moths were recorded in and adjacent to Conservation Precinct 2A. Banksia woodland in the conservation zones was identified as Graceful Sun-moth habitat (Figure 10).

When EPBC 2009/4796 approval was granted, the Graceful Sun-moth was listed as Endangered under the EPBC Act. The sun-moth has since been found to occur over a wider distribution and wider host plant range on the Swan Coastal Plan. The sun-moth was removed from the WA threatened fauna list in November 2012 (it remains listed as Priority 4) and subsequently removed from the EPBC Act threatened species list in May 2013.

#### Monitoring Regimes and Survey Methods

Given the delisting of the Graceful Sun-moth and the two surveys (consistent with DBCA methods) already undertaken at Jandakot Airport, no further monitoring surveys are required.

#### Thresholds for Triggering Further Management Intervention

No thresholds for triggering management intervention are warranted given the delisting of the Graceful Sun-moth.

### 6.2.6 *Throscodectes xiphos*

In 2011 Western Wildlife (2011e) were engaged to undertake a literature review of *Throscodectes xiphos* to collate background information on the species and use it to inform recommendation for a potential field study.

The cricket *T. xiphos* is known only from male specimens collected from Cutler Road in Jandakot in April 1981 and is listed as Priority 1 by DBCA on the basis that there is little known about the species.

Any conclusions regarding its distribution, biology and habitat are based on generalisations about the subfamily Tettigoniinae that it belongs to. It is *possible* that *T. xiphos* occurs in bushland at Jandakot Airport due to the proximity (2 km) from Cutler Road (Figure 12). As other katydids favour heath habitats, *T. xiphos* may *potentially* occur at the airport in areas of *Banksia* woodland with a heath understorey (Western Wildlife 2011e, 2017a).

#### Monitoring Regimes and Survey Methods

Any attempted surveys of *T. xiphos* are likely to be costly, highly experimental and with limited chance of success due to following:

- As the call of *T. xiphos* is unknown, it cannot be used as a sampling technique for this species.
- Searching and direct observation may be used but its greyish-brown colour would be difficult to distinguish from the background environment.
- It is not known whether it is nocturnal or diurnal.
- A long-handled invertebrate net may be used to sweep for katydids that are resting on foliage, but this would be ineffective if *T. xiphos* does not rest on foliage.

A study undertaken by Phoenix Environmental Sciences (2010) in the Project Area and surrounding bushland of the proposed Roe Highway extension area targeted *T. xiphos* amongst other invertebrates. Despite utilising various survey methods (large aerial sweep

nets amongst flowering shrubs, pitfall trapping, foraging and night spotting) over different seasons, no native crickets were recorded. As the study area extended to land directly adjoining Jandakot Airport's northern boundary and the vegetation type is similar to that found at Jandakot Airport, the likelihood of a similar survey finding the species at Jandakot Airport would appear remote.

With members of the Tettigoniinae, collecting the more abundant nymphs in spring and raising them to maturity has been found to be an efficient sampling method (Rentz 2010). Although this method may be suitable for sampling katydid communities, its approach is nonspecific. Potentially, a range of katydid species may be raised, but the targeted species may not be among them. However, the advantage of this method is that it is the most likely to detect the presence of *T. xiphos* at the airport, and it is the method recommended by David Rentz, a katydid specialist (D. Rentz, pers. comm., April 2011). Such a method is still likely to be time consuming and costly, with limited chance of success, and such factors need to be considered in light of the management priorities of other significant species on the airport and the limited resources available with which to manage them.

Given the above, and the fact that there is no existing evidence that establishes a definitive link between *T. xiphos* and Jandakot Airport's Conservation Precincts, species-specific monitoring regimes and surveys are not warranted. Furthermore, in the unlikely event that *T. xiphos* is present within the Jandakot Airport Conservation Precincts but unable to be located, its presence will continue to be safeguarded due to ongoing management measures to protect its potential habitat.

#### Thresholds for Triggering Further Management Intervention

Given the lack of existing knowledge about the species, management for maintenance of potential *T. xiphos* habitat and populations will be primarily through actions relating to other sections of this plan, including:

- Vegetation management (refer Section 4.7), primarily via weed control (Appendix B) and Dieback Control (Appendix C). Key thresholds include maintaining Bushland Condition at levels of "Good" or above, and restricting weed cover to a maximum of 20%.
- Rehabilitation/revegetation of habitats (Appendix D).
- Feral animal control; maintaining or reducing on-site predators or competitors (Appendix F).
- Fencing strategy; to minimise risk of road deaths (Appendix H).

It is anticipated these actions will be adequate to maintain habitat within the Jandakot Airport Conservation Precincts where *T. xiphos* could potentially occur, and therefore no species-specific thresholds for triggering management intervention are warranted at this stage.

### **6.3 Feral Animals**

The Jandakot Airport Feral Animal Management Plan (Appendix F) is a component of the Jandakot Airport Conservation Management Plan. The Feral Animal Management Plan has been reviewed and amended to include objectives and control measures for the protection of native fauna.

### **6.4 Bushfire Management**

A Bushfire Management Plan (Appendix G) has been prepared for Jandakot Airport in accordance with the Airport Environment Strategy and forms a component of the Jandakot Airport Conservation Management Plan.

## 6.5 Fauna Road Crossing and Fencing

To ensure safe and efficient transport links to Jandakot Airport, additional transport links to the Perth Metropolitan Region are essential and therefore included in the approved Master Plan 2014. A Wildlife Fencing and Underpass Strategy (Appendix H), accounting for fauna habitat connectivity has been developed.

When planning for new roads and transport links to the airport, the need for fauna habitat connectivity will be addressed as a component of the road engineering design process. Each road development will be addressed individually on a case-by-case process and is ultimately approved by the Department of Infrastructure, Regional Development and Cities (DIRDC).

In situations where mitigation measures (e.g. underpasses and fences) are proposed to reduce the impact of transport corridors, the biology and ecology of the target species will be taken into account to ensure the structures and materials used will be the most effective in preventing such species from entering a road or transport corridor.

The Strategy also references the use of fencing to manage wildlife values in situations other than roads.

It should be noted that factors such as the planned future development of Precincts 7 and 8 by the City of Canning, ongoing management of Ken Hurst Park by the City of Melville, and potential changes in the proposed East Link Road alignment have impacted the original plans to have a continuous wildlife corridor from areas north of the Airport to Jandakot Regional Park in the South.

### East Link

An East Link dual carriageway is proposed; however, the final alignment has not been determined. Fauna linkages and fencing will be included in the design of the final approved alignment and constructed accordingly. It is anticipated the East Link will be fenced on both sides to prevent fauna access onto the road itself (thus minimising the number of fauna road deaths) and to protect the conservation areas from unauthorised access by members of the public.

### Ken Hurst Park

Ken Hurst Park borders the north of Jandakot Airport, adjoining Conservation Precincts 1A and 1B. The properties are separated by fire breaks and a service road (Leeming Road). This service road is one option being considered for the alignment of the future East Link Road. Should the East Link Road be developed between the properties, fencing and underpass requirements will be considered in the design phase in line with the Wildlife Fencing and Underpass Strategy (Appendix H). Should the East Link Road alignment not impact the boundary, JAH will liaise with the City of Melville to determine if any measures are required to aid wildlife connectivity. The current fencing separating the properties allows for limited movement of quenda, Western Grey Kangaroos and Western Brush Wallabies. Other factors that need to be taken into account when developing future wildlife corridors include:

- Consistent feral animal management
- Security of accessible infrastructure
- Detrimental public access impacts (e.g. rubbish dumping, vandalism, off-road vehicles)
- Detrimental impacts of native fauna species that utilise wildlife corridors on significant fauna populations and endangered flora.

## 6.6 Future Identification of Flora and Fauna Species

In the event of a new EPBC Act listed or WA priority fauna or flora species being found on the airport (i.e. one that has not previously been identified as occurring on site), JAH will take steps to confirm the find (via DBCA or expert consultant) and ensure the immediate vicinity is appropriately protected from impacts commensurate to the species/individual(s) located. Once the finding is confirmed, JAH will consult with the DBCA or relevant expert consultant to determine whether existing management measures within the CMP are sufficient to protect the species on the airport. If necessary, the CMP will be amended to incorporate any species-specific management measures required.

## 7 STAKEHOLDER CONSULTATION

Stakeholder consultation is recognised as an important component of sound environment management practices.

Jandakot Airport holds regular internal consultation meetings as well as with government departments and other external stakeholders as required. Stakeholder consultation relevant to the Conservation Management Plan is summarised below:

<b>Table 1. Stakeholder Consultation</b>	<b>Timing</b>
<b>INTERNAL</b>	
Jandakot Airport Holdings Management Committee Meetings	Monthly
Jandakot Airport Staff Meetings	Monthly
Jandakot Airport Safety Management System Meetings	Monthly
Airport Environment Officer - Department of Infrastructure, Regional Development and Cities	Fortnightly
Airport Building Controller - Department of Infrastructure and Regional Development	Fortnightly
<b>EXTERNAL</b>	
Department of the Environment and Energy (DOEE)	As required
Department of Biodiversity, Conservation and Attractions (DBCA)	As Required
Jandakot Airport Community Aviation Consultative Group meetings	Quarterly
Jandakot Regional Parks Community Advisory Committee meetings	Quarterly
City of Canning, City of Cockburn and City of Melville	As required
Department of Planning, Lands and Heritage (DPLH)	As required
Jandakot Airport Neighbouring Residents	As required

JAH has established a Community Aviation Consultation Group (CACG). The CACG is independently chaired and includes community, aviation, local government and state government representatives. Meetings are held quarterly and it has specific terms of reference for consultation which among other things, cover noise and environmental issues associated with the airport.

Consultation with the WA DBCA occurs on a regular basis, particularly when expert advice relating to environmental matters (other than matters protected under EPBC) is required in order to manage local and regional issues.

## **8 REPORTING REQUIREMENTS**

Reporting against actions described in this plan will be included within the Jandakot Airport Annual Environment Report (AER). In line with the *Airports (Environmental Protection) Regulations 1997*, the AER will be submitted to the DIRDC by 28<sup>th</sup> October each year. A copy of the report will be provided to DOEE by 28<sup>th</sup> October each year.

## **9 REVIEW AND AMENDMENT OF CMP**

The Conservation Management Plan (including its Appendices) will require regular review and amendment in order to meet practical requirements on site as changing circumstances demand.

Once amended, the Conservation Management Plan will be submitted to DoEE for the Minister's approval (ref Conditions 6 and 12 of EPBC 2009/4796 approval). The approved management plan will be implemented.

Unless an earlier trigger arises, the CMP will be reviewed following the approval of Jandakot Airport Master Plan 2019 and any other associated approvals required for implementation of Master Plan 2019.

## 10 SUMMARY OF ACTIONS

The Table below contains a list of summary actions relating to the Conservation Management Plan. Note that actions specific to sub-plans (e.g. Weed Management Plan) are contained within the relevant Appendix.

<b>Table 2. Conservation Management Plan Summary of Actions.</b>			
<b>Action</b>		<b>Responsibility</b>	<b>Timing</b>
<b>Native Vegetation Management</b>			
CMP1	Undertake Bushland Condition Survey and update Bushland Condition mapping.	JAH EM	End of 2021 (at least every 5 years).
CMP2	Update Bushland Condition mapping if significant unexpected detrimental changes are noted in annual weed quadrat surveys or triennial dieback assessments.	JAH EM	Within 12 months of the impact being reported.
CMP3	Develop a site-specific revegetation plan for areas identified as requiring revegetation utilising the Rehabilitation and Revegetation Guidelines.	JAH EM	Prior to undertaking any revegetation.
CMP4	Implement site-specific revegetation plan developed under CMP3.	JAH EM	As detailed in site-specific revegetation plan.
CMP5	Review Rehabilitation and Revegetation Guidelines.	JAH EM	End of 2023.
<b>Orchid Management</b>			
CMP6	Liaise with BGPA or other orchid expert, if <i>Drakaea elastica</i> is identified on site, to determine the most appropriate ongoing management and monitoring requirements.	JAH EM	Begin consultation with 1 month of plants being identified.
CMP7	Update CMP if <i>D. elastica</i> is identified on site.	JAH EM	Within 12 months of plants being identified.
CMP8	Undertake annual monitoring of translocated orchids and orchids within quadrats.	JAH EM	Annually until CMP is next reviewed.
CMP9	Identify (i.e. tag) and record location details on database of <i>C. huegelii</i> plants identified opportunistically.	JAH EM	Spring, annually from 2014.
CMP10	Complete <i>C. huegelii</i> census and update database.	JAH EM	At intervals no greater than every 5 years with the next survey (including mapping) to be completed before the end of 2023.
CMP11	Restrict access to	JAH EM	At all times.

<b>Table 2. Conservation Management Plan Summary of Actions.</b>			
<b>Action</b>		<b>Responsibility</b>	<b>Timing</b>
	Conservation Precincts containing <i>C. huegelii</i> persons (e.g. staff, contractors and researchers) with a valid reason for entry.		
CMP12	Staff and contractors working in the vicinity of endangered orchids will be made aware of their presence and significance (e.g. via CEMPs, inductions, toolbox meetings or signage).	JAH EM	At all times
CMP13	Prohibit controlled burning as a fuel reduction technique.	JAH EM	At all times unless advice provided by orchid experts indicating action would not be detrimental to the population.
CMP14	Include open flowered members of Myrtaceae in perimeter plantings (Precinct 1A and 1B) and in bushland rehabilitation.	JAH EM	When the need for planting/rehabilitation is identified.
CMP15	Undertake hand pollination and subsequent seed pod collection in fenced orchid quadrat for seed banking and/or research purposes (or alternatively provide access to a third party to undertake).	JAH EM	Annually if requirement for seed is confirmed by BGPA or relevant research institution.
CMP16	Consult with orchid experts for advice on necessary management actions if results of the next <i>C. huegelii</i> census show a population decline of more than 25%, and amend the CMP if required.	JAH EM	If triggered, within 12 months of the completion of 2023 census.
CMP17	Liaise with DOEE if East Link Road Alignment differs from that detailed in Master Plan 2014.	JAH EM	If applicable, prior to road construction works commencing.
CMP18	Engage orchid experts to salvage any <i>C. huegelii</i> plants impacted by the East Link Road.	JAH EM	If applicable, prior to road construction works commencing.
<b>Fauna Management – Carnaby’s Black-Cockatoo</b>			
CMP19	Participate in the Annual Great Cocky Count survey.	JAH EM	Annually
<b>Fauna Management – Quenda</b>			
CMP20	Undertake passive quenda monitoring within the Conservation Precincts.	JAH EM	Triennially (2020)

<b>Table 2. Conservation Management Plan Summary of Actions.</b>			
<b>Action</b>		<b>Responsibility</b>	<b>Timing</b>
CMP21	Consult with fauna experts for advice on management actions if passive monitoring reveals the absence of quenda within Conservation Precincts.	JAH EM	2020
CMP22	Capture and relocate quenda from large bushland areas prior to undertaking approved clearing activities.	JAH EM	Prior to clearing.
<b>Fauna Management – Western Brush Wallaby</b>			
CMP23	Undertake a Wallaby Survey in Conservation Precincts 1A, 1B & 2A.	JAH-EM	2019.
CMP24	Monitor established fauna corridor between Precinct 2A and Jandakot Regional Park Acourt Reserve.	JAH EM	For 12 months following installation.
CMP24	Review and report on trends associated with aircraft safety wildlife incidents within AER.	JAH EM	Annually
CMP26	Obtain Dangerous Fauna or Damage Permits/Licenses from DBCA.	JAH EM	Prior to undertaking actions requiring permits/licenses.*
*Except in the event that it has been justified and documented that failure to take immediate action has a high probability of resulting in a catastrophic event that impacts air safety/human lives.			
<b>Fauna Road Crossing and Fencing</b>			
CMP27	Include fauna linkages and fencing within the design of the East Link Road consistent with the Wildlife Fencing and Underpass Strategy.	JAH EM	Prior to construction commencing.
CMP28	Liaise with City of Melville to determine if any measures are required to manage wildlife connectivity between Ken Hurst Park and Precincts 1A and 1B.	JAH EM	Within 12 months of East Link Road alignment being finalised unless achieved earlier.
<b>Future Identification of Flora and Fauna Species</b>			
CMP29	Ensure the vicinity of any new EPBC Act Listed or WA priority flora/fauna species found on the site is protected and consult DBCA or expert consultant regarding confirmation of identification and management measures.	JAH EM	Immediately (within 24 hours) protect the vicinity and consult regarding identification and management measures within 1 week.
<b>Stakeholder Consultation</b>			
CMP30	Report on Stakeholder Consultation with JAH AER.	JAH EM	28 October Annually.
<b>Reporting Requirements</b>			
CMP31	Report against actions of the CMP within the Jandakot Airport Annual Environment	JAH EM	28 October Annually.

<b>Table 2. Conservation Management Plan Summary of Actions.</b>			
<b>Action</b>		<b>Responsibility</b>	<b>Timing</b>
	Report (AER) and provide copies to DIRDC and DOEE.		
CMP32	Report against actions of the CMP within an Annual Compliance Report (ref Condition 16 of EPBC 2009/4796) and publish on the JAH website.	JAH EM	28 October Annually.
<b>Review and Amendment of CMP</b>			
CMP33	Undertake a full comprehensive review and amendment of CMP.	JAH EM	Within 6 months of approval of Master Plan 2019 and any associated EPBC approvals, or as otherwise directed by DOEE.
CMP34	Amend CMP to include updated significant fauna management actions or thresholds for triggering management intervention (for Cockatoos, quenda and Western Brush Wallaby) if the findings of ongoing research/surveys identify relevant species-specific actions/thresholds that should be applied at Jandakot Airport.	JAH EM	Within 12 months of relevant, applicable species-specific thresholds being identified.

Refer to Appendices for additional sub-plan actions relating to the CMP.

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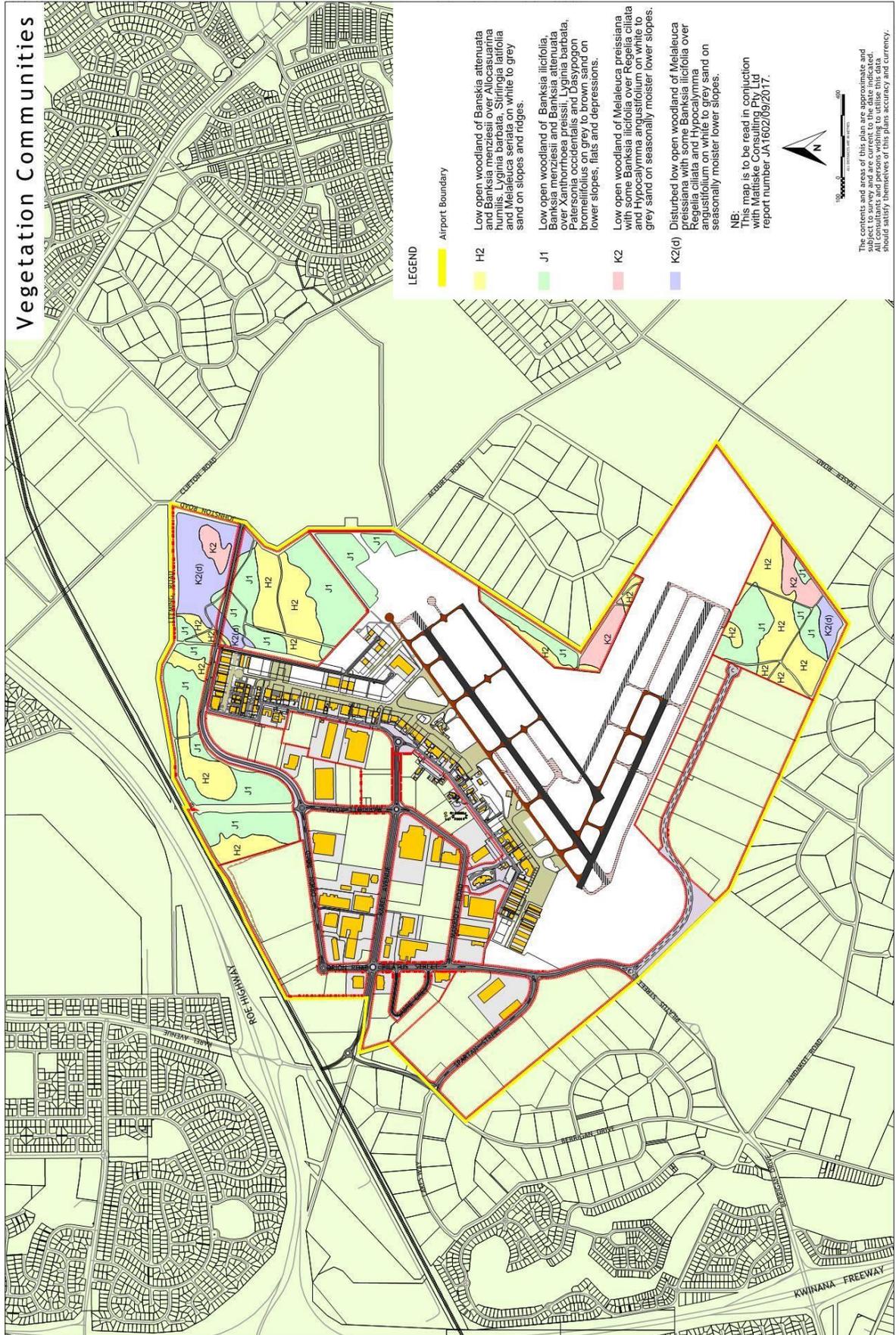
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## 12 GLOSSARY.

<b>AER</b>	Annual Environment Report
<b>BGPA</b>	Botanic Gardens and Parks Authority
<b>CACG</b>	Community Aviation Consultation Group
<b>CALM</b>	Department of Conservation and Land Management (now known as DBCA)
<b>CMP</b>	Conservation Management Plan
<b>DBCA</b>	Department of Biodiversity, Conservation and Attractions (Formerly DPAW, DEC and CALM).
<b>DEC</b>	Department of Environment and Conservation (formerly CALM). On 1 July 2013 the Department of Environment and Conservation separated into two agencies, the Department of Parks and Wildlife (DPAW – now DBCA) and the Department of Environment Regulation (DER – now DWER).
<b>DER</b>	Department of Environment Regulation (now DWER)
<b>DEWHA</b>	Department of Environment, Water, Heritage and the Arts (now DOEE)
<b>DIRDC</b>	Department of Infrastructure, Regional Development and Cities (previously DIT and DIRD)
<b>DIT</b>	Department of Infrastructure and Transport (now DIRDC)
<b>DOE</b>	Department of the Environment (now DOEE)
<b>DOEE</b>	Department of the Environment and Energy (previously DOE, DEWHA and DSEWPaC)
<b>DPAW</b>	Department of Parks and Wildlife (formerly DEC). On 1 July 2017 DPAW was merged with three other Departments to become DBCA.
<b>DSEWPaC</b>	Department of Sustainability, Environment, Water, Population and Communities (Previously DEWHA and now DOEE)
<b>EMS</b>	Environmental Management System
<b>EPBC</b>	Environmental Protection and Biodiversity Conservation Act 1999
<b>JAH</b>	Jandakot Airport Holdings
<b>NES</b>	National Environmental Significance
<b>UWA</b>	University of Western Australia
<b>WC Act</b>	Wildlife Conservation Act



**FIGURE 2 VEGETATION COMMUNITIES MAPPING 2016**



**FIGURE 3 VEGETATION CONDITION MAPPING 2016**

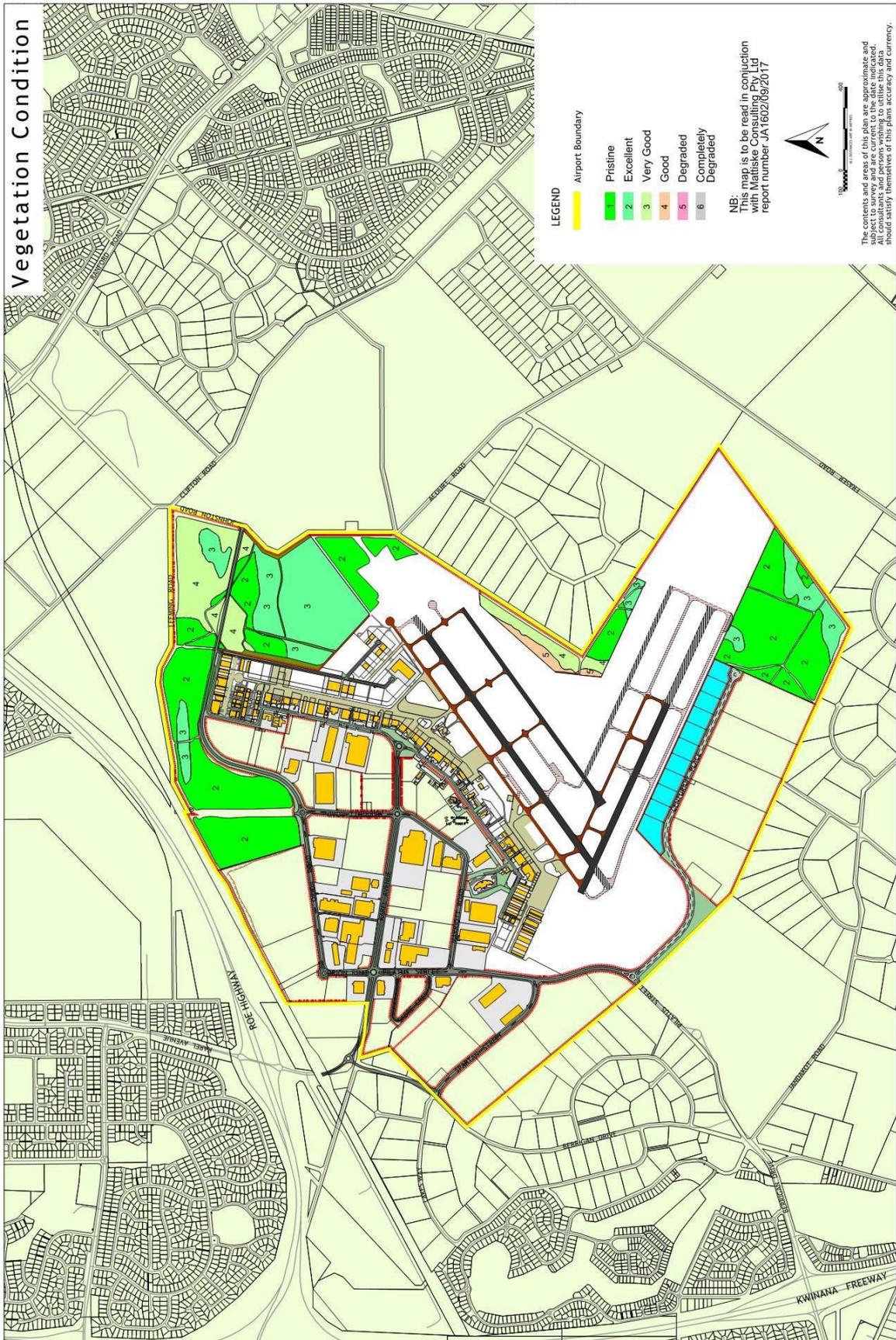
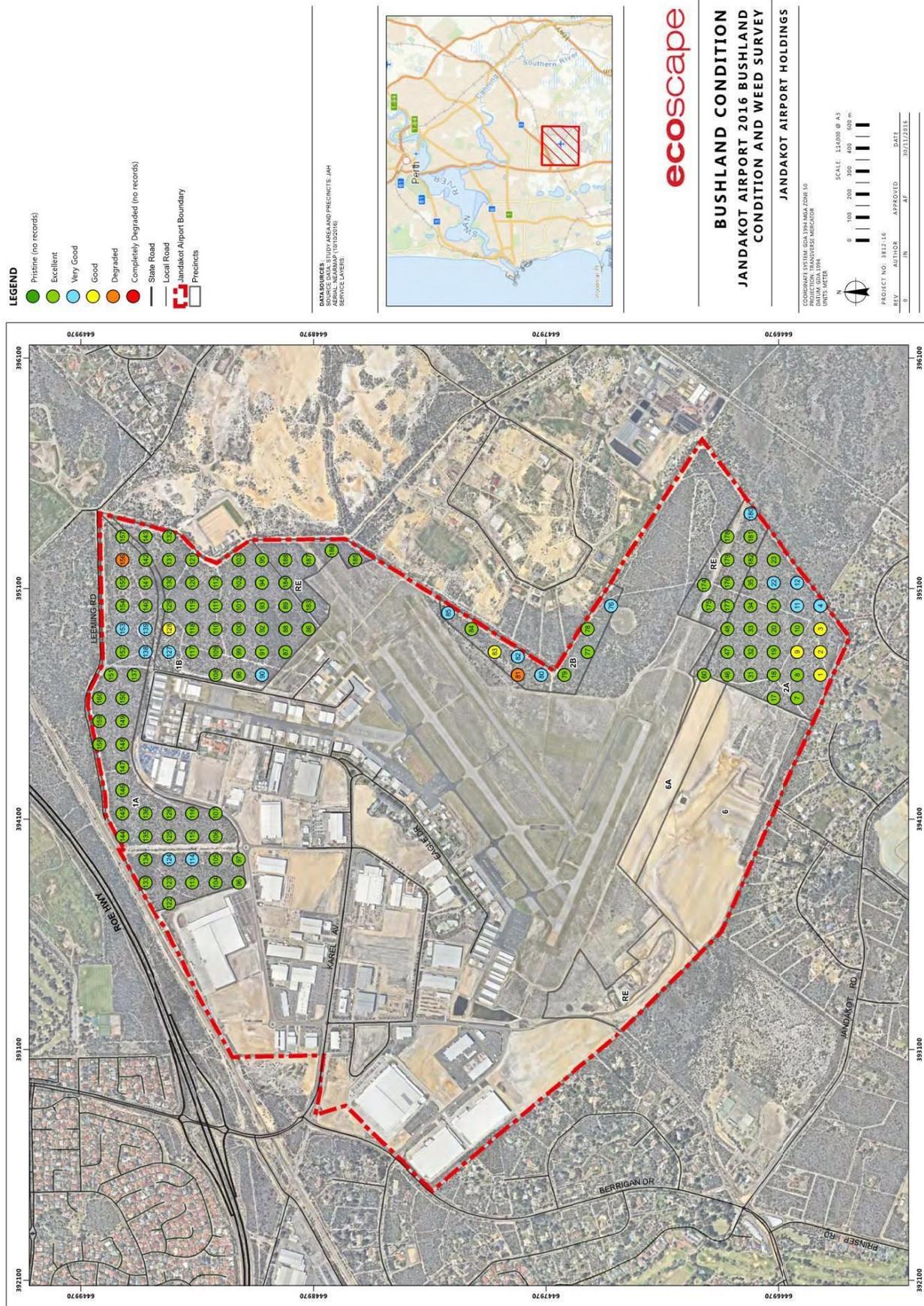


FIGURE 4 BUSHLAND CONDITION MAPPING 2016



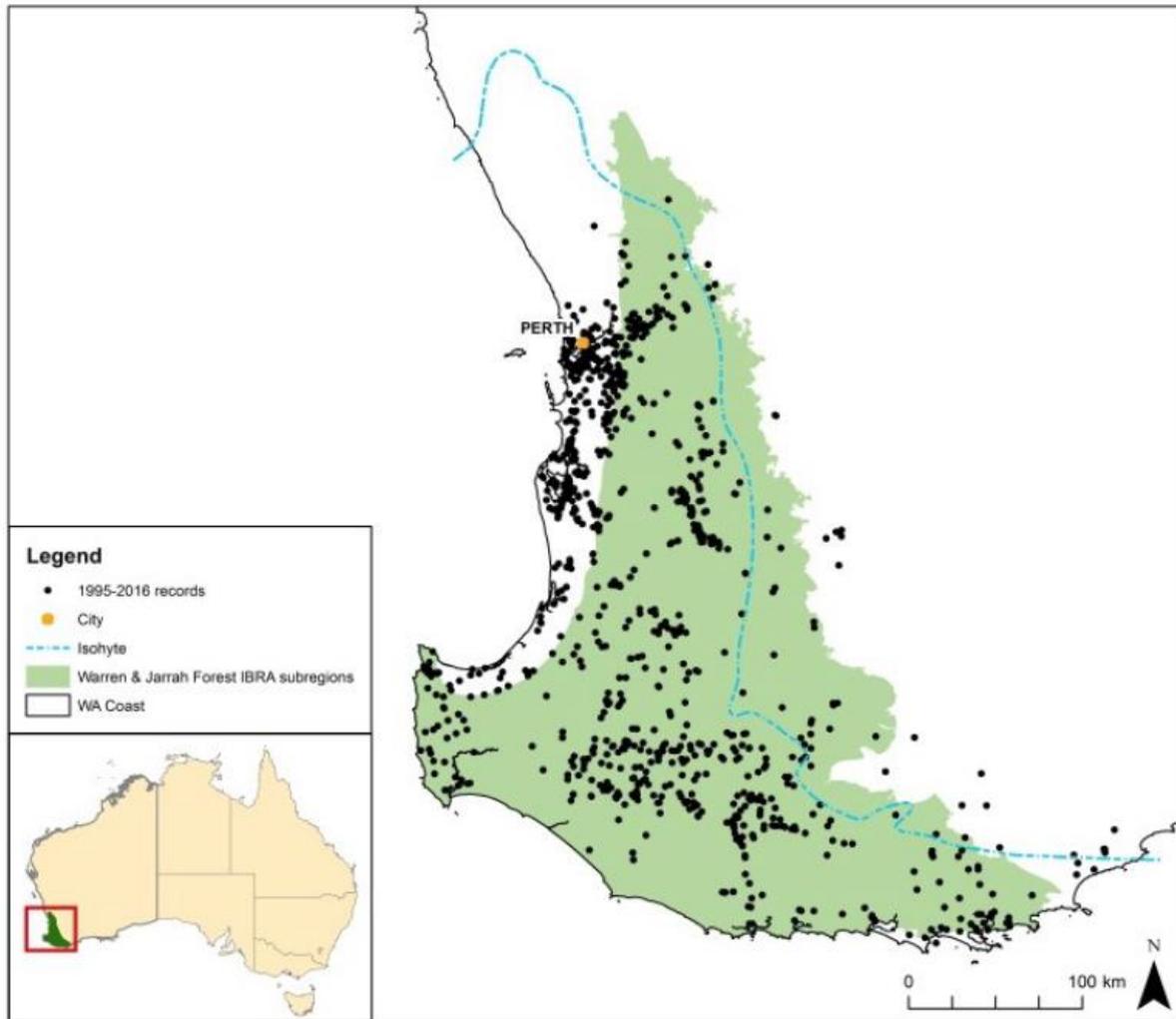
**FIGURE 5 ENDANGERED ORCHID SPECIES**



**FIGURE 6 CARNABY'S BLACK-COCKATOO HABITAT MAP**



**FIGURE 7. FOREST RED-TAILED BLACK-COCKATOO HABITAT MAP**



Current distribution of Forest Red-tailed Black-Cockatoos (DBCA 2017).

FIGURE 8 QUENDA HABITAT MAP



**FIGURE 9 WESTERN BRUSH WALLABY HABITAT MAP**



**FIGURE 10 GRACEFUL SUN MOTH HABITAT MAP**



**FIGURE 11 THROSCODECTES XIPHOS LOCATION AND POTENTIAL HABITAT MAP**



## **APPENDIX A: EPBC ACT APPROVAL (EPBC 2009/4796)**

## **APPENDIX B: WEED MANAGEMENT PLAN**

## **APPENDIX C: DIEBACK MANAGEMENT PLAN**

## **APPENDIX D: BUSHLAND REHABILITATION AND REVEGETATION GUIDELINES**

**APPENDIX E: JANDAKOT RARE ORCHID RESEARCH PROGRAM KEY  
FINDINGS**

## **APPENDIX F: FERAL ANIMAL MANAGEMENT PLAN**

## **APPENDIX G: BUSH FIRE MANAGEMENT PLAN**

## **APPENDIX H: WILDLIFE FENCING AND UNDERPASS STRATEGY**

## **APPENDIX I: HERITAGE MANAGEMENT PLAN**