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Wildlife Hazard Management Plan

ESTATE MANAGEMENT OPERATIONS SERVICES (EMOS)

Wildlife Hazard Management Plan

Royal Australian Air Force Base,
Williamtown, NSW

02 June 2021

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Kleinfelder Document Number: NCA20R110940
Project No: 20210304

Prepared for:

ESTATE MANAGEMENT OPERATIONS SERVICES (EMOS)
On behalf of the Department of Defence

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Document Control:

V	Description	Date	Author	Technical Reviewer	Peer Reviewer
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AUTHORISATION

This document forms the Wildlife Hazard Management Plan (WHMP) for RAAF Base Williamtown. This WHMP has been prepared in accordance with the *Defence Aviation Safety Regulation 139 - Aerodromes* and the requirement to meet the *Civil Aviation Safety Regulations 1998* Part 139. The aim of the WHMP is to provide procedures to deal with the danger to aircraft operations caused by the presence of wildlife on or near the aerodrome.

The Chief of Air Force has the overall responsibility for the technical and operational airworthiness of Defence aviation safety systems, and the Estate and Infrastructure Group (E&IG). EMOS are responsible for coordinating this WHMP at RAAF Base Williamtown. The WHMP is authorised jointly by the Williamtown Air Base Executive Officer (ABXO) as the Aerodrome Operator.

The Base Aviation Safety Officer (BASO) will implement the *Defence Aviation Safety Regulation 139 - Aerodromes* through the implementation of this WHMP. The WHMP complies with the *Civil Aviation Safety Regulations 1998* Part 139. Appropriate resourcing with trained personnel to fulfil wildlife management activities are identified herein.

	11 Jun 21
Name: Air Base Executive Officer (ABXO) RAAF Base Williamtown	Date:
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1. INTRODUCTION

Kleinfelder were engaged by BGIS on behalf of the Department of Defence (Defence) to undertake airfield fauna monitoring to update the existing Wildlife Hazard Management Plan (WHMP) prepared by Avisure (2020) for the RAAF Base Williamtown, NSW. The associated tasks included fauna monitoring surveys in and around the airfield, review of previous WHMP documentation and fauna survey data, identification and risk assessment of hazardous wildlife, and the development of an updated WHMP.

The structure of the WHMP follows the template developed by Avisure (V4 2020) and the Australian Aviation Wildlife Hazard Group (2011) in conjunction with Wildlife Hazards Management at Airports prepared on behalf of the Australian Airports Association (AAA) by Avisure (2016).

1.1 FUNCTION

The function of this updated WHMP is to reassess the risks that wildlife poses to aircraft operating from RAAF Williamtown, review objectives, strike data and performance indicators and to ensure procedures are in place for the systematic management of those risks.

The WHMP aims to support the requirements of Appendix I to *Civil Aviation Safety Regulations 1998* (CASR 1998) subparagraph 139.095(a)(ii) in relation to the content of the Aerodrome Manual. It also aims to support the requirements of the Manual of Standards (MOS) Part 139, Section 10.14 in relation to the preparation of a WHMP and the *Defence Aviation Safety Regulation 139 - Aerodromes* to address the presence of wildlife in the vicinity of the aerodrome, so they do not pose a threat to aircraft operational safety.

1.2 POLICY

The Defence Aviation Safety Management System (ASMS) (2016) provides a framework for the management of Defence aviation activities. Aviation safety activities are to be conducted at acceptable levels of risk and, where appropriate, to a level So Far As Reasonably

Practicable (SFARP) by ensuring a certified or registered Defence aerodrome does not compromise suitability for flight.

While it may not be possible to prevent all wildlife strikes, this WHMP aims to reduce the frequency and severity of strikes by focusing management efforts on species and habitats that constitute significant aircraft hazards at RAAF Base Williamtown.

1.3 GOALS AND OBJECTIVES

The goal of this WHMP is to minimise risk to pilots, flight crews, passengers, aircraft and equipment by reducing wildlife hazards and associated risks to aircraft and airport operations caused by wildlife activities on and within the vicinity of RAAF Base Williamtown.

The specific objectives of the WHMP are to:

- Target high and moderate risk species and habitats that occur both on and off the aerodrome, including Defence neighbouring properties.
- Ensure that adequate systems are in place to define roles, responsibilities and procedures for managing wildlife risks at RAAF Base Williamtown.
- Define the methods by which wildlife hazards are managed at RAAF Base Williamtown.
- Develop standard operating procedures, performance indicators and targets for management of wildlife issues and outline how these will be assessed and reviewed.
- Ensure compliance with all relevant aerodrome operational and environmental legislation and regulations.
- Ensure regular annual review and updates of the WHMP.

1.4 MANAGEMENT

The WHMP management is a sub-document of the RAAF Base Williamtown Aerodrome Manual.

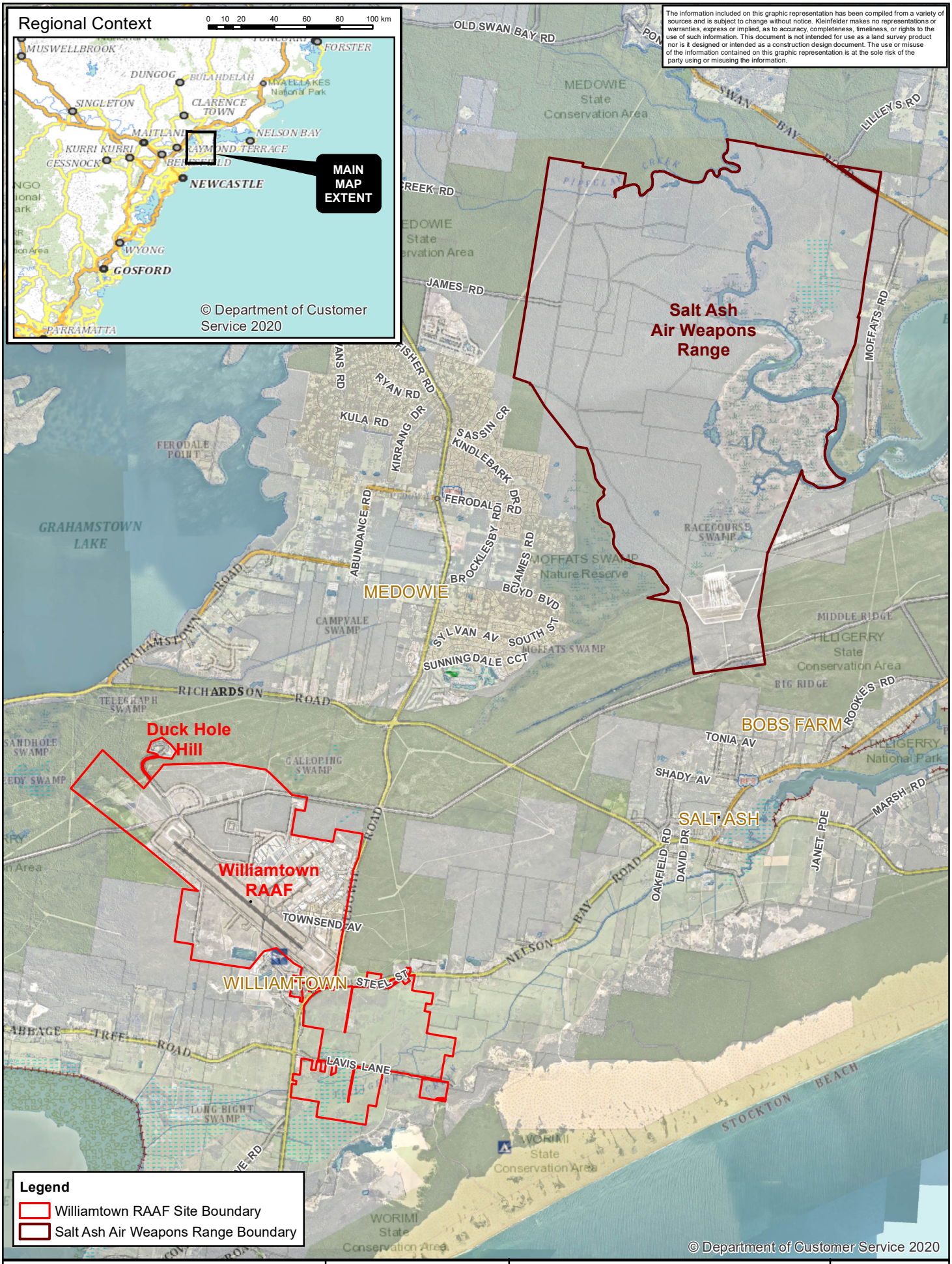
2. WILLIAMTOWN AERODROME

RAAF Base Williamtown is located approximately 15 km north east of Newcastle, within the Port Stephens Local Government Area (LGA). It is the premier permanent fighter base and training facility for the RAAF. The base shares operational facilities with Newcastle Airport, which provides commercial and private domestic airline services. General information about the base is provided below in **Table 1**.

Table 1: RAAF Base Williamtown General Information

Element	Description
Airfield location	RAAF Base Williamtown is located 15 km northeast of the city of Newcastle within the Port Stephens LGA.
Surrounding land use(s)	RAAF Base Williamtown covers an area of approximately 1,188.77 ha, inclusive of Lavis Lane. Rural residential properties are located along Cabbage Tree Road, Nelson Bay Road and Lavis Lane to the south and southeast of the base. Tilligerry State Conservation Area and adjoins the base at the north and east boundaries, the western boundary of the base is bound by Hunter Water Corporation Crown land. Salt Ash Air Weapons Range (SAAWR) is located approximately 6 km to the north-east of the base.
Landscape	RAAF Base Williamtown is situated in a coastal lowland area. It is bordered to the north, northwest and east by the Tilligerry State Conservation area and The Hunter River and its associated estuary is located 4 km to the south west of the base, and Grahamstown Lake 3.5 km to the north. The Pacific Ocean lies 5.2 km to the southeast.
Elevation	RAAF Base Williamtown is situated at 8 m above sea level (BoM 2020).
Airfield ownership	RAAF Base Williamtown is located on Defence Estate land defined predominantly as Lot 201 DP1091749, Lot 100 DP 852703, Lot 1 and Lot 2 DP833133. RAAF Base Williamtown is an operational military base. Newcastle Airport Limited leases land from Defence and shares use of the airstrip for civilian aircraft movements with military aircraft.
Airfield operator	The airport is operated by the RAAF with the Newcastle Airport Limited operating the civilian terminal.
Traffic profile	Locally based military aircraft include: F35A Lightning II, E-7A Wedgetail, Hawk 127, PC-21, Learjet, Sikorsky helicopter, and other transient military types. Civilian aircraft operations include: Commercial light and medium jet, turboprop, helicopters, and various other transient fixed and rotary aircraft.
Runways	The main runway is 3,058 m (10,033 ft) long and 45 m wide in a runway strip that is 230 m wide. The runway has clearways 60 m long and overrun areas of 200 m at each end. The original asphalt runway was constructed in the 1940s.
Navigation aids	Full airbase capability for all ground-based navigation aids which includes the Tactical Air Navigation System (TACAN), Instrument Landing System (ILS), and Non-Directional Beacon (NDB).

Element	Description
	Category 1 High Intensity Approach Lighting (HIAL), Double-sided Precision Approach Path Indicator (PAPI), Runway Edge Lighting, Taxiway and Apron Lighting.
Communications	The control tower is manned by RAAF during operational hours (0600 – 2200L). The tower can operate 24 hours a day when necessary.
Hours of operation	RAAF Base Williamtown has 24-hour operations.
Climate	The mean annual temperature at RAAF Base Williamtown is between 12.4 to 23.2^{o}C. Average annual rainfall is 1118 mm per year, with the wettest month June having an average of 125.2 mm of rain (8.4 mean days of rain) (BoM 2020).



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PROJECT REFERENCE: 20210304

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DRAWN BY: GJoyce

DATA SOURCE:
NSW DFSI - 2019
Nearmap - 2020

Locality Map

BGIS
Airfield Monitoring and
Wildlife Hazard Monitoring Plan 2020
Royal Australian Air Force Base, Williamtown, NSW

FIGURE:

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3. PLANNING

RAAF Base Williamtown has adopted a three-step approach for assessing and reducing the risk posed to aircraft by wildlife. The three steps include:

1. **Hazard identification** – broad assessment of the airport's hazard profile, including aircraft movements, the habitat and activities that attract wildlife both on and off airport, the species most observed on and off airport, and the trends observed in wildlife strikes.
   a) It must be noted that fauna surveys occurred over a limited time period, during April/May (i.e. over 11 days in Autumn 2020). Species diversity, density and behaviour will change depending on the time of the year. Migration and breeding seasonality can cause a dramatic shift in animal behaviour, abundance and location.
   b) The mitigation measures and management actions identified in this WHMP address the species and habitats identified during the current survey period (i.e. over 11 days in Autumn). Modification to infrastructure and/or base activities and aircraft movements (i.e. as we are experiencing due to the current COVID19 pandemic) will affect species diversity, abundance and behaviour within and surrounding the aerodrome.
2. **Risk assessment** – a risk assessment based on the information available on wildlife numbers, behavior, characteristics, and/or strikes for each species encountered on and around the aerodrome.
3. **Wildlife Management Plan** – a plan comprising actions for each of the highest risk species, supported by a summary of their relevant characteristics, identified by qualified personnel (i.e. ecologist) and key airport staff during routine hazard monitoring, to help the airport reduce the degree of risk and meet its wildlife management goals and objectives.

3.1 SUPPORTING INFORMATION

The following documents provide further background to the WHMP:

- AECOM 2012. Aviation Hazard and Base Wildlife Survey. RAAF Williamtown.
- Australian Government 2012. RAAF Base Williamtown Noise and Flight Path Monitoring System Q4 2011. Department of Defence. 13 August 2012.
- Australian Government 2021. Williamtown NFPMS Report: January – December 2018 and 2020. Department of Defence. Department of Defence NFPMS Reporting.
- Australian Transport Safety Bureau (ATSB) 2020. ATSB Information Sheets. Managing Bird strike risks at Australian Airports.

- Australian Transport Safety Bureau (ATSB) 2008, 2012, 2014, 2019. An analysis of Australian bird strike occurrences
- Australian Civil Aviation Safety Authority (CASA) 2011. Wildlife hazard management at aerodromes.
- Avisure 2009a. Bird and Wildlife Operational Management Plan. RAAF Williamtown.
- Avisure 2009b. Bird and Wildlife Management Audit. RAAF Williamtown.
- Avisure 2012. Bird strike hazard management programs at airports – what works?
- Avisure 2016. Wildlife Hazards Management at Airports prepared on behalf of the Australian Airports Association. March 2016.
- Avisure 2020. Wildlife Hazard Management Plan RAAF Base Williamtown. V4 March 2020.
- Bureau of Meteorology (BoM) 2020. Bureau of Meteorology Station no. 061078 (Williamtown).
- Coffey 2015. Wildlife Hazard Management Plan. RAAF Williamtown. Report to Brookfield Johnson Controls.
- Civil Aviation Safety Regulations (CASR), 1998. Statutory Rules No. 237 made under the Civil Aviation Act 1998.
- ERM 2004. Airfield fauna hazard reduction strategy. RAAF Williamtown. Department of Defence.
- HBOC 2007. Distribution, abundance and status of birds in the Hunter Estuary. Report prepared for Newcastle City Council by Chris Herbert, Special Report No. 4.
- Kleinfelder 2016. Wildlife Hazard Management Plan. Royal Australian Air Force Base Williamtown. Report to Department of Defence.
- Paton 2010. Bird Risk Assessment Model for Airports and Aerodromes, Revision 3. Published by Australian Aviation Wildlife Hazard Group.
- Rehbein Airport Consulting 2013. F-35A Lightning II Project Environmental Impact Statement – aviation. Risk Assessment. Report to Coffey.
- URS 2009. RAAF Base Williamtown. Bird and Wildlife Operational Management Plan. December 2009. Report to Department of Defence.

3.2 HAZARD IDENTIFICATION

The risk of bird strike poses a safety concern for aircraft operations from the potential for damage to aircraft and injury to aircrews. Effects on community members are also of concern if damaged aircraft were forced to land in a populated area. Aircrafts may encounter birds at altitudes of 9,144 m (30,000ft) or higher, however 95% of reported bird strike occurs below 914 m (3,000ft) above ground level (Avisure 2020). Approximately 50% of bird strike occurs in the airport environment, and 25% occur during low-altitude flight training (Avisure 2020).

3.2.1 Aircraft Movement and Types

A Military Control Zone (CTZ) exists around RAAF Base Williamtown encompassing an area within 12 nautical miles of the base (Avisure 2020). All the arrivals, departures and aircraft manoeuvring for the final approach occur within the CTZ. The CTZ has the greatest concentration of aircraft activity.

The more aircraft movements at an aerodrome, the greater the chances of wildlife strike. Different aircraft have different susceptibility to wildlife strikes. Large turbo fan aircraft tend to fly fast, have a large frontal surface area, have a great sucking power through their engines, rendering them more likely to strike wildlife than propeller driven aircraft. In Australia, Regular Passenger Transport aircraft are 16 times more likely to report a strike than general aviation aircraft (ATSB 2008). Light aircraft however are not subject to the same rigorous design standards imposed on commercial jet aircraft.

Military and civilian aircraft movement data was examined for years 2009, 2010, 2011 (Avisure 2020) and for 2018, 2019 and 2020 from the Defence NFPMS Reporting. Defence records from this period are considered representative of current operations. Airport operational hours for military flights are from 0900 to 2200, with civilian flights operating from 0600 to 2200. Military use of aircraft in 2020 ranged from 590 to 1873 flights per month while civilian flights range from 411 to 1574 per month (NFPMS 2020). RAAF Base Williamtown is a 24/7 operational airfield with tower hours between 0600-2200L where the majority of flight operations occur.

Aircraft flight data for 2018, 2019 and 2020 are shown in **Table 2** below (NFPMS 2020). Military aircraft movements were variable during 2020 with a minimum in April (590 movements) and a maximum in August (1873 movements). The low number of military aircraft movement in April 2020 may be attributed to the implementation of national travel restrictions in response

to the COVID-19 Pandemic and due to a reduction in classic Hornet fleet availability due to introduction to service of the F-35A.

While civilian activity increased from 2009 to 2011 (20,294 to 24,287), it decreased in 2018, 2019 and 2020 (18,917, 18,780 to 11,248). Monthly movement patterns of aircraft vary with the highest flight periods occurring in the months of July and September in 2018, in March and July in 2019 and February and August in 2020. With the lowest occurring in December in 2018 and 2019 and in April in 2020 (NFPMS 2020).

Table 2: RAAF Base Williamtown aircraft movement information

2018 Aircraft Category	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Military	1235	984	1569	1596	1896	882	1997	1618	2016	1697	1260	496	**17,246**
Civilian	1423	1600	1680	1613	1529	1656	1807	1585	1570	1649	1068	1737	**18,917**
Unknown	233	23	43	40	106	59	5	57	115	118	0	5	**804**
Total	2,891	2,607	3,292	3,249	3,531	2,597	**3,809**	3,260	**3,701**	3,464	2,328	**2,238**	**36,967**
2019 Aircraft Category	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Total**
Military	1418	1574	2824	1687	755	1343	1996	1934	1594	1326	1081	518	**18,050**
Civilian	1450	1574	1683	1690	1642	1452	1698	1456	1630	1700	1646	1159	**18,780**
Unknown	14	60	72	107	85	92	43	72	50	29	21	14	**659**
Total	2,882	3,208	**4,579**	3,484	2,482	2,887	**3,737**	3,462	3,274	3,055	2,748	**1,691**	**37,489**
2020 Aircraft Category	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Military	991	1574	1238	590	1702	1181	1610	1873	1716	1463	1260	636	**15,834**
Civilian	1524	1574	1319	411	613	548	725	705	704	975	1068	1082	**11,248**
Unknown	10	60	15	0	1	2	1	0	4	0	0	0	**93**
Total	2,525	**3,208**	2,572	**1,001**	2,316	1,731	2,336	**2,578**	2,424	2,438	2,328	1,718	**27,175**

3.2.2 On Aerodrome Hazards

3.2.2.1 Literature Review and Database Search

Existing information on vegetation community mapping and potential fauna species within the locality of RAAF Base Williamtown was obtained from existing reports and from:

- The Department of Agriculture, Water and the Environment (2020) Protected Matters Search Tool, which involved a search for matters of national environmental significance

within a 5-kilometre radius of the RAAF Base Williamtown to identify potential species of concern.
    - **Appendix 1** details potential species and their habitat which pose a risk to aircraft at RAAF Base Williamtown.
- Regional Vegetation mapping (LHCCREMS 2003) identifies five vegetation communities as occurring within the base (**Figure 2**):
    - Coastal Sand Apple-Blackbutt Forest.
    - Coastal Sand Wallum Woodland Heath.
    - Swamp Mahogany-Paperbark Forest.
    - Swamp Oak Rushland Forest.
    - Tomago Sand Swamp Woodland.

3.2.2.2 Habitats

Within RAAF Base Williamtown and surrounding areas of the CTZ, areas of known and potential wildlife habitat occur. Operational and maintenance activities within habitat areas may influence the presence of species types and numbers. Habitat types at RAAF Base Williamtown include:

- Managed grassland (i.e. Lavis Lane).
- Remnant native vegetation.
- Wetlands and waterbodies (i.e. including Lake Cochran).
- Landscaped and built environments.

The locations of these habitat types are shown in **Figure 2**. Note, that SAAWR was not assessed as part of the habitat assessment.

Grasslands

There is approximately 659.621 ha of grasslands (managed and unmanaged) across RAAF Base Williamtown. This includes most of the airside areas as well as sports fields. This habitat is used by many bird and mammal species that are potentially hazardous to aircraft and other traffic throughout the airport.

Several fauna species have been identified foraging, breeding and performing other activities in the managed grassland areas of RAAF Base Williamtown over the years. Species include the Brown Hare (*Lepus capensis*), European Rabbit (*Oryctolagus cuniculus*), raptors and their prey (i.e. rodents) which have been previously involved in wildlife strike incidents (Avisure 2020). The Eastern Grey Kangaroo (*Macropus giganteus*) and the Red-necked Wallaby (*Macropus rufogriseus*) are also known to forage in managed grassland areas of the base.

Wild Dogs (*Canis lupus familiaris*), Feral Cat (*Felis catus*) and the European Red Fox (*Vulpes vulpes*) have also been sighted on the base with scat and hunting evidence observed (Avisure 2020).

Bird species most common to these areas include the Australian Magpie (*Cracticus tibicen*), Magpie-lark (*Grallina cyanoleuca*), Galah (*Eolophus roseicapilla*), Masked Lapwing, (*Vanellus miles*) (Kleinfelder 2016).

Remnant native vegetation

There is a patch of managed remnant native vegetation which accommodates the runway extension. The managed vegetation is approximately 37.78 ha in area and is located in the north west of the base. There is an additional 268.69 ha of remnant vegetation in the southern end of the base, to the south and east of Lake Cochran and patches within Lavis Lane. Another strip exists along the western boundary of the airport. Native vegetation communities identified in areas both on and around the base include (ERM 2004):

- Broad-leaved Paperbark (*Melaleuca quinquenervia*) / Swamp Mahogany (*Eucalyptus robusta*).
- Smooth-barked Apple (*Angophora costata*) / Red Bloodwood (*Corymbia gummifera*) Open Forest.
- Scribbly Gum (*Eucalyptus haemastoma*) Open Forest.
- Isolated mature Drooping Red Gum (*Eucalyptus parramattensis*) trees.

The remnant native vegetation within the airfield provides nesting, roosting and foraging opportunities for several woodland and grassland birds including Australian Magpie, Galah, and raptors. The flowering trees within this habitat type provide food resource for parrots, honeyeaters and flying foxes and it is also known habitat for species such as Koala (*Phascolarctos cinereus*) and various macropods including the Red-necked Wallaby and the Swamp Wallaby (*Wallabia bicolor*). Foxes and feral dogs may also take refuge within this habitat type.

Wetlands and waterbodies (including Lake Cochran)

Lake Cochran, the drainage lines flowing into it, as well as the ephemeral wetlands created by pumping water into the airside grasslands constitute the habitat type wetlands and ponds. The approximate area of Lake Cochran is 5.4 ha and the approximate area of the remaining wetland habitat is approximately 13.19 ha.

RAAF Base Williamtown is situated on an unconfined sand aquifer, the Tomago Sandbeds. Permanent water occurs at the treated wastewater lagoon near the civilian terminal and retention pond near the office area. Periods of prolonged rainfall cause the shallow groundwater table to rise, resulting in surface water ponding in open grassy areas, in drains adjacent the airstrip and expansion of the treated wastewater lagoon and retention pond (Avisure 2020). Lavis Lane is an ephemeral wetland and is periodically inundated with water during heavy rains and flooding from Tilligerry Creek.

Wetland bird species will use the permanent water areas in dry periods, however the expansion of surface water during periods of water ponding will result in a significant increase in the on-site presence of wetland bird species including ducks, egrets, herons, ibises, Black Swan (*Cygnus atratus*) and Australian Pelican (*Pelecanus conspicillatus*). Water bodies and standing water sources attract mammals such as macropods and microchiropteran bats.

Landscape and Built Environment

The landscape and built environment are approximately 203.6 ha in area and include planted trees and shrubs, hangars, offices, workshops, and other man-made structures throughout the RAAF Base Williamtown. This habitat provides foraging, nesting and roosting opportunities for several flocking bird species such as Welcome Swallow (*Hirundo neoxena*), House Sparrow (*Passer domesticus*), Noisy Miner (*Manorina melanocephala*), pigeons and owls.

Of relevance is the open beam ceilings of hangars and building structures, which provide an attractive roosting and nesting opportunity for several bird species, putting them near airport traffic and operations. This habitat type will also attract small mammals such as rabbits and rodents that will, in turn, attract predatory birds such as raptors and owls.

3.2.2.3 Activities

Activities both in and around RAAF Base Williamtown that can be attractive to wildlife are discussed below.

Slashing/mowing

Slashing/mowing the grasslands exposes small lizards, rodents, frogs and small vertebrates which attracts birds of prey and other insect eating species, particularly Australian Magpie and ibises. It was observed that slashing/mowing adjacent to the runway was attracting birds, creating a risk to nearby airside traffic.

Dry season burn offs

The smoke plumes resulting from dry season burn offs, on or around the base, (i.e. burning of surrounding Defence land, nearby Crown land and local government reserves) flush out insects, small mammals and reptiles attracting birds of prey (Avisure 2020).

Standing water

The flat topography of the base, with little or no drainage, coupled with the shallow water table, results in water pooling throughout the managed grasslands. Pooling water has also been observed at the far-western end of the airport.

Water discharges during construction works and the operation of the PFAS treatment plant contribute to the ponding of water, attracting water birds such as ibises, egrets, herons and other wading birds that forage in ephemeral wetlands.

Waste/rubbish bins

Open or exposed rubbish bins can attract bird species that feed on refuse, such as Australian Raven (*Corvus coronoides*), ibises and others, as well as rodents which will attract raptors and/or owls. Waste/rubbish bins are located throughout the RAAF Base Williamtown.

Stockpiling soil

Soil stockpiles are utilised by foraging birds. It may also attract rabbits, rodents and basking reptiles which can attract predatory birds.

Runway lights

Runway lights attract insects which will attract birds and bats that feed on them.

3.2.2.4 Natural phenomena

Naturally occurring phenomena in and around Williamtown RAAF Base that can attract potentially hazardous wildlife are discussed below. While natural phenomena cannot be controlled, an understanding of their processes can assist with risk mitigation at the base.

High rainfall events

High rainfall events lead to water pooling in areas of depression which attract ibises, egrets, herons and other birds to forage. Due to the level topography of the airport, the airfield, other landscaped and managed grassland areas may also flood, creating wetland environments.

Thermal air currents

Thermal air currents are columns of air that rise as they are heated. This phenomenon typically occurs from mid to late morning as the sun heats the ground and the air rises. Raptors and pelicans use thermals to gain altitude to hunt or travel long distances, while conserving energy.

Fauna movements

Bird migrations and local bat movements increase species type and numbers into the RAAF Base Williamtown airspace. Bat movements are highest during dusk periods while migratory bird species movements are variable and likely to fluctuate both seasonally and in accordance with rainfall events.

The Hunter Estuary is a wetland of importance (Ramsar site) and includes several areas that are important migratory shorebird roosting and feeding habitats. The flightpaths of these migratory birds might take them through the Williamtown airspace during arrival/departure from the Hunter Estuary. Other bird movements, including short range, autumnal and spring movements of forest birds (such as Yellow-faced Honeyeaters and Silvereyes) along the coast, may impact on the flight paths of aircraft out of the base.

Significant Grey-headed Flying-fox (*Pteropus poliocephalus*) camps are located at Fullerton Cove (10 km), Medowie (5 km), Bob's Farm (14 km), Raymond Terrace (16 km), Salamander Bay (30 km), Wallaroo National Park (27 km) and Snapper Island (21 km). The Black Flying-fox (*Pteropus alecto*) is also known to occur within the area. Flying foxes leave their camps in large numbers at dusk before dispersing to their foraging areas and are capable of nightly flights of up to 50 km from their camp to find food resources.

3.2.3 Off Aerodrome Hazards

There are several habitat types and features that occur in the vicinity of RAAF Base Williamtown that will attract potentially hazardous wildlife.

Grahamstown Dam

Grahamstown Dam is a large body of water situated approximately 3 km northwest of RAAF Base Williamtown. The dam provides foraging and roosting opportunities for waterbirds including, Australian Pelican, ducks, Black Swan, terns and gulls and raptors.

As the largest fresh waterbody in the area, Grahamstown Dam attracts a high number of waterbirds that are also likely to disperse and seek out smaller bodies of water, such as Lake Cochran.

Hunter River Estuary

The Hunter River Estuary, approximately 12 km from Williamtown RAAF Base, includes several internationally significant roosting and foraging sites for migratory and resident shorebirds. The flightpaths of these migratory birds might take them through the RAAF Base Williamtown airspace during arrival/departure from the Hunter Estuary.

Stockton Beach

Stockton Beach lies approximately 5 km east of RAAF Base Williamtown. Birds that use this habitat that may also be drawn to the airport include Silver Gull (*Chroicocephalus novaehollandiae*), Australian Pelican, White-bellied Sea Eagle (*Haliaeetus leucogaster*) and cormorants.

Storm events may wash high numbers of dead fish onto the beach, attracting high numbers of birds. These birds may then disperse to nearby areas such as the RAAF Base Williamtown.

Wetlands

To the east of Nelson Bay Road are permanent and ephemeral wetlands that attract ibises, egrets, herons, raptors and other birds. There are several stands of trees throughout this area that provide roosting opportunities for these bird species.

Of note is a Straw-necked Ibis (*Threskiornis spinicollis*) roost located within a stand of She-oak trees within these open fields.

Tilligerry State Conservation Area and Salt Ash Air Weapons Range

Tilligerry State Conservation Area (SCA) lies immediately to the north, east and west of the base and Salt Ash Air Weapons Range (SAAWR) is located approximately 6 km to the north-east of the base. They both include native forest and provide roosting, nesting, and foraging

opportunities for woodland birds and birds of prey. They also provide habitat for a range of terrestrial fauna species which may enter the Williamtown RAAF Base airspace, especially during bushfire. Bushfire will flush out terrestrial fauna species, while attracting species such as raptors.

During 2016 field surveys, Kleinfelder identified evidence of fauna digging under the access gate in the northern boundary fence. Although a positive identification could not be made, it was likely a Red Fox that breached the boundary fence of the base.

Grasslands

There are areas of grasslands to the east of Nelson Bay Road and Lavis Lane that attract ibises, egrets, herons, raptors and other birds. These grasslands also provide a potential source for rabbits, hares, foxes and macropods.

Flying-fox colonies

There are several known Grey-headed Flying-fox camps located in area, between 5 km and 30 km from the airfield, respectively. There are also Black Flying-foxes which are known to occur in the area. Daily movements to forage, particularly at dusk when animals leave their camps, could potentially bring large numbers of this highly mobile species into the RAAF Base Williamtown airspace.

3.2.4 Wildlife Strike History

3.2.4.1 Australia

In Australia, between 2008 and 2017, there were 16,626 confirmed bird strikes reported to the ATSB (2019). The number of reported bird strikes has increased in recent years, with 2017 having the highest on record with 1,921 (ATSB 2019). Despite being a high frequency occurrence, bird strikes rarely result in aircraft damage or injuries. Of the 16,626 bird strikes, 99.8% were classified as incidents (ATSB 2019). A total of 19 bird strikes were classified as accidents and a further five bird strikes were classified as serious incidents (ATSB 2019). Nine bird strikes, or approximately 0.05% of the bird strikes in the ten years, resulted in minor injuries to pilots or passengers. There were no reported serious injuries or fatalities associated with a bird strike occurrence in the ten-year period (ATSB 2019).

The five most commonly struck flying animals in the 2016 to 2017 period were Flying Foxes and bats (many of which were likely to be flying foxes), Galahs, Magpies, and Plovers.

Non-flying animal strikes are relatively rare in comparison to bird strikes, with 396 animal strikes reported between 2008 and 2017 (ATSB 2019). The most common animals involved were hares, rabbits, kangaroos, wallabies, and foxes. Damaging animal strikes mostly involved kangaroos and wallabies.

3.2.4.2 RAAF Base Williamtown

2003-2017

Historical airstrike data for Williamtown RAAF Base have been analysed previously by ERM (2004), URS (2009) and AECOM (2012).

There has been an increase in the number of recorded bird strikes over this period, from 2.8/year (1973 - 2003) to 16/year (2005 – 2009) and 22.5/year (2007 - 2011). The increase may be a result of increased aircraft activity at the airport, increased reporting of incidents, changes in wildlife movement patterns in the locality, or a combination of these factors.

During the period 1973 – 2002, the majority (92%) of wildlife strikes at Williamtown Airport, involving both civilian and military aircraft, were with 'unidentified flying species' (URM 2004). For the wildlife strikes where the animal species, or group, was identified, the species involved were:

- Masked Lapwing.
- Galah.
- Nankeen Kestrel (*Falco cenchroides*).
- Unidentified bats.
- Macropods (kangaroos and wallabies).

There were 65 strikes during the period 2006 – 2008, of these 42 were with an unknown species. The animal species or species groups that were identified to be involved in the remaining incidents were:

- Plover, Masked Lapwing.
- Australian Magpie.
- Unidentified bats.
- Galah.

- Sparrow' (no positive identification).
- Unidentified raptors (hawks, kites and eagles).

Data obtained from ATSB (2019) report approximately 181 bird strikes at RAAF Base Williamtown during the period of 2008 – 2017, all of which are reported as an incident with a null injury level. Of these, approximately 100 are unknown species, the remaining and the most common species include:

- Plover.
- Unidentified bats.
- Flying Fox.
- Galah.
- Magpie.
- Birds of prey.

Data obtained from ATSB (2019) report lists nine animal strikes at RAAF Base Williamtown during the period of 2008 – 2017, all of which are reported as an incident with a null injury level. Species identified include six rabbits, two brown hares and one kangaroo.

2018-2020

Data obtained from Williamtown Airbase Operations Squadron reported a total of 50 bird strikes at RAAF Base Williamtown during the period of 2018- July 2020. A summary of the data for each year is provided below.

2018 bird strike data:

- Total of eight strikes, four of which occurred in December.
- All species are unknown.

2019 bird strike data:

- Total of 31 strikes, eight of which occurred in April, six in November and five in October.
- Species include:
    - 13 unknown species.
    - Seven unidentified bat species.
    - Three Swallows.
    - One Ibis flock.
    - One Falcon.
    - One Eagle.

- One Galah.
- Four Plovers.

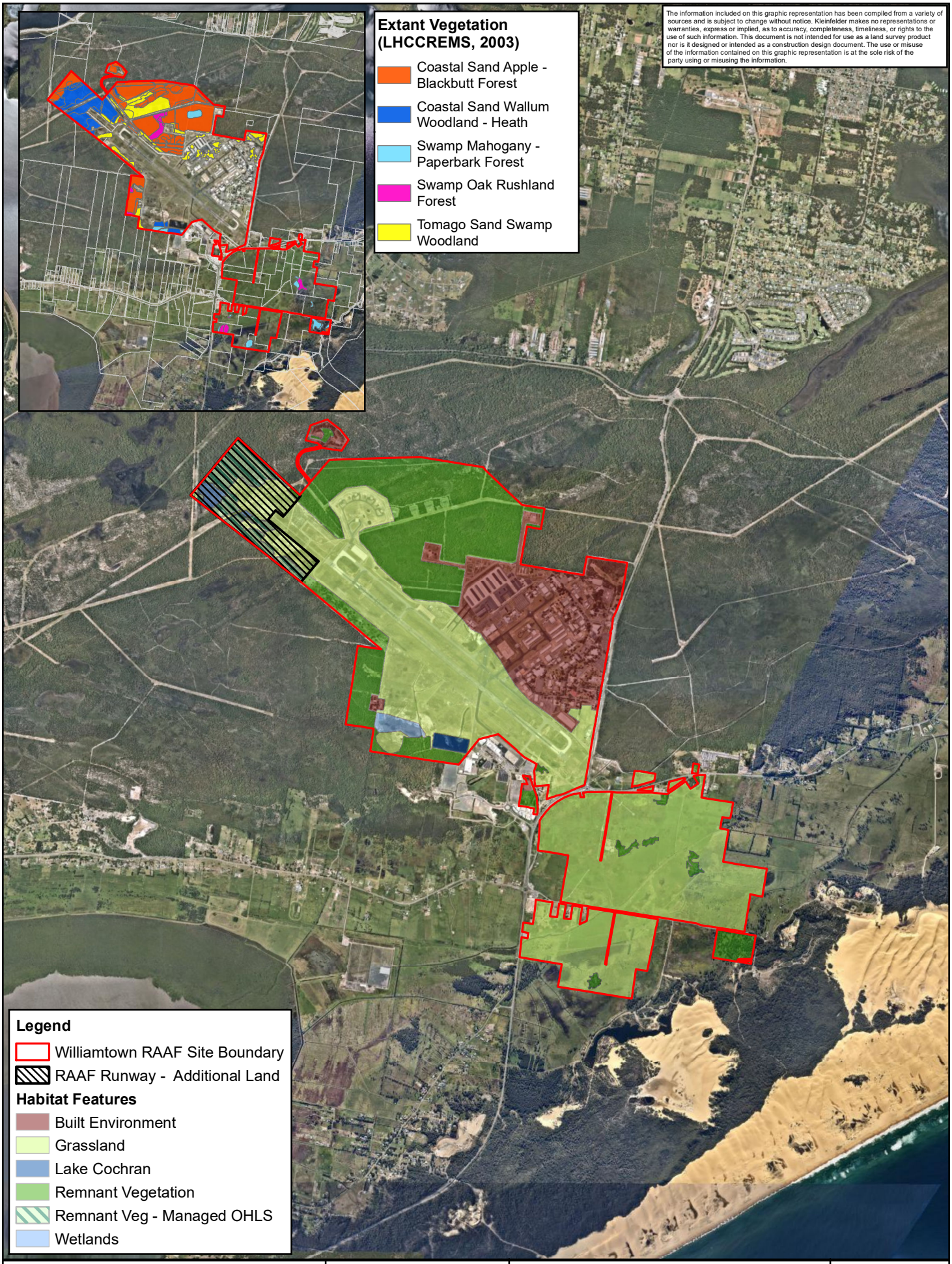
January to July 2020 bird strike data:

- Total of 12 strikes, four of which occurred in January and four in February.
- Species include:
  - Ten unknown species.
  - One unidentified bat species.
  - One Ibis flock, which caused damage to JS32 aircraft.

3.3 MANAGEMENT ACTIONS 2019/2020

Management actions undertaken during 2019/2020 at RAAF Base Williamtown to assist with the systematic management of wildlife strike risk include:

- The monitoring and maintenance of perimeter fencing by security.
- Recording of strike data by Williamtown Airbase Operations Squadron.
- Pre take off checks.
- Collection and disposal of remains where possible.
- General base management:
  - Grassland management.
  - Waste management.
  - Pest animal monitoring.
  - Pest animal management – culling.
    - Rabbit management – ground shooting undertaken by Australian Vertebrate Pest Management Pty Ltd in April/May 2020.
  - Drainage, to minimise pooling water.



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DATA SOURCE:
Nearmap - 2020
NSW DFSI - 2020
LHCCREMS - 2003

Habitat Features within Williamtown RAAF Base

BGIS
Airfield Monitoring and
Wildlife Hazard Monitoring Plan 2020
Royal Australian Air Force Base, Williamtown, NSW

FIGURE:

2

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Legend

- Williamtown RAAF Site Boundary
- RAAF Runway - Additional Land
- Salt Ash Air Weapons
- Tilligerry State Conservation Area
- Grassland / Ephemeral Wetland
- Named Watercourses
- Primary Road
- Arterial Road
- Sub-arterial Road

Metres
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DATA SOURCE:
NSW DFSI - 2019
Nearmap - 2020

Habitat Features within the Locality

BGIS
Airfield Monitoring and
Wildlife Hazard Monitoring Plan 2020
Royal Australian Air Force Base, Williamtown, NSW

FIGURE:
3

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4. METHODOLOGY

Fauna monitoring surveys were undertaken in and around the airfield of RAAF Base Williamtown to identify potentially hazardous wildlife species that occur. Field surveys were undertaken by Kleinfelder ecologists during the period of 28 April 2020 through to 08 May 2020.

Survey methodologies replicated Kleinfelder 2016, however the following survey locations had to be slightly adjusted due to difficulties surrounding access and Defence approvals:

- Bird survey location – B3, B5, B10.
- Remote camera locations – RC1, RC2, RC3, RC4.

The fauna monitoring survey methodologies are detailed below and are shown in **Figure 4**.

4.1 WEATHER CONDITIONS

Weather conditions during the fauna survey period are provided in **Table 3**. Temperatures were mild, with mild to moderate winds and no extreme weather events.

Table 3. Weather conditions during the survey period

Date	Temps		Rain	9:00 AM					3:00 PM				
	Min	Max		Temp	RH	Cld	Dir	Spd	Temp	RH	Cld	Dir	Spd
	°C	°C	Mm	°C	%	8th	-	km/h	°C	%	8th	-	km/h
April 2020													
28	15.3	23.7	4.6	21.6	74	4	NE	15	20.2	91	8	NE	20.2
29	13	27	1	18.9	87		NW	11	25.7	60		ENE	25.7
30	18.9	22	0	20.9	70	4	N	17	14.9	91	8	WNW	14.9
May 2020													
01	11	16.8	6.4	13.6	55		WNW	46	16.6	41		WNW	46
02	12.7	19.5	0	15.2	44		WNW	65	18.3	48		NW	61
03	9.4	19.7	0	14	57		WNW	30	18.5	43		SSW	28
04	7.2	19.6	0	13	70		WNW	20	18.5	54		S	28
05	10.1	19.7	5.6	14	95	4	NW	17	19.2	72	1	SSW	13
07	7.4	21.5	0.2	14.3	80		NW	15	21.3	60	2	NNW	7
08	7.4	26.3	0	16.3	74		NW	17	25.9	34		NW	13
Statistics for the first half of May 2020													
Mean	8.7	20.6		14.1	67	6		25	19.5	50	3		22

Date	Temps		Rain	9:00 AM					3:00 PM				
	Min	Max		Temp	RH	Cld	Dir	Spd	Temp	RH	Cld	Dir	Spd
	°C	°C	Mm	°C	%	8th	-	km/h	°C	%	8th	-	km/h
Lowest	4.8	16.8	0	11.2	44	4	NNW	13	16.6	28	1	NNW	7
Highest	12.7	26.3	6.4	19.6	100	8	WNW	65	25.9	72	8	NW	61
Total			17.8										

Source: Bureau of Meteorology 2020; station no. 061078 (Williamtown).

4.2 BIRD SURVEYS

Bird surveys were undertaken at ten locations within (six), bordering and around the airside (four) at RAAF Base Williamtown (**Figure 4**). At each survey point, two surveys were conducted over separate days and over a minimum of 30 minutes. Surveys were carried out in the morning, between 06:30 h and 10:00 h, when bird activity is at its peak (Bibby *et al*. 2000).

All bird species visible and their behaviour, followed by a count of all individuals from all species from a vantage point within a two-hectare area were counted and recorded to allow for estimates of relative abundance. The location of any bird sighted and any identified habitat features or obvious attractants, relative to the runway was also noted. Birds were identified with the aid of binoculars or aurally by their characteristic call.

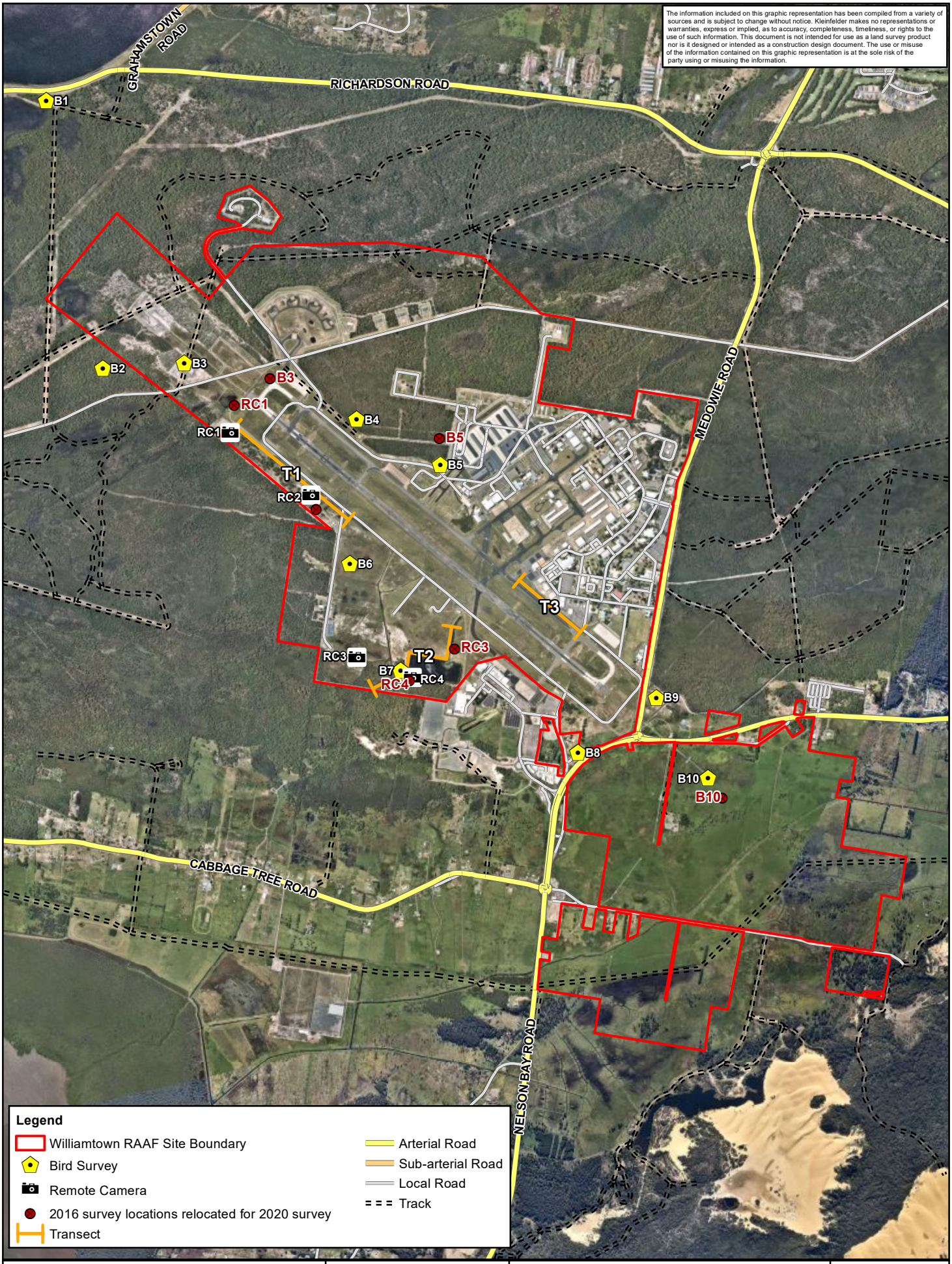
Opportunistic observations of any other fauna species during field work were also recorded and included in the assessment.

4.3 FAUNA TRANSECTS

Three 1000 m transects were established within the RAAF Base Williamtown in order to determine the presence of any potentially hazardous non-avian fauna (**Figure 4**). Transects were walked in the morning between 07:00 h – 10:00 h. All fauna species sighted were recorded and the number of individuals were counted. Transect surveys were replicated over five separate days. Habitat features and any wildlife attractants (natural or man-made) were also noted during the transect walks.

4.4 INFRARED CAMERAS

To record general mammal activity within the base at night, four infrared motion-sensing cameras were installed and left deployed for 11 days. These cameras were not baited so that wildlife was not attracted to the airfield, which would bias the results and potentially create a hazard. The locations of the cameras are provided in **Figure 4**.



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DRAWN BY: CWhyte
DATA SOURCE:
NSW DFSI - 2019
Nearmap - 2020

Fauna Survey Effort

BGIS
Airfield Monitoring and
Wildlife Hazard Monitoring Plan 2020
Royal Australian Air Force Base, Williamtown, NSW

FIGURE:
4

L:\GIS FOLDER\00 CLIENT FILES\125646_Brookfield\20210304_AirfieldMonitoring_Williamtown\Mapping\20210304_Williamtown_Fig4_FaunaSurveyEffort.mxd

5. RESULTS

5.1 WILDLIFE STRIKE HISTORY

A summary of the available wildlife strike data from 2008 through to July of 2020 for RAAF Base Williamtown is provided below (**Plate 1**). Strike data for 2020 is inclusive of six months only. Looking at the results from 2019 in comparison to 2020, it is probable that by December 2020 the total wildlife strike results would be similar to the 2019 total (i.e. 31 strikes recorded).

Overall it appears that more wildlife strikes are occurring, however the increase in strikes may be attributed to an increase in the recording of strikes and better data management by airport personnel. Wildlife strike recording and data management over the coming years will be important to determine whether or not this is the case.

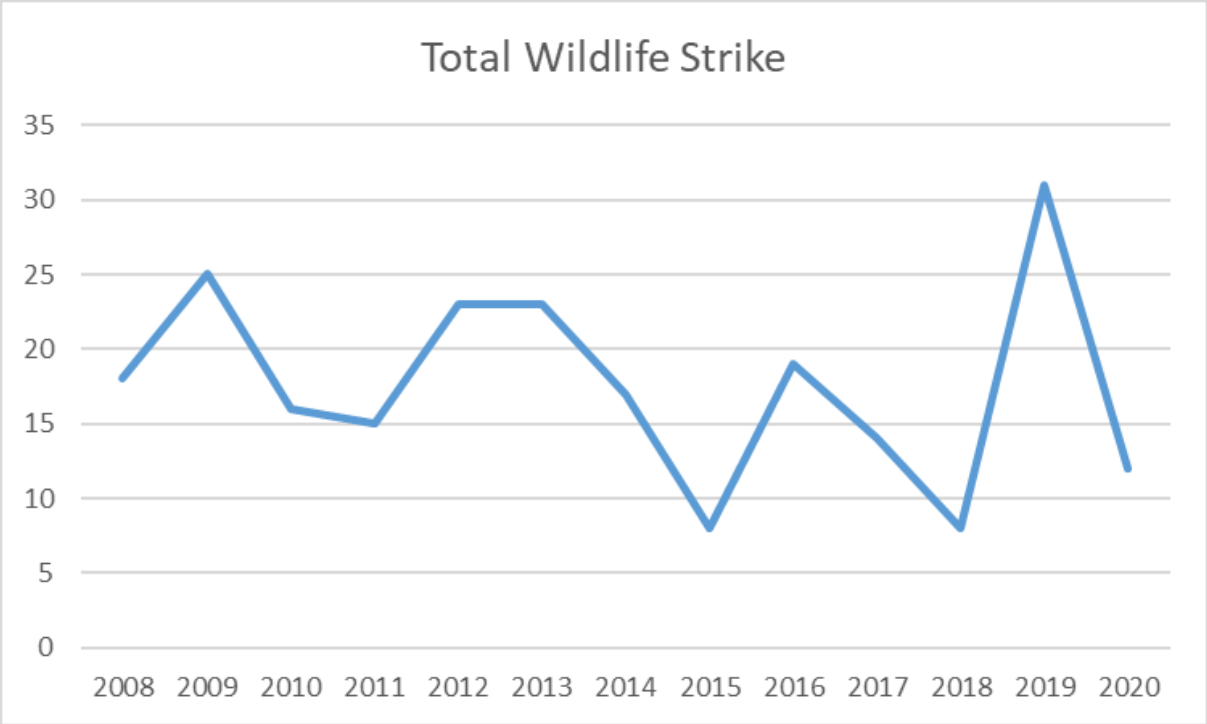

Plate: 1: **RAAF Base Williamtown wildlife strike data 2008 to July 2020**

5.2 BIRD SURVEYS

Bird survey results for 2016 and 2020 are provided in **Table 14** of **Appendix 2**.

5.2.1 2016 Survey Results

A total of 61 species were recorded on and around RAAF Base Williamtown. Of these, 45 species were recorded airside. The highest proportion of species recorded were from the family *Meliphagidae* (Honeyeaters which included 8 species), followed by *Acanthizidae* (Thornbills which 4 species), *Artamidae* (Magpies, Butcherbirds and Currawongs which included 4 species) and *Cacatuidae* (Cockatoos and Galahs which included 4 species). The two families of raptors, *Accipitridae* and *Falconidae*, each had three species, with a combined count of six species.

The species with the highest count of individuals was Straw-necked Ibis, of which over 50 individuals were observed leaving a roost outside of the RAAF Base at B10 (**Figure 4**). High numbers of Straw-necked Ibis (26 and 16) were also recorded foraging airside on several occasions. Other species that were recorded in high numbers were Galah and the Noisy Friarbird.

5.2.2 2020 Survey Results

A total of 49 species were recorded on and around RAAF Base Williamtown. Of these, 42 species were recorded airside, only three less than the previous survey period undertaken by Kleinfelder. Bird families and species identified during the 2020 survey are comparable to the 2016 survey results. The highest proportion of species recorded is from the family *Meliphagidae* (8 species), followed by *Acanthizidae* (4 species) and *Artamidae* (4 species). However, the family *Cacatuidae* (Cockatoos and Galahs) only include 2 species and only one family of raptor was identified (*Accipitridae*).

No Straw-necked Ibis were identified during the current survey. The Straw-necked Ibis are a waterbird species who are highly mobile and nomadic and whose movements are closely tied to water availability within inland floodplains and wetlands. It is unclear as to why the variation of numbers of this species occurred during this survey, however they are not an indicator species and are highly variable depending on resources.

The species with the highest count of individuals was the Galah, with approximately 90 individuals observed from B8 within the RAAF Base Williamtown land (**Figure 4**). High numbers of species recorded airside included the Cattle Egret (*Ardea ibis*), 10 individuals were recorded airside at B4 and Variegated Fairy Wren (*Malurus lamberti*), up to 11 individuals recorded at B7, 6 individuals recorded at B6 and B3. Rainbow Lorikeets were recorded at each bird survey location with a total of 22 individuals recorded at B5 and 10 individuals at B8, both survey locations are airside.

Four Eastern Grey Kangaroos were observed at B9 during the survey.

5.3 FAUNA TRANSECTS

Fauna transect results for 2016 and 2020 are provided in **Table 15** of **Appendix 3**. The fauna transects surveys identified several habitat features and activities throughout the RAAF Base that could potentially attract birds and other fauna. These habitat features and the fauna they attract are shown in **Table 4**. One activity, slashing/mowing, was observed. This activity will potentially attract fauna species (inclusive of birds).

No evidence of, or actual sightings of flying-foxes were recorded during the 2016 or the 2020 survey. However, ERM (2004) recorded a species of flying fox caught in a fence within the airport. Given this, and the occurrence of flying-fox habitat within the Williamtown RAAF Base and known camps in the vicinity, flying-foxes should be considered in the WHMP. As the surveys did not include nocturnal survey targeted to flying foxes, a qualitative probability of strike occurrence could not be made. The consequence category for the flying-fox was calculated to be 'extreme', this was the rank given.

Table 4. Habitat features within the RAAF Base Williamtown

Habitat feature	Attraction to fauna
Dead stags	• Branches provide nesting habitat for magpies, corvids, raptors and microchiropteran bats. • Hollows used by parrots and Kookaburras.
Fallen trees	• Provide shelter and nest sites for rodents and reptiles. • Rabbits may burrow underneath. • Rodents, rabbits and reptiles will attract predatory birds.
Hangars	• Open beam ceilings provide nesting and roosting sites for birds such as pigeons, sparrows and owls. • Rodents and reptiles may be attracted to shelter provided within hangars.

Habitat feature	Attraction to fauna
Buildings	• The eaves, air conditioning vents and antennas of buildings throughout the base may provide nesting sites for sparrow, pigeons and other birds.
Flowering trees	• Attract nectivorous birds and bats.
Waste bins	• If left open, can attract corvids, ibises, magpies and other birds, as well as rodents.
Pooling water	• Attracts wading birds such as ibises, herons and egrets to forage. • May also attract ducks and other water birds.

5.3.1 2016 Survey Results

Evidence of non-avian fauna species was detected along T2 only, species include:

- Lace Monitor (*Varanus varius*).
- European Rabbit.
- Red Fox (scats).
- Domestic/wild dog (*Canis lupus familiaris*).

5.3.2 2020 Survey Results

Evidence of non-avian fauna species was detected along T1 and T2, species include:

- European Rabbit (T1 and T2).
- Red Fox (scats) T2).
- Brown Hare (T1).

Several species of avifauna were recorded at T2 (9 species), T3 (10) and several Galahs (40) were also recorded at T3.

5.4 INFRARED CAMERAS

Infrared camera results for 2016 and 2020 are provided in **Table 15** of **Appendix 4**.

5.4.1 2016 and 2020 Survey Results

Seven fauna species were detected using the infrared motion-sensing cameras during 2016 surveys, only one species was detected during 2020 surveys. This may be attributed to the

length the cameras were deployed in 2016 (1 month), in comparison to 2020 (11 nights). Species identified include four birds, two mammals and one reptile.

Both the Tawny Frogmouth (*Podargus strigoides*) and the Long-nosed Bandicoot (*Perameles nasuta*) are nocturnal species and so will typically be missed by diurnal surveys.

The ecology and behaviour of terrestrial mammals and reptiles are unsuitable for assessment using the Paton Risk Assessment model for bird strike. A qualitative approach was used for these taxa. The Long-nosed Bandicoot is a small nocturnal mammal that is usually reluctant to leave the cover of vegetation, this species is considered a very low risk at the RAAF Base Williamtown. Lace Monitors and Red Foxes may leave the woodland within or from surrounding areas and venture across the runway and taxiways. Management recommendations have been provided for these two species in **Table 22**.

6. RISK ASSESSMENT

6.1 RANKING SPECIES BY RISK

Bird strike records are an important source of information for determining the hazards present at airfields. The information collected allows an assessment of species struck and trends across years, seasons, months and time of the day. Several risk assessments models have been developed to rank the species present at an airport in order of risk posed to aircraft. Doing so allows for wildlife hazard reduction programs to be focused on the species (and the habitats they prefer) that present the greatest threat to aviation and operations at RAAF Base Williamtown.

Typically, the outcome of a risk assessment is a probability **x** consequence matrix, an example is provided in the **Table 5** below. The species found to exhibit the highest probability of being involved in a strike and potentially result in the greatest damage (consequence) to aircraft are then listed as an 'extreme' or 'very high' risk species in the upper left hand boxes of the matrix, allowing prioritisation of management actions.

Table 5. Probability and consequence matrix for assessing the severity of bird hazards

Consequence	Probability			
	Very High	High	Medium	Low
Extreme	Extreme	Extreme	Very High	High
Very High	Very High	High	High	Medium
High	High	High	Medium	Medium
Medium	Medium	Medium	Low	Low
Low	Low	Low	Negligible	Negligible
Very Low	Negligible	Negligible	Negligible	Negligible

6.2 PATON RISK ASSESSMENT

The Paton Risk Assessment model for airports and aerodromes (2010) was used to assign rank to species found at, or within the vicinity of the RAAF Base Williamtown. According to this model, the consequence of a bird strike in relation to a particular species is related to bird species body mass, their flocking characteristics, flight behaviour while the probability of a strike is related to the abundances of different species on or near an airport or aerodrome. As

the probability of a bird strike on any one aircraft is extremely low, strike data may not provide the best estimate of the likelihood of a strike.

From an aircraft operator's perspective, there are two main consequences of bird strike: damage to an aircraft, safety crew and subsequent consequences (of varying magnitude – from negligible to extreme), and disruption to aircraft movements. The damage caused to an aircraft will depend on the mass of bird/s, the flocking density, and the location of the strike on the aircraft. Generally, birds with greater body mass in tight flocks will have higher consequence on the matrix.

The scoring system for bird strike consequence is described in **Table 17** and **Table 18** of **Appendix 5.** The consequence categories of bird species recorded during 2016 and 2020 surveys is provided in **Table 19** of **Appendix 6.**

The probability of a bird strike of each species was also calculated using the Paton Risk Assessment Model (2010). The details of this calculation are described in **Table 20** of **Appendix 7.** The qualitative probability of bird species recorded during 2016 and 2020 surveys is provided in **Table 21** of **Appendix 8.**

6.3 RISK RANKING OF SPECIES FOR RAAF BASE WILIAMTOWN

The Paton Risk Assessment (2010) recommends assigning high risk to species for priority management based on abundance and behaviour: The aim of this ranking vice system is to identify the species with the highest probability of being involved in a bird strike at a particular aerodrome and not to provide an absolute scoring system. As this is a relative measure of risks of a strike the listing of species into different categories (very high, high, medium and low) should aim to have 5-10 bird species falling into each of the two highest categories.

Smaller aerodromes may lack systematic counts of birds and so have limited quantitative data for scoring abundance, yet they may have some qualitative or observational data that allows them to rank species in terms of their relative abundance.

The result of the risk assessment for RAAF Base Williamtown are presented in **Table 6.** Based on the methods used, Black Swan, Little Corella (*Cacatua sanguinea*), Galah, Australian Pelican, Australian White Ibis (*Threskiornis molucca*) and the Straw-necked Ibis are the

highest risk species at RAAF Base Williamtown and are the priority targets of the wildlife management activities. A summary of species risk ranking for RAAF Base Williamtown, with an overview of the key hazard information and potential management actions to minimise the risk of bird strike with each species is provided in **Table 22** of **Appendix 9**.

Table 6. Risk ranking of species for RAAF Base Williamtown

Consequence	Probability/Likelihood			
	Very High	**High**	**Medium**	**Low**
Extreme	Black Swan Little Corella Galah Australian Pelican Australian White Ibis Straw-necked Ibis	Sulphur-crested Cockatoo Grey-headed Flying Fox Microbats	Pacific Black Duck	
Very High	White-bellied Sea Eagle Common Starling Cattle Egret White-faced Heron Australian Magpie Australian Raven Eastern Rosella Red-rumped Parrot	Rainbow Lorikeet Duck species		Musk Duck Yellow-tailed Black Cockatoo Tawny Frogmouth
High	Black-shouldered Kite Australian Hobby Magpie-lark Masked Lapwing	Peregrine Falcon Whistling Kite Purple Swamphen	Feral dog Brown Hare European Rabbit Lace Monitor Fox Laughing Kookaburra Common Myna	Great Crested Grebe
Medium	Nankeen Kestrel	Noisy Miner		Pied Currawong Little Wattlebird Red Wattlebird Noisy Friarbird
Low	Welcome Swallow Pied Butcherbird Grey Butcherbird		Black-faced Cuckoo-shrike	Red-browed Finch
Very Low		Willie Wagtail	Australasian Pipit	Striated Thornbill Yellow Thornbill Brown Thornbill White-browed Scrubwren Sacred Kingfisher

Consequence	Probability/Likelihood			
	Very High	High	Medium	Low
				Eastern Spinebill Yellow-faced Honeyeater Superb Fairy-wren Scarlet Honeyeater White-cheeked Honeyeater Leaden Flycatcher Golden whistler Rufous whistler Spotted Pardalote Eastern Yellow Robin Grey Fantail Silvereye Golden-headed Cisticola

7. WILDLIFE HAZARD MANAGEMENT PLAN

7.1 MANAGEMENT ACTIONS

Management actions for the on-aerodrome hazardous habitats, activities and natural phenomena, as well as off-airport hazards to minimise the risk of bird strike are provided in **Table 7** below.

Some of these actions require appropriate permissions from various government regulators. Advice should be sought before any action is taken. Additionally, some of these actions may be expensive or require major adjustments to current or planned work practices or programs, a risk-based cost benefit analysis should be conducted by Defence of any potential actions. Care should be taken when implementing multiple actions, so that the implementation of one does not infer in the efficacy of another, or that any aberrant outcomes occur.

Table 7: Management actions for RAAF Base Williamtown

Habitat / Activity	Management actions
On-airport habitat types	
Managed grassland / Landscape management	• Implement a grass program. • Maintain airside grass height to 20 – 30 cm to render the habitat unattractive to grassland-foraging birds, particularly ibises. Exclude Lavis Lane. • Regularly remove seed heads. • Mow adjacent to aircraft movement at night. • Where long grass is regularly maintained, assess the suitability of cutting the grass (i.e.ad hoc) to 0.25 cm to remove accumulated clippings and dead growth. • Fertilise grass to encourage dense growth. • Exclude grass species that are known attractants to bird species.
	• Implement a Landscape Management Plan. • Assess existing plant species suitability for the landscape. • Assess plant species suitable for new landscaping. • Do not plant species that exceed 10 m when mature. • Do not plant more than 5 trees within a group. • Single trees should not be planted closer than 50 m to any other single tree. • Trees should not make up more than 5% of the landscaping. • Shrubs should not exceed 5 m in height. • Nectar and fruit producing shrubs should not be planted in groups of more than 5 per group and within 50 m of the same species.
Remnant native vegetation	• Monitor the large trees and dead stags within the remnant native vegetation for bird nests. • Remove hollows from dead stags and relocate them off the aerodrome in suitable habitat. • Cover hollows with mesh when hollows are unoccupied - may require nest removal. • Active trapping and relocation for Commonwealth and State listed species.

Habitat / Activity	Management actions

	• Relocate any raptor nests that are found within the airfield.
	• Egg and nest removal from airside vegetation.
	• Destroy Noisy Miner nests if they are located within the airfield.
	• Implement a pest animal management plan (PAMP).
	  ○ Monitor for pest animals.
	  ○ Manage pest animals if detected.

Wetlands and ponds	• The installation of mesh or netting to cover the open water of Lake Cochran to prevent ducks, Australian Pelican, Black Swan, and other water birds from using the habitat should be investigated.
	• Identify all areas prone to occasional or regular flooding.
	• Drain and remove unnecessary water: regrade and seal areas that accumulate water, fill ground depressions, install curtains over drain culvert entries.
	• Implement a PAMP.
	  ○ Monitor for pest animals.
	  ○ Manage pest animals if detected.
	• Other considerations, i.e. pooling water from contamination remediation programs need to be considered, as does the engineering and cost considerations of netting.

Built environment	• Netting to be installed in the eaves of buildings and in the ceilings of hangars to prevent birds roosting and nesting. • Monitor air conditioner vents, rooftop aerials and other structures for bird nests. • Remove bird nests from buildings before eggs have been laid if possible, then install netting or mesh to prevent the bird remaking the nest. ○ Ensure appropriate PPE is worn. • Install exclusion devices - anti-perching devices can be installed on ledges, where netting is inappropriate, to prevent bids roosting, ensure does not interfere with any other program, e.g. netting, spikes on poles and lights, pest control, rodents and insects in buildings. • Turn off runway lights when not in use to reduce the insect attraction. • Modify apron lighting enclosures to prevent nest establishment. • Ensure perimeter fencing adequately excludes terrestrial fauna. • Regularly check perimeter fencing.
On-airport activities	
Slashing/mowing	• Mow/slash airside grassland at night when diurnal bird species are not active.
Daily monitoring	• Monitoring of airside environment (i.e. birds, other fauna species, fencing, carcasses, fruiting and nectar producing plant species).
Staff Training	• Train staff in the importance of wildlife hazard management and the use of Standard Operating Procedures.
Seasonal fauna surveys (birds count and infrared cameras)	• Quarterly fauna survey by an ecologist – letter style report presenting results • Annual report detailing the years results and updating of WHMP. • Implement Species Action Plans
Draining water over managed grassland	• Exclude/ restrict access to water. • Investigation already underway to identify alternatives to draining water airside. • Drain water as far as possible from the runway to encourage foraging birds away from airport traffic. • Install netting or a wire matrix over semi-permanent/permanent water. • Remove any dense vegetation surrounding areas containing semi-permanent/permanent water.
Waste/rubbish bins	• Ensure rubbish/waste bins are kept closed and emptied often to discourage foraging birds. • Ensure bin design restricts bird access.

Habitat / Activity	Management actions
	• Ensure that the frequency of waste removal is commensurate with the volume of waste generated.
Fencing	• Maintain and monitor perimeter fencing.
Stockpiling soil	• Minimise time that soil is stockpiled and cover soil stockpiles to discourage foraging birds.
On-airport natural phenomena	
High rainfall events	• Refer to management actions for ibises, egrets and herons. • Ensure drainage is in place to reduce pooling water.
Thermals	• Refer to management actions for raptors and Australian Pelican.
Bird and bat movements	• Diligent pre-take-off checks for bird activity during known migration period. • Pre-take-off checks at night for bat activity. • When planting new trees, consider non-nectar-producing and non-fruit-producing species. Remove fruiting trees from the base.
Off-airport hazards	
Off airport hazards will need Stakeholder engagement and cooperation. It may be effective for Defence to contribute to management actions off site.	
Grahamstown Dam	• Implement management actions for Lake Cochran to deter water birds entering the airfield.
Hunter River Estuary	• Diligent pre-take-off checks for bird activity during known migration period.
Stockton Beach	• Refer to management actions for ibises, Australian Pelican and raptors.
Wetlands	• Implement management actions for wetlands and ponds and managed grassland to deter wetland species from entering the airport.
Tilligerry State Conservation Area	• Daily monitoring of perimeter fence. • Repair any holes in the perimeter fencing to prevent fauna entering the airfield. • Timely and ongoing maintenance and repairs of any damage observed.
Grasslands	• Refer to management actions for grassland species. • Monitor boundary fence daily and timely maintenance and repair of any damage to boundary fence.
Flying-fox colonies	• Pre-take-off checks at night for bat activity. Minimise flights taking off and landing at the aerodrome during dusk when bats are flying.

7.2 POSITIVE AND NEGATIVE ACTION OUTCOMES

No one wildlife management measure is completely effective as fauna species often grow tolerant of techniques, rendering them ineffective. Therefore, a combination of measures is needed to achieve the most effective results. **Table 8** lists positive and negative outcomes of several management actions which were discussed in detail in **Table 7**.

Table 8: Positive and negative outcomes management actions

Management action	Positive outcomes	Negative outcomes
Passive management		
Grass program	Grass height maintained at 20-30 cm is a viable method of deterring ground foraging birds.	Longer grass may attract rodents and other small mammals, which may, in turn, attract raptors. Longer grass may also attract snakes, introducing another hazard. Management is quite expensive. Need personnel to work outside normal work hours. Safety issues. Establishing and maintaining long grass at airports is site specific and depends on soil type, grass species, climate and rainfall.
Removing hollows	Removing hollows from dead stags will prevent arboreal fauna, microchiropteran bats and birds such as Galahs, rosellas and lorikeets from roosting/nesting within the base.	This will not prevent these species foraging within the airfield.
Waste management	Prevention of birds and pest species accessing and feeding on waste.	Not applicable.
Removal of fruiting and flowering vegetation	It will prevent nectar feeding species from coming into the aerodrome to forage.	Loss of biodiversity.
Implement a Landscape Management Plan	Plant species will not attract fauna species into the aerodrome. Understanding of which plant species attract fauna to the aerodrome.	Reduced visual amenity. Additional expense.
Carcass removal	Removal of decaying carcasses will prevent scavenger feeders from entering the aerodrome space.	Loss of food source for several fauna species.
Limiting pooling water	Limit waterbird species such as ibises, egrets and herons foraging within the airfield.	Limited options for draining the water from the construction areas.
Anti-perching devices	Will prevent birds, such as magpies, Magpie-larks, Butcherbirds and Ravens landing on structures within the airfield such as light poles. Will limit the number of these birds congregating throughout the base.	Not effective with all species. Smaller birds can perch and nest in between spikes. Requires maintenance. May interfere with other programs (e.g. netting)

Management action	Positive outcomes	Negative outcomes
Bird deterrents (See **Section 7.2.1**)	Passive actions have differing rates of success in dispersing birds that are congregated airside.	Birds may become accustomed to techniques. Need to use a variety of actions.
Active management		
Daily monitoring	Allows the effectiveness of management measure to be assessed. Will enable managers to determine were alternative approaches are necessary. Allows managers to see how species are using the airport and adapting to management measures. Identifies new species and their movements/behaviour. Allows the airport to adjust management techniques to address new threats.	Need specialist skills and time to cover the airfield each day.
Removing birds and nests	Removing birds will immediately reduce the number of birds within the airport. Removing nest repeatedly may cause the birds to abandon the territory.	Short-term solution. Labour intensive. Permission required Reputational risk to Defence and impacts to species. If removing birds is not coupled with other measures such as habitat modification, other birds will move into the recently vacant territory of the removed bird. Birds will usually rebuild nests that have been removed or destroyed.
Dispersing birds (See **Section 7.2.1**)	Will immediately remove birds from the area. If started early and repeated, may prevent bird congregations becoming settled. If repeated and combined with habitat modification, it may reduce bird activity	Short-term solution. Needs to be coupled with other measures, mainly habitat modification. Birds may return later in the day after dispersal. Birds may become tolerant to dispersal technique. Multiple techniques should be used and alternated. Birds may only disperse to another area of the airport if not monitored. Birds may disperse into flight patterns if not coordinated with traffic control.

7.2.1 Bird Deterrents

The advantages and disadvantages of available bird deterrent devices and dispersal techniques are provided in **Table 9**. It should be ensured that each action does not impact on the efficacy of any other action.

Table 9: Advantages and disadvantages of bird deterrents and dispersal techniques

Deterrent device / dispersal technique	Advantages	Disadvantages
Anti-perching wire system – parallel wires installed over a series of narrow pins on a ledge.	Minimal damage to the building. Long-lasting. Environmentally safe.	Can only be used on ledges. Not suitable for all species; mostly pigeons. Requires maintenance.
Plastic netting systems – installed in the rafters of ceilings or eaves to exclude birds.	Suitable for large areas. Environmentally safe. Effective against most species. Long-lasting.	Can be difficult to install. Need to be monitored and maintained for holes. Can obscure some architectural elements.
Anti-perching spikes – rows of steel spikes installed in ledges, poles or other perches to prevent birds landing.	Easy to install. Long-lasting. Environmentally safe.	Not suitable for all species. Can collect debris such as nesting material and excrement. Need to be cleaned regularly.
Ultrasonic deterrents – produce high-frequency sounds to deter birds from an area.	None	Birds do not hear within this range, rendering them ineffective.
Pyrotechnics – scare cartridges, shell crackers, fireworks or alarm pistols.	Will disperse birds immediately. Safe. Humane.	Noise pollution – shots are very loud and may create a hazard. Temporary solution. Birds will likely return after a period of time. Birds may become habituated, rendering the technique ineffective. Requires training and permissions
Distress signal call play-back – recordings of distress calls of birds played to elicit a 'flight' response, evacuating birds from the area.	Will not obscure building aesthetics. Does not impact a building. Doesn't need installation.	Birds may become habituated and unresponsive. Distress signals are loud and obnoxious, creating a disturbance to personnel. Birds may return after the signal is stopped.
Scarecrows –includes rubber snakes and plastic owls, dead bird effigies, and other devices aimed at deterring birds.	Safe and unobtrusive. Effective against several hazardous species	Generally ineffective. Birds recognise they are not real predators. They may be used as perches by birds, having the opposite effect of that desired. Effigies require maintenance and replacement –birds become habituated.
Trapping – used to capture and relocate birds.	Humane.	Temporary solution. The bird may return, or others will likely move into the newly opened territory. Labour intensive

8. IMPLEMENTATION

8.1 ROLES AND RESPONSIBILITIES

The Bird and Wildlife Operational Management Plan (OMP) (URS, 2009) aligns with this WHMP. Section 2.1.3 of the OMP outlines all roles and responsibilities of inspections, air traffic control, database management and ongoing surveys required as part of the plan, which will be maintained in this WHMP.

It is understood that EMOS will be responsible for the overall coordination, supervision, implementation and management of the WHMP. This includes allocating resources, designating responsibility, coordinating training, and reviewing performance of the Plan's implementation.

Williamtown Air Base Executive Officer (ABXO) will be responsible for implementing the WHMP in relation to Aviation Safety matters and Aerodrome Airworthiness through the Base Aviation Safety Committee. A detailed description of the roles and responsibilities of the staff at RAAF Base Williamtown for managing wildlife hazards is provided in **Table 11**.

8.2 TRAINING

The development and implementation of a staff training program in the core elements of the WHMP enables effective wildlife management. Providing staff with the tools, knowledge and motivation ensures they can fulfil the requirements of the RAAF Base Williamtown WHMP (2021).

It is understood that EMOS will be responsible for implementing training to all civilian personal. The RAAF Base Williamtown Aviation Safety Officer will be responsible for implementing training to all Defence staff.

8.2.1 Standard Operating Procedures

Standard operating procedures (SOPs) provide personnel at RAAF Base Williamtown with standard details on the management and the monitoring of the wildlife risk. Staff members

need to be trained on the importance of the SOPs and how to properly complete the SOPs. The SOPs provide step by step instruction for the safety of staff members and ensure a standardised approach to data management and reporting. SOPs relating to the wildlife count procedure (WHMP-01), wildlife hazard surveillance (WHMP-02), strike reporting procedure (WHMP-03), the identification and handling of remains (WHMP-04), the wildlife dispersal procedure (WHMP-05) and the wildlife culling procedure (WHMP-06) templates are provided in **Appendix 10**.

8.2.2 Species Action Plans

It is recommended that Species Action Plans (SAPs) are developed for personnel at RAAF Base Williamtown. SAPs will provide species information and habit, seasonality and migration patterns if applicable, and targeted management actions for species assessed as high or moderate risk.

8.3 COMMUNICATION

8.3.1 Wildlife Hazard Reporting

In the event of identified hazard within, or in the vicinity of, the aerodrome, steps will be taken to remove the hazard, or notify pilots of its nature. Bird and animal strike reports are essential for understanding and managing risks. Strikes need to be accurately categorised and reported. Strikes are reported regardless of strike confirmation, location or damage. All strike reports are forwarded to the ATSB and entered into the RAAF Base Williamtown strike database.

A bird hazard warning notice is included in the En Route Supplement Australia (ERSA). Where a wildlife hazard is present that cannot be effectively managed by EMOS, Air Traffic Control is notified to inform pilots of additional risk levels. Where there is a significant increase in risk Air Traffic Control arranges a Notices to Airmen (NOTAM) to be issued. The NOTAM must provide specific information on species, period of risk, likely location and flight path.

In the event of a strike, the species involved should be identified wherever possible so that the WHMP may be adapted to ensure this species is targeted. Photographs of the animal should be taken and remains sent to a specialist for identification (Australian Centre for Wildlife

Genomics at the Australian Museum see http://australianmuseum.net.au/bird-strike. A summary of the strike process is provided below.

Table 10: Wildlife strike processing and reporting

Task	Description	Frequency	Responsible	Procedure
Recording strikes	Recording every strike	As required	Aircraft operators Maintenance crew Aviation Safety Officer	WHMP-03
Reporting strikes	Civilian pilots report all strikes to ATSB, Defence use an Aviation Safety Report (ASR) through Sentinel	As required	Aircraft operators, Maintenance crew Aviation Safety Officer	WHMP-03
Data management	Maintain records of wildlife strikes and review monthly to assess changes in populations	Ongoing	Aviation Safety Officer	NA
Strike Remains	Collect struck remains when possible	As required	Aviation Safety Officer	WHMP-04

9. MONITORING

Monitoring is a critically important tool in wildlife management at RAAF Base Williamtown. Effective monitoring provides essential information that assists staff to adapt the program, as required, to shifts in hazard and level of risk. It also provides evidence of conformance to regulatory and other standards and efficacy of the WHMP in minimizing wildlife strike risk to aviation.

The WHMP is updated annually and is the guiding document for wildlife hazard management, however RAAF Base Williamtown should facilitate routine reporting throughout the year (i.e. monthly and quarterly/seasonally), to maintain an up to date understanding of risks and hazards.

9.1 ROUTINE HAZARD MONITORING

It is important that areas both on and surrounding the airport that have the potential to attract birds and wildlife and therefore increase the risk of collision with aircraft are adequately monitored by the Operations Officers at the RAAF Base Williamtown. Off-site potential wildlife habitat surrounding the airport and base are monitored on a seasonal basis by an approved ecologist.

Routine detection of hazards in the field is achieved through regular runway and runway strip inspections and during airside wildlife surveillance. Both aspects are important to ensure early detection of wildlife hazards in airside areas, particularly inside runway strips.

9.2 BIRD SURVEY AND COUNTS

Bird counts should be conducted by the Operations Officers at the RAAF Base Williamtown on a daily basis. The monitoring involves the Operations Officer driving around the airport and recording all birds observed on the standard datasheet.

Detailed bird surveys should be conducted at the airstrip once per season (every three months) by a suitably trained ecologist. The Operations Officers at the RAAF Base Williamtown should engage an ecologist who has demonstrated experience and expertise in fauna ecology. The

surveys should be undertaken across two time periods – either early morning or early evening. This information will assist with the accurate management of bird and wildlife hazards at RAAF Base Williamtown. The potential risks that individual species pose to aircraft at RAAF Base Williamtown can then be quantified. Additionally, the information issued to aid in the development and assessment of management objectives to mitigate against and manage the risk of wildlife strike.

9.3 RECORD KEEPING AND REPORTING

Records of monitoring activities are to be kept providing evidence of management actions and to demonstrate WHMP processes are in place and SOPs are being used. Routine reporting ensures that all staff and managers are equipped with the information needed to adapt hazard management activities and the WHMP when required. All data will be compiled quarterly with the fauna survey results and provided in a letter style report to be presented at the Base Aviation Safety Committee meeting. The annual update of the WHMP will include the years data and actions implemented and any amendments to species risk rating and management actions for the coming year.

9.4 PERFORMANCE INDICATORS

Performance indicators need to be established and implemented to help effectively assess how well aerodrome is conforming to the requirements of the WHMP.

Primary performance indicators include:

- Reduction in previous year's bird strike count.
- Reduced percentage of bird strike resulting in aircraft damage and in-flight disruption.
- Reduced count of fauna species and numbers.
- Implementation and management of a PAMP.
- All staff operating airside at RAAF Base Williamtown aware of the importance of wildlife hazard management and the available SOPs.
- All staff know how to complete an SOP and which SOP to use for the management and the monitoring of the wildlife risk.
- The provision of training and species identification assistance to improve the quality of data collected.
- The development and circulation to staff members of Species Action Plans (SAPs).

- Daily and seasonal surveys.
- The annual audit detects minimal to no corrective actions.

Secondary performance indicators include:

- Proper identification of carcass, prompt carcass removal and accurate recording.
- Grass heights maintained at the recommended height.
- Reduced pooling and covered semi-permanent/permanent water.
- Establish a database (Bird and Animal Hazard Management System) for the storage and of all data relating to strikes, counts, and dispersal actions.
- Regular reporting protocols that analysed and interpretive program data.

9.5 AUDITING AND REVIEW

An external audit by suitably qualified personnel (i.e. Avisure personnel or a qualified aviation ecologist) should be undertaken annually. The findings from the audit will generate corrective actions, where appropriate, and are recorded and referred to in the annual WHMP update.

10. SUMMARY OF KEY POTENTIAL MANAGEMENT ACTIONS

The key potential wildlife management actions are summarised below. It should be ensured that any action implemented does not impact on any other management action or other program, policy, or plan at RAAF Base Williamtown.

It is difficult to ascertain the extent that ongoing management has reduced the level of wildlife strike at the RAAF Base Williamtown without consistent annual data. Management needs to be diligent and documented to link strike records with survey results and management actions.

Implementing management actions is the most cost effective and easiest way to reduce the risk of airfield strike at the base.

- Implement a grass program - maintain long grass (20 – 30 cm) throughout airfield where possible, excluding Lavis Lane.
- Implement a Landscape Management Plan – access suitability of existing plant species and any new plantings.
- Remove hollows from dead stags and relocate them to nearby bushland.
- Cover hollows when unoccupied with mesh to prevent access and nesting.
- Install anti-perching devices on airside ledges, poles, and eaves, and within the rafters of hangars.
- Install mesh over semi-permanent and permanent water.
- Drain and remove unnecessary water – regrade and reseal roads, fill depressions, cover culvert entries.
    - Investigate alternatives to pumping water from construction areas into the managed grassland within the airfield.
- Remove nests and eggs from airside trees, dead stags and buildings.
- Implement a PAMP.
    - Monitor and manage identified pests.
    - Pest animal control is cost effective and efficient at reducing fauna within the aerodrome.
- Repair and maintain boundary fence to prevent terrestrial fauna entering the airfield.
- Train staff in the importance of wildlife hazard management and the use of SOPs.
- Develop and implement SAPs.
- Daily bird and perimeter fence monitoring.
- Season fauna survey and data compilation.

- Annual WHMP update.
- Annual Audit.

Actions, roles and responsibilities and a compliance checklist for 2020/2021 are provided in **Table 11**.

Table 11: Actions, roles and responsibilities and compliance 2019/2020

Component	Task	Responsibility	Timeframe	Requirement/ Comments	Compliance
Administration					
Bird strike reporting	All bird strikes reported	Aviation Safety Officer Air operators	As required - ongoing	All strikes recorded with all available information and forwarded to the appropriate parties.	□ N/A □ Non-compliant **x** Completed □ No data provided
Permits and licensing	All permits for bird and animal management activities held and kept valid	EMOS / Ecologist	As required - ongoing	All permits held and valid by the ecologist	□ N/A □ Non-compliant **x** Completed □ No data provided
Records of activities	All records of activities kept (i.e. counts, ammunition, cull etc) and where necessary. Pest management.	EMOS / Aviation Safety Officer	Ongoing	Pest management and cull data provided.	□ N/A □ Non-compliant **x** Completed □ No data provided
Committee Meetings	Agenda to cover wildlife issues and management actions. Relevant on and off airport stakeholders must be included.	EMOS GIS in conjunction with the BASO should deliver this at the Base Aviation Safety Committee Meeting.	Annual	Meetings held on a quarterly basis. Minutes taken to record achievements and progress	□ N/A □ Non-compliant **x** Completed □ No data provided
Review of proposed land use changes- on airport land	All proposed land use changes within RAAF Base Williamtown controlled land with potential to increase the risk of bird strike must be scrutinised appropriately.	EMOS / Environmental Consultant	As required - ongoing	Where risk increase is likely, modification to proposals is sought or the development is refused.	□ N/A □ Non-compliant **x** Completed □ No data provided
Review of proposed land use changes – off aerodrome land	Ensure a mechanism exists with relevant councils within 13km of RAAF Base Williamtown to refer land use changes or developments that have potential to impact on wildlife hazards at RAAF Base Williamtown.	EMOS / Environmental Consultant	As required - ongoing	Where risk increase is likely, RAAF Base Williamtown should formally object to the development and request modification to proposals.	□ N/A □ Non-compliant **x** Completed □ No data provided
Training					

Component	Task	Responsibility	Timeframe	Requirement/ Comments	Compliance
Wildlife management training	Once-yearly competency-based assessment for airfield risk and for all new starts.	Defence / EMOS /External provider (ecologist, environmental consultancy, wildlife fauna handlers, Avisure)	Once-yearly – ongoing	Assessment as part of annual audit.	☐ N/A **x** Non-compliant ☐ Completed ☐ No data provided
Monitoring Risks					
Risk based surveys	Professional wildlife surveys undertaken annually on and off aerodrome.	EMOS / Ecologist	Once-yearly – ongoing	Surveys conducted; results presented in annual updates in this WHMP (2021)	☐ N/A ☐ Non-compliant **x** Completed ☐ No data provided
Detecting Hazards and Active Management					
Perimeter fence inspections and fauna airside survey	Perimeter fence inspections	MSS security currently inspect the fence line, however there is no preventive maintenance inspection being conducted.	As required - ongoing	Nil breaches of fence by medium and large sized mammals. No breaches were detected during surveys for this WHMP (2021)	☐ N/A **x** Non-compliant ☐ Completed ☐ No data provided
Discouraging breeding on airport	Nest removal or destruction animal breeding place Egg destruction? Other airside habitats? Implementation of bird deterrents.	EMOS / Ecologist	As required - ongoing	No birds nesting airside. NO records for removal or destruction of breeding habitat	☐ N/A ☐ Non-compliant ☐ Completed **x** No data provided
Recording activities	Logging bird/animal monitoring and management efforts	EMOS /Defence/ Ecologist	Once-yearly – ongoing	NO monthly records for counts inspections dispersal and patrol. Annual results presented in this WHMP (2021)	☐ N/A **x** Non-compliant ☐ Completed ☐ No data provided
Passive Management					

Component	Task	Responsibility	Timeframe	Requirement/ Comments	Compliance
Vegetation management	Identification and removal of vegetation that attracts significant birds/wildlife as specified in plan.	EMOS / Defence	As required - ongoing	No additional attraction of birds due to vegetation and landscaped areas of RAAF Base Williamtown. Hollows identified during surveys. Nectar and fruit producing Eucalypts and Melaleucas present airside.	☐ N/A **x** Non-compliant ☐ Completed ☐ No data provided
Ponded water	Areas of ponded water to be filled as required to reduce bird hazard as specified in plan. Mesh or netting over open drains and water features.	EMOS / Defence	As required - ongoing	Areas of ponded water, wetland and Lake Cochran on airport attracting birds. Open drains require netting No netting over semi-permanent and permanent water.	☐ N/A **x** Non-compliant ☐ Completed ☐ No data provided
Waste management	Ensure waste on airport land is disposed of effectively to reduce bird attraction	EMOS / Defence	As required - ongoing	Ensure bin lids remain closed and waste is not accessible for wildlife to feed.	☐ N/A ☐ Non-compliant **x** Completed ☐ No data provided
Review					
Major review of plan	Undertake major review 5 yearly	EMOS	5 yearly - ongoing	Major review every 5 years or when triggered	**x** N/A ☐ Non-compliant ☐ Completed ☐ No data provided
Update plan	Update WHMP annually	EMOS / Ecologist/ Consultant	Yearly - ongoing	Plan updated annually	☐ N/A ☐ Non-compliant **x** Completed ☐ No data provided

Component	Task	Responsibility	Timeframe	Requirement/ Comments	Compliance
Records of review	Records of review and audits kept	EMOS / Environmental Consultant	Yearly - ongoing	Records kept yearly in Plan	□ N/A □ Non-compliant □ Completed **x** No data provided
Audit	Audit of actions and management implemented by external reviewer	Avisure/Aviation Ecologist	Yearly	Corrective actions to be included in annual update of WHMP.	□ N/A □ Non-compliant □ Completed **x** No data provided

11. GLOSSARY

Table 12: Glossary of terms

Active management	The use of short-term management techniques such as distress calls, pyrotechnics, trapping and culling to disperse or remove wildlife.
Airside	The movement area of the airport, adjacent terrain and buildings or portions within the airport security fence line.
Bird or animal strike (all must be reported)	A “reported bird or animal strike” is deemed to have occurred whenever: A pilot reports a strike to the ATSB. Aircraft maintenance personnel find evidence of a bird or animal strike on an aircraft. Personnel on the ground report seeing an aircraft strike one or more birds or animals. Bird or animal remains are found on the airside pavement area, or within the runway strip, unless another reason for the bird or animals’ death can be found. A “suspected bird or animal strike” is deemed to have occurred whenever a bird or animal strike has been suspected by aircrew or ground personnel but upon inspection: No bird or animal carcass is found. There is no physical evidence on the aircraft of the strike having occurred. A “confirmed bird or animal strike” is deemed to have occurred whenever: Aircrew report that they *definitely* saw, heard or smelt a bird strike. Bird or animal remains are found on the airside pavement area or within the runway strip, unless another reason for the bird or animals death can be found. Aircraft maintenance personnel find evidence of a bird or animal strike on an aircraft. A “bird or animal near miss” is deemed to have occurred whenever a pilot takes evasive action to avoid birds or animals. An “on-aerodrome bird or animal strike” is deemed to be any strike that occurs within the boundary fence of the aerodrome, or where this is uncertain, where it occurred below 500 ft on departure and 200ft on arrival. A “bird strike in the vicinity of an aerodrome” is deemed to have occurred whenever a bird strike occurs outside the area defined as “on aerodrome” but within an area of 15 kilometres radius from the aerodrome reference point (ARP) or up to 1,000 feet above the elevation of the aerodrome. A “bird or animal strike remote from the aerodrome” is deemed to have occurred whenever a bird strike occurs more than 15 kilometres from an aerodrome or more than 1,000 feet above the elevation of the aerodrome.
Consequence	The outcome of an event expressed qualitatively or quantitatively, being a loss, injury, disadvantage or gain. There may be a range of possible outcomes associated with an event.
Foraging	When wildlife search for and obtain food.
Habituation	The tendency for wildlife to become accustomed to certain stimulus when repeatedly exposed to it.
Hazard	A source of potential harm or a situation with potential to cause loss
Migration	When wildlife passes periodically from one region to another.
Nocturnal species	A species which is most active during the night.

Passive management	The modification of habitat to render it less attractive to wildlife.
Probability	The likelihood of a specific event or outcome, measured by the ratio of specific events or outcomes to the total number of possible events or outcomes
Risk	The chance of something happening that will have an impact upon objectives. It is measured in terms of consequences and probability.
Risk treatment	The process of selection and implementation of measures to modify risk.
Roosting	When birds repeatedly return to a place in numbers to forage or nest.
Transit	When birds fly from one place to another.
Wildlife	Wildlife refers to animals that may pose hazards to aircraft when struck. This includes birds, bats and terrestrial mammals such as rabbits, hares, foxes, dogs.
Wildlife count	Scheduled counts.

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APPENDIX 1: POTENTIAL FAUNA SPECIES OF CONCERN AND THEIR HABITAT

Table 13: RAAF Base Williamtown Species of Concern (Avisure 2020)

Common Name	Scientific Name	Seasonal and/or Daily Activity	Habitat
Macropods			
Eastern grey kangaroo	*Macropus giganteus*	Macropods tend to graze on the grasslands at night and move into the remnant vegetation during daylight. Macropod species present all year round. Site inspections in 2015 and 2016 did not detect any macropods. There has been a confirmed sighting of a macropod airside in 2019.	Managed grassland Remnant native vegetation Landscaped areas
Red-necked wallaby	*Macropus rufogriseus*		
Koala	*Phascolarctos cinereus*	Inhabit eucalypt woodlands and forests. Survey did not detect this species.	Remnant native vegetation
Pest animals			
Brown hare	*Lepus capensis*	Brown hare numbers in the airside managed grasslands increases without proactive feral animal management as it is an ideal habitat for them. The presence of hares, and possibly rabbits may attract foxes and feral dogs. Pest animal species present all year round. No pest animals were sighted during site inspections in 2015 & 2016 however there was evidence of their presence. Baiting was conducted in 2019 for Foxes and Dogs, and shooting has been implemented for Brown Hares and Rabbits. There is an active rabbit population and ongoing control required.	Managed grassland Remnant native vegetation Landscaped areas Built environment
European rabbit	*Oryctolagus cuniculus*		
Fox	*Vulpes vulpes*		
Feral dogs	*Canis lupus familiaris*		
Cat	*Felis catus*		
Rat	*Rattus* sp.		
Bat species			
Grey-headed flying fox	*Pteropus poliocephalus*	Flying-foxes are an extreme aviation hazard when present on the airfield due to their large flock sizes and their nocturnal presence.	Landscaped areas

Common Name	Scientific Name	Seasonal and/or Daily Activity	Habitat
Black Flying-fox	*Pteropus alecto*	Site inspections did not detect the presence of any bat species, however nearby camps pose a risk to aircraft during dusk hours when foraging.	Built environment Remnant native vegetation
Microbat species		Micro bats are small to medium-sized bats that mostly eat insects. Most Australian micro-bats will roost in tree hollows or under bark, or they can be found in caves and cave-like structures. Microbats pose a risk to aircraft during dusk hours when foraging.	Wetlands and waterbodies Remnant native vegetation Landscaped areas
Birds of Prey			
Nankeen kestrel	*Falco cenchroides*	Temporal and spatial variability in food items may influence the presence and abundance of birds of prey at the base. Maintaining grass at long heights (which is recommended for deterring a number of high hazard bird species) may lead to higher populations of certain prey items (such as rodents and lizards) and therefore attracting birds of prey (ATSB, 2004), although there is not sufficient data from RAAF Base Williamtown to support this. There is little information on seasonal variation in abundance of birds of prey in the region. Bird surveys in 2015 did not detect the presence of any birds of prey, however the 2016 study identified all seven species noted.	Built environment Remnant native vegetation
Black-shouldered kite	*Elanus axillaris*		
Tawny Frogmouth	*Podargus strigoides*		
White-bellied Sea Eagle	*Haliaeetus leucogaster*		
Australian Hobby	*Falco longipennis*		
Peregrine Falcon	*Falco peregrinus*		
Whistling Kite	*Haliastur sphenurus*		
Ibises			
Australian white ibis	*Threskiornis molucca*	Both species of ibis (Australian white ibis and straw-necked ibis) occur in the region year-round. Their numbers in the region vary seasonally and typically there is an autumn and winter increase in their numbers. A site inspection in 2016 sighted the presence of approximately 50+ ibis individuals around the northern boundary of the site.	Managed grassland Wetlands and waterbodies Landscaped areas
Straw-necked ibis	*Threskiornis spinicollis*		
Cockatoo species			
Sulfur-crested cockatoo	*Cacatua galerita*	Variation in the use of native vegetation is influenced by a range of factors, including seasonal and other variation in food availability, and local, regional and wider movements of bird populations.	Remnant native vegetation Landscaped areas
Little Corella	*Cacatua sanguinea*		

Common Name	Scientific Name	Seasonal and/or Daily Activity	Habitat
Yellow-tailed Black Cockatoo	*Calyptorhynchus funereus*	A site inspection in 2016 identified each of the nominated cockatoo species.	
Duck species			
Grey teal	*Anas gracilis*	Teal species are more common in the region in summer and autumn. Site inspections in 2015 and 2016 did not detect the presence of these species.	Wetlands and waterbodies
Chestnut teal	*Anas castanea*		
Australian wood duck	*Chenonetta jubata*	Australian wood duck are likely to be found near the ponded areas and lake at RAAF Base Williamtown. Limited information is currently available as to their seasonal variations. A site inspection in 2015 detected a small number of the species around the office and lake area on RAAF Base Williamtown. The 2016 study did not detect the presence of the species	Managed grassland Remnant native vegetation Wetlands and waterbodies Landscaped areas
Pacific black duck	*Anas supercilliosus*	Limited information is currently available as to their seasonal variations. A site inspection in 2015 detected a small number of the species around the office and lake area on RAAF Base Williamtown.	Remnant native vegetation Wetlands and waterbodies
Musk Duck	*Biziura lobata*	The male Musk Duck is the largest of Australia's ducks and has a powerful build. A site inspection in 2016 did detect the presence of this species.	Wetlands and waterbodies
Black Swan	*Cygnus atratus*	Large low-flying birds noted as an extreme bird strike risk. Black swans show a considerable variation from year to year in their local abundance and there is regular movement between the sites within the region, particularly at dusk and at night. A site inspection in 2016 did detect the presence of this species.	Wetlands and waterbodies
Other bird species			
Masked lapwing	*Vanellus miles*	Masked lapwings are typically a seasonal problem at airfields, particularly from late spring to autumn. Site inspections in 2015 and 206 detected the presence of this species in areas surrounding the airfield.	Managed grassland Landscaped areas

Common Name	Scientific Name	Seasonal and/or Daily Activity	Habitat
Galah	*Eolophus roseicapilla*	The species is known to occur at the base on occasion and is known to utilise the managed grasslands near the runway. Seasonal variation in food availability is likely to influence galah numbers on the managed grasslands. A site inspection in 2016 did detect the presence of this species.	Managed grassland Remnant native vegetation Landscaped areas
Rock dove	*Columba livia*	Rock doves prefer open areas however they are also prevalent throughout urbanised areas. A site inspection in 2015 detected the presence of this species around the office area.	Managed grassland Remnant native vegetation Landscaped areas
Australian raven	*Corvus coronoides*	This species is likely to be found across a variety of habitats in and around the base. Ravens have a wide-ranging diet that may consist of grains, fruits, insects, small animals, eggs, refuse and carrion. Site inspections in 2015 and 2016 detected the presence of this species	Managed grassland Remnant native vegetation Landscaped areas
Australian magpie	*Cracticus tibicen*	This species was abundant on the managed grasslands at the airfield during the field surveys in 2015 and the 2016 inspection.	Managed grassland Landscaped areas Built environment
White-faced heron	*Ardea novaehollandiae*	Large low-flying birds noted as a high bird strike risk. White-faced herons are known to be more abundant in the region during late autumn and winter. Site inspections in 2015 and 2016 detected the presence of this species in the western area and around the offices.	Wetlands and waterbodies
Cattle Egret	*Ardea ibis*	A relatively small snowy-white egret. The Cattle Egret is found in grasslands, woodlands and wetlands. Will also forage at garbage dumps and is often seen with cattle and other stock. Site inspection in 2016 detected the presence of this species	Wetlands and waterbodies
Magpie-lark	*Grallina cyanoleuca*	Seasonal migrations; non-breeding and young birds form large nomadic flocks, sometimes consisting of several thousand individuals; mainly move north in autumn and winter and south in spring and summer.	Landscaped areas Built environment

Common Name	Scientific Name	Seasonal and/or Daily Activity	Habitat
		Site inspections in 2015 and 2016 confirmed the presence of this species.	
Crested pigeon	*Ocyphaps lophotes*	The crested pigeon inhabits woodland and open areas, often is association with water bodies. This species is usually seen in small flocks and feeds on ground. A site inspection in 2015 detected the presence of this species near the offices.	Landscaped areas and built environment
Australian pelican	*Microcarbo melanoleucos*	Large low-flying birds noted as an extreme bird strike risk. Australian pelican show a considerable variation from year to year in their local abundance and there is regular movement as flocks (often in V shape). Breeding occurs inland during the wet season. Site inspections in 2015 and 2016 detected the presence of this species	Wetlands and waterbodies
Rainbow lorikeet	*Trichoglossus haematodus*	Found in most habitats of woodland and farmland this species feeds on fruits, blossoms, seeds and nectar (flowering plants) traveling between areas in sporadic flight patterns. Breeding occurs from August to December in the hollows of trees. Site inspections in 2015 and 2016 detected the presence of this species.	Remnant vegetation Landscaped areas
Red-rumped parrot	*Psephotus haematonotus*	The red-rumped parrot is found in open grasslands or lightly timbered plains, as well as along watercourses and in farmlands with access to water. This species is usually seen in small flocks and feeds on the ground. Site inspections in 2015 and 2016 detected the presence of this species around the office area.	Remnant vegetation Landscaped areas
Noisy miner	*Manorina melanocephala*	The noisy miner is common in open woodland areas often flying in large colonies. Often seen moving between advantageous high points in trees and aggressively harassing other birds and wildlife, this species is active in movement. Site inspections in 2015 and 2016 detected the presence of this species.	Remnant native vegetation Landscaped areas Built environment

Common Name	Scientific Name	Seasonal and/or Daily Activity	Habitat
Common miner	*Acridotheres tristis*	The common miner is common in open woodland areas often flying in large colonies. In the evening, large groups of the species gather in communal roosts, in roof voids or large trees. Site inspections in 2015 and 2016 detected the presence of this species around the office area and southern boundary of RAAF Base Williamtown.	Remnant vegetation Landscaped areas
Welcome swallow	*Hirundo neoxena*	The welcome swallow is found in open habitats including woodland and open grass and wetlands. Use of buildings for nesting from August to December is common. Site inspections in 2015 and 2016 detected the presence of this species.	Remnant native vegetation Landscaped areas Built environment
Fork tailed swift	*Apus pacificus*	The fork-tailed swift is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground and probably much higher. They are found in urban areas and open habitats. A site inspection in 2015 detected the presence of this species around the office area of RAAF Base Williamtown.	Built environment Landscaped areas
Striated Thornbill	*Acanthiza lineata*	The Striated Thornbill is found in open forests and woodlands. Site inspection in 2016 detected the presence of this species	Remnant native vegetation
Yellow Thornbill	*Acanthiza nana*	They occur throughout open forests, woodlands and shrublands. Site inspection in 2016 detected the presence of this species	Remnant native vegetation Landscaped areas
Brown Thornbill	*Acanthiza pusilla*	The Brown Thornbill is found in dense shrubby habitats including wet and dry forests, woodlands, shrublands, heathlands and rainforests, as well as along watercourses. Site inspection in 2016 detected the presence of this species	Remnant native vegetation Landscaped areas
White-browed Scrubwren	*Sericornis frontalis*	The White-browed Scrubwren lives in rainforest, open forest, woodland and heaths. It is usually seen in pairs, low down in the thick vegetation. Site inspection in 2016 detected the presence of this species	Remnant native vegetation
Pied Butcherbird	*Cracticus nigrogularis*	The Pied Butcherbird inhabits drier forests and woodlands and often approaches parks and houses.	Remnant native vegetation Landscaped areas

Common Name	Scientific Name	Seasonal and/or Daily Activity	Habitat
		Site inspection in 2016 detected the presence of this species	Built environment
Grey Butcherbird	*Cracticus torquata*	Grey Butcherbirds are found in a range of wooded habitats, including suburban areas. Site inspection in 2016 detected the presence of this species	Remnant native vegetation
Pied Currawong	*Strepera graculina*	The Pied Currawong prefers forests and woodlands and has become well adapted to suburban areas. Site inspection in 2016 detected the presence of this species	Remnant native vegetation Landscaped areas Built environment
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	The Black-faced Cuckoo-shrike is found in almost any wooded habitat, except for rainforests. Site inspection in 2016 detected the presence of this species	Remnant native vegetation Landscaped areas Built environment
Golden-headed Cisticola	*Cisticola exilis*	The Golden-headed Cisticola lives in sub-coastal areas, wetlands, swamp margins, wet grasslands, rivers, and irrigated farmland. Site inspection in 2016 detected the presence of this species	Wetlands and waterbodies
Red-browed Finch	*Neochmia temporalis*	The Red-browed Finch is found in grassy areas interspersed with dense understory vegetation, often along creek lines. Site inspection in 2016 detected the presence of this species	Landscaped areas Wetlands and waterbodies
Laughing Kookaburra	*Dacelo novaeguineae*	The Laughing Kookaburra inhabits most areas where there are suitable trees. Site inspection in 2016 detected the presence of this species	Remnant native vegetation Landscaped areas Built environment
Sacred Kingfisher	*Todiramphus sanctus*	The sacred kingfisher is a medium-sized woodland kingfisher that occurs in mangroves, woodlands, forests, and river valleys. Site inspection in 2016 detected the presence of this species	Remnant native vegetation Wetlands and waterbodies
Superb Fairy-wren	*Malurus cyaneus*	Seen in most habitat types where suitable dense cover and low shrubs occur. They are common in urban parks and gardens. Site inspection in 2016 detected the presence of this species	Remnant native vegetation Landscaped areas Built environment
Red Wattlebird	*Anthochaera carunculata*	The Red Wattlebird occurs in forests, woodlands and gardens, where it aggressively protects food-bearing plants from other honeyeater species. Site inspection in 2016 detected the presence of this species	Remnant native vegetation Landscaped areas Built environment

Common Name	Scientific Name	Seasonal and/or Daily Activity	Habitat
Little Wattlebird	*Anthochaera chrysoptera*	Little Wattlebirds prefer the drier and often scrubby, habitats, such as banksia heaths, forests, woodlands and urban parks and gardens. Site inspection in 2016 detected the presence of this species	Remnant native vegetation Landscaped areas Built environment
Eastern Spinebill	*Acanthorhynchus tenuirostris*	The Eastern Spinebill prefers heath, forest and woodland. Site inspection in 2016 detected the presence of this species	Remnant native vegetation
Yellow-faced Honeyeater	*Lichenostomus chrysops*	The Yellow-faced Honeyeater is found in open forests and woodlands, often near water and wetlands. Site inspection in 2016 detected the presence of this species	Remnant native vegetation Wetlands and waterbodies
Scarlet Honeyeater	*Myzomela sanguinolenta*	The Scarlet Honeyeater lives in open forests and woodlands with a sparse understorey, especially round wetlands, and sometimes in rainforests. Site inspection in 2016 detected the presence of this species	Remnant native vegetation Landscaped areas Wetlands and waterbodies
Noisy Friarbird	*Philemon corniculatus*	The Noisy Friarbird prefers dry forests and eucalypt woodlands, as well as coastal scrub, heathlands and around wetlands and wet forests. Site inspection in 2016 detected the presence of this species	Remnant native vegetation Wetlands and waterbodies
White-cheeked Honeyeater	*Phylidonyris niger*	The White-cheeked Honeyeater is usually found in moist heathlands, as well as around wetlands and in forests or woodlands with a heath understorey. Site inspection in 2016 detected the presence of this species	Remnant native vegetation Wetlands and waterbodies
Leaden Flycatcher	*Myiagra rubecula*	The Leaden Flycatcher is found in tall and medium open forests, mainly in coastal areas. Site inspection in 2016 detected the presence of this species	Remnant native vegetation
Australasian Pipit	*Anthus novaeseelandiae*	Australasian Pipits are found in open country, in a range of habitat types from wet heaths to dry shrublands and open woodland clearings. Site inspection in 2016 detected the presence of this species	Remnant native vegetation Landscaped areas
Golden whistler	*Pachycephala pectoralis*	The Golden Whistler can be found in almost any wooded habitat, from rainforest to mallee, but prefers the denser areas. Occasionally it visits parks and orchards.	Remnant native vegetation Landscaped areas

Common Name	Scientific Name	Seasonal and/or Daily Activity	Habitat
		Site inspection in 2016 detected the presence of this species	
Rufous whistler	*Pachycephala rufiventris*	The Rufous Whistler is found in forests, woodlands and shrublands, with a shrubby understorey. Is also found in gardens and farmland with some trees, and in remnant bushland patches. Site inspection in 2016 detected the presence of this species	Remnant native vegetation Landscaped areas
Spotted Pardalote	*Pardalote punctatus*	The Spotted Pardalote is mostly found in eucalypt forests and woodlands but occurs in parks and gardens with well-established eucalypt canopy.	Remnant native vegetation Landscaped areas
Eastern Yellow Robin	*Eopsaltria australis*	Eastern Yellow Robins are found in a wide range of habitats, from dry woodlands to rainforests. They are also common in parks and gardens. Site inspection in 2016 detected the presence of this species	Remnant native vegetation Landscaped areas
Great Crested Grebe	*Podiceps cristatus*	The Great Crested Grebe is a medium to large aquatic bird and is the largest of the grebes. Site inspection in 2016 detected the presence of this species	Wetlands and waterbodies
Eastern Rosella	*Platycercus eximius*	The Eastern Rosella is found in open woodlands, grasslands, farmlands and remnant bushland. Often found in urban habitats such as parks, gardens and golf courses. Site inspection in 2016 detected the presence of this species	Remnant native vegetation Landscaped areas Built environment
Purple Swamphen	*Porphyrio porphyrio*	The Purple Swamphen is found around freshwater swamps, streams and marshes. Site inspection in 2016 detected the presence of this species	Wetlands and waterbodies
Grey Fantail	*Rhipidura albiscapa*	The Grey Fantail is found in most treed habitats. Site inspection in 2016 detected the presence of this species	Remnant native vegetation Landscaped areas Built environment
Willie Wagtail	*Rhipidura leucophrys*	Willie Wagtails are found in most open habitats, especially open forests and woodlands, tending to be absent from wet sclerophyll forests and rainforests. They are often associated with watercourses and wetlands and are common around human habitation. Site inspection in 2016 detected the presence of this species.	Remnant native vegetation Landscaped areas Built environment Wetlands and waterbodies

Common Name	Scientific Name	Seasonal and/or Daily Activity	Habitat
Common Starling	*Sturnus vulgaris*	The Common Starling has become a familiar sight around human habitation. Site inspection in 2016 detected the presence of this species	Landscaped areas Built environment
Silvereye	*Zosterops lateralis*	Silvereyes may occur in almost any wooded habitat, especially commercial orchards and urban parks and gardens. Site inspection in 2016 detected the presence of this species	Remnant native vegetation Landscaped areas Built environment
Reptile			
Lace Monitor	*Varanus varius*	Lace monitors are wide forages and may occupy any area of Base. Reptile animal species present all year round. Evidence of presence on Base noted in 2016 inspection.	Wetlands and waterbodies Remnant native vegetation Landscaped areas
Marsupial			
Long-nosed Bandicoot	*Perameles nasuta*	As the Long-nosed Bandicoot is a small nocturnal mammal that is usually reluctant to leave the cover of vegetation, this species is considered a very low risk at the Williamtown RAAF Base	Wetlands and waterbodies Remnant native vegetation Landscaped areas

APPENDIX 2: BIRD SURVEY RESULTS 2016 AND 2020

Table 14: Bird survey 2016 and 2020 results

Bird survey ID			B1		B2		B3 (airside)		B4 (airside)		B5 (airside)		B6 (airside)		B7 (airside)		B8 (airside)		B9		B10	
Family	**Species**	**Common Name**	**2016**	**2020**	**2016**	**2020**	**2016**	**2020**	**2016**	**2020**	**2016**	**2020**	**2016**	**2020**	**2016**	**2020**	**2016**	**2020**	**2016**	**2020**	**2016**	**2020**
Acanthizidae	*Acanthiza lineata*	Striated Thronbill						1											5			
Acanthizidae	*Acanthiza nana*	Yellow Thornbill	1						4	2												4
Acanthizidae	*Acanthiza pusilla*	Brown Thornbill				2					2											
Acanthizidae	*Sericornis frontalis*	White-browed Scrubwren			2	1					3	1										
Accipitridae	*Elanus axillaris*	Black-shouldered Kite																	2			
Accipitridae	*Haliastur sphenurus*	Whistling Kite											2					1				2
Accipitridae	*Milvus migrans*	Black Kite																1				
Anatidae	*Anas superciliosa*	Pacific Black duck	3												2	5				8		
Anatidae	*Biziura lobata*	Musk Duck	3																			
Ardeidae	*Ardea ibis*	Cattle Egret								10									5			
Ardeidae	*Egretta novaehollandiae*	White-faced Heron											1					1				
Artamidae	*Cracticus nigrogularis*	Pied Butcherbird				1	2	1	1					1	3			1	1	1		
Artamidae	*Cracticus tibicen*	Australian Magpie		1	1		3	4		2	1	2	3	4	1		2	2	1		1	
Artamidae	*Cracticus torquatus*	Grey Butcherbird			2											2						
Artamidae	*Strepera graculina*	Pied Currawong	1			1			1		1											
Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo																	2			
Cacatuidae	*Cacatua sanguinea*	Little Corella															7		1			
Cacatuidae	Calyptorhynchus funereus	Yellow-tailed Black Cockatoo												1		1						
Cacatuidae	*Eolophus roseicapilla*	Galah															12	90	2		1	
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo Shrike					1						1									
Charadriidae	*Vanellus miles*	Masked Lapwing	5									1					3					1
Cisticolidae	*Cisticola exilis*	Golden-headed Cisticola																			3	
Climacteridae	*Cormobates leucophaea*	White-throated Tree creeper														2						
Columbidae	*Ocyphaps lophotes*	Crested Pigeon				1																
Columbidae	*Spilopelia chinensis*	Spotted Dove*												2				9				2
Corvidae	*Corvus coronoides*	Australian Raven	2		2				1				1					3	5		1	
Estrildidae	*Neochmia temporalis*	Red-browed Finch	3		3					2		1		1		2		1		1	1	
Falconidae	*Falco cenchroides*	Nankeen Kestrel					1						2									
Falconidae	*Falco longipennis*	Australian Hobby							1													
Falconidae	*Falco peregrinus*	Peregrine Falcon																				
Halcyonidae	*Dacelo novaeguineae*	Laughing Kookaburra					1									5						6
Halcyonidae	*Todiramphus sanctus*	Sacred Kingfisher	1											1				2				2
Hirundinidae	*Hirundo neoxena*	Welcome Swallow																				
Maluridae	*Malurus cyaneus*	Superb Fairy Wren	1		5				1		1				1	6		9	2			
Maluridae	*Malurus lamberti*	Variegated Fairy Wren		5		4		2		1		8								5		5

Bird survey ID			B1		B2		B3 (airside)		B4 (airside)		B5 (airside)		B6 (airside)		B7 (airside)		B8 (airside)		B9		B10	
Family	**Species**	**Common Name**	**2016**	**2020**	**2016**	**2020**	**2016**	**2020**	**2016**	**2020**	**2016**	**2020**	**2016**	**2020**	**2016**	**2020**	**2016**	**2020**	**2016**	**2020**	**2016**	**2020**
Meliphagidae	*Acanthorhynchus tenuirostris*	Eastern Spinebill			1			6			1			6	1	11						
Meliphagidae	*Anthochaera carunculata*	Red Wattlebird						1														
Meliphagidae	*Anthochaera chrysoptera*	Little Wattlebird													2							
Meliphagidae	*Entomyzon cyanotis*	Blue-faced Honeyeater								1												
Meliphagidae	*Lichenostomus chrysops*	Yellow-faced Honeyeater	2		2				3		3		1		2			1	2			
Meliphagidae	*Manorina melanocephala*	Noisy Miner			5					4	1	5	1							5		1
Meliphagidae	*Myzomela sanguinolenta*	Scarlet Honeyeater	2		1				1						1			1				3
Meliphagidae	*Philemon corniculatus*	Noisy Friarbird			2	2	3		4													
Meliphagidae	*Phylidonyris niger*	White-cheeked Honeyeater	5		2			6		3		6				2		1		3		
Monarchidae	*Grallina cyanoleuca*	Magpie Lark		10			2		2	2	1		3	5	1				2			
Monarchidae	*Myiagra rubecula*	Leaden Flycatcher																	3			
Motacillidae	*Anthus novaeseelandiae*	Australasian Pipit											1									
Oriolidae	*Oriolus sagittatus*	Olive-backed Oriole		1		4		1		2				2		2		3			1	2
Pachycephalidae	*Pachycephala pectoralis*	Golden Whistler				1		1			1	1										
Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler	3		1		1	1	1		1											1
Pardalotidae	*Pardalote punctatus*	Spotted Pardalote	1			1																
Pardalotidae	*Pardalotus striatus*	Striated Pardalote						2														
Pelecanidae	*Pelecanus conspicillatus*	Australian Pelican	3					1														
Petroicidae	Eopsaltria australis	Eastern Yellow Robin	2						1		1											
Podicipedidae	Podiceps cristatus	Great Crested Grebe	3																		1	
Psittaculidae	*Platycercus eximius*	Eastern Rossella					3		2				4	2	2	2		2				
Psittaculidae	*Psephotus haematonotus*	Red-rumped Parrot															5	2	1			
Psittaculidae	*Trichoglossus chlorolepidotus*	Scaley Breasted Lorikeet				2				2												
Psittaculidae	*Trichoglossus moluccanus*	Rainbow Lorikeet		5		8		7		7		22		2		2		10	2	2		4
Rallidae	*Porphyrio porphyrio*	Purple Swamphen														4						
Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail	1	1	1	2			1		1			1		2			1	2		
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail							1				1			2			1			
Sturnidae	*Sturnus tristis*	Common Myna*																26				
Sturnidae	*Sturnus vulgaris*	Common Starling															5				1	
Threskiornithidae	*Threskiornis moluccus*	Australian White Ibis																	1			
Threskiornithidae	*Threskiornis spinicollis*	Straw-necked Ibis											16		3		5					
Zosteropidae	*Zosterops lateralis*	Silvereye							4													
Macropus	*Macropus giganteus*	Eastern Grey Kangaroo																		4		

APPENDIX 3: FAUNA TRANSECT RESULTS

Table 15: Fauna survey 2016 and 2020 results

Fauna transect ID			T1		T2		T3	
Family	Species	Common Name	2016	2020	2016	2020	2016	2020
Canidae	*Vulpes vulpes*	European Red Fox			Scats	Scats and tracks		
Leporidae	*Oryctolagus cuniculus*	European Rabbit			Scats and warrens	Scats and warrens		
Leporidae	*Lepus europaeus*	Brown Hare		1				
Canidae	*Canis lupus familiaris*	Canine Tracks			Tracks			
Varanidae	*Varanus varius*	Lace monitor			1			
Anatidae	*Anas superciliosa*	Pacific Black duck				12		
Ardeidae	*Egretta novaehollandiae*	White-faced Heron						1
Artamidae	*Cracticus tibicen*	Australian Magpie		6				10
Artamidae	*Cracticus nigrogularis*	Pied Butcherbird						1
Artamidae	*Cracticus torquatus*	Grey Butcherbird				2		
Cacatuidae	*Eolophus roseicapilla*	Galah						40
Cacatuidae	*Calyptorhynchus funereus*	Yellow-tailed Black Cockatoo		2				
Estrildidae	*Neochmia temporalis*	Red-browed Finch				2		
Hirundinidae	*Hirundo neoxena*	Welcome Swallow				3		
Maluridae	*Malurus cyaneus*	Superb Fairy Wren				5		
Meliphagidae	*Manorina melanocephala*	Noisy Miner						1
Monarchidae	*Grallina cyanoleuca*	Magpie Lark		2		1		2
Motacillidae	*Anthus novaeseelandiae*	Australasian Pipit						1
Psittaculidae	*Trichoglossus moluccanus*	Rainbow Lorikeet						2

Fauna transect ID			T1		T2		T3	
Family	Species	Common Name	2016	2020	2016	2020	2016	2020
Psittaculidae	*Platycercus eximius*	Eastern Rosella				2		2
Rallidae	*Porphyrio porphyrio*	Purple Swamphen				3		
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail				1		
Threskiornithidae	*Threskiornis spinicollis*	Straw-necked Ibis						1

APPENDIX 4: INFRARED CAMERA RESULTS

Table 16: Infrared camera survey 2016 and 2020 results

			RC1		RC2		RC3		RC4	
	Species name	**Common name**	**2016**	**2020**	**2016**	**2020**	**2016**	**2020**	**2016**	**2020**
Ardeidae	*Ardea novaehollandiae*	White-faced Heron	+							
Monarchidae	*Grallina cyanoleuca*	Magpie-lark					+			
Peramelidae	*Perameles nasuta*	Long-nosed Bandicoot					+		+	
Podargus	*Podargus strigoides*	Tawny Frogmouth			+					
Rallidae	*Porphyrio porphyrio*	Purple Swamphen					+			
Varanidae	*Varanus varius*	Lace Monitor					+			
Canidae	*Vulpes vulpes*	European Red Fox							+	+

APPENDIX 5: PATON'S CATEGORIES FOR BIRD STRIKE CONSEQUENCE

A simple scoring system developed by Paton (2010) which ranks the consequence of bird strike according to:

- Six categories of body mass.
- Three categories of flocking behaviour.
- Two categories of flight behaviour.

The scores are then combined (category scores are multiplied together) to provide a consequence score. The ranking system for body mass, flocking behaviour and flight behaviour scores and examples of bird species within each category are provided in **Table 17**.

The categories of consequences based on consequence scores are provided in **Table 18** below.

Table 17: Paton's categories for bird strike consequence

Category	Examples	Score
	Body Mass (g)	
< 20	Welcome Swallow	1
21 - 50	House Martin, Skylark	2
51 - 200	Common Starling, Magpie-lark, Nankeen Kestrel	4
201 - 1000	Feral Pigeon, Galah, Silver Gul, Australian Magpie, Masked Lapwing, small ducks	8
1001 - 5000	White Ibis, Straw-necked Ibis, large ducks	16
> 5000	Australian Pelican, Cape Barren Goose	32
	Flock Size	
Usually solitary or widely spaced	Nankeen Kestrel, Skylark	1
Often in loose flocks	Australian Magpie, Little Raven, Magpie-lark, Welcome Swallow, Silver Gull	2
Often in tight flocks	House Sparrow, Galah, Little Corella, lorikeets, ducks, ibises	4
	Flight Behaviour	
Rapid direct	Little Raven, Australian Magpie, ducks, ibises	1
Slow, meandering, erratic, hovering, manoeuvrable	Nankeen Kestrel, Galah, Common Starling, swallows, Magpie-lark, Silver Gull, Australian Pelican, Masked Lapwing	2

Table 18: Consequence category

Consequence Category	Consequence Score (body mass score × flock score × flight score)
Extreme	64 – 128
Very high	32
High	16
Medium	8
Low	4
Very low	1 - 2

APPENDIX 6: CONSEQUENCE CATEGORIES OF BIRD SPECIES 2016 AND 2020

Species in **bold** were identified by Kleinfelder during the 2016 survey period only and were not identified during the Kleinfelder 2020 survey. Despite not being identified during the current survey period, they are common species to the area and would likely use habitat within and around the aerodrome at various times of the day, month or season.

Table 19: Consequence categories of bird species 2016 and 2020

Scientific Name	Common Name	Body mass (g)	Score	Flock size	Score	Flight behaviour	Score	Consequence score	Consequence category
Acanthiza lineata	Striated Thornbill	7	1	L	2	R	1	**2**	Very low
Acanthiza nana	Yellow Thornbill	7	1	L	2	R	1	**2**	Very low
Acanthiza pusilla	Brown Thornbill	7	1	L	2	R	1	**2**	Very low
Sericornis frontalis	White-browed Scrubwren	14	1	L	2	R	1	**2**	Very low
Elanus axillaris	**Black-shouldered Kite**	**260-300**	**8**	**S**	**1**	**S**	**2**	**16**	**High**
Haliaeetus leucogaster	**White-bellied Sea Eagle**	**2500-4200**	**16**	**S**	**1**	**S**	**2**	**32**	**Very High**
Haliastur sphenurus	Whistling Kite	700-850	8	S	1	S	2	**16**	High
Anas superciliosa	Pacific Black Duck	700-1500	16	T	4	R	1	**64**	Extreme
Biziura lobata	**Musk Duck**	**1550-2400**	**16**	**L**	**2**	**R**	**1**	**32**	**Very High**
Cygnus atratus	**Black Swan**	**5000-6000**	**32**	**T**	**4**	**R**	**1**	**128**	**Extreme**
Ardea ibis	Cattle Egret	340-390	8	T	4	R	1	**32**	Very High
Egretta novaehollandiae	White-faced Heron	550	8	T	2	R	1	**16**	High

Scientific Name	Common Name	Body mass (g)	Score	Flock size	Score	Flight behaviour	Score	Consequence score	Consequence category
Cracticus nigrogularis	Pied Butcherbird	120	4	S	1	R	1	**4**	Low
Cracticus tibicen	Australian Magpie	220-350	8	T	4	R	1	**32**	Very High
Cracticus torquata	Grey Butcherbird	90	4	S	1	R	1	**4**	Low
Strepera graculina	Pied Currawong	280-320	8	S	1	R	1	**8**	Medium
Cacatua galerita	**Sulphur-crested Cockatoo**	**815-975**	**8**	**T**	**4**	**S**	**2**	**64**	**Extreme**
Cacatua sanguinea	**Little Corella**	**485-590**	**8**	**T**	**4**	**S**	**2**	**64**	**Extreme**
Calyptorhynchus funereus	Yellow-tailed Black Cockatoo	645-900	8	L	2	S	2	**32**	Very High
Eolophus roseicapilla	Galah	330	8	T	4	S	2	**64**	Extreme
Coracina novaehollandiae	Black-faced Cuckoo-shrike	115	4	S	1	R	1	**4**	Low
Vanellus miles	Masked Lapwing	230-400	8	S	1	S	2	**16**	High
Cisticola exilis	**Golden-headed Cisticola**	**8**	**1**	**L**	**2**	**R**	**1**	**2**	**Very low**
Cormobates leucophaea	White-throated Treecreeper	22	2	L	2	R	2	**8**	Medium
Ocyphaps lophotes	Crested Pigeon	150-250	4	L	2	R	1	**8**	Medium
Spilopelia chinensis	Spotted Dove*	160	4	L	2	R	1	**8**	Medium
Corvus coronoides	Australian Raven	650	8	T	4	R	1	**32**	Very High
Neochmia temporalis	Red-browed Finch	10.5	1	T	4	R	1	**4**	Low
Falco cenchroides	**Nankeen Kestrel**	**165-185**	**4**	**S**	**1**	**S**	**2**	**8**	**Medium**
Falco longipennis	**Australian Hobby**	**210-290**	**8**	**S**	**1**	**S**	**2**	**16**	**High**
Falco peregrinus	**Peregrine Falcon**	**600-890**	**8**	**S**	**1**	**S**	**2**	**16**	**High**
Dacelo novaeguineae	Laughing Kookaburra	310-380	8	L	2	R	1	**16**	High
Todiramphus sanctus	**Sacred Kingfisher**	**40**	**2**	**S**	**1**	**R**	**1**	**2**	**Very low**
Hirundo neoxena	Welcome Swallow	15	1	L	2	S	2	**4**	Low

Scientific Name	Common Name	Body mass (g)	Score	Flock size	Score	Flight behaviour	Score	Consequence score	Consequence category
Malurus cyaneus	Superb Fairy-wren	12	1	L	2	R	1	**2**	Very low
Malurus lamberti	Variegated Fairy Wren	12	1	L	2	R	1	**2**	Very Low
Anthochaera carunculata	Red Wattlebird	100-130	4	L	2	R	1	**8**	Medium
Anthochaera chrysoptera	**Little Wattlebird**	**60-75**	**4**	**L**	**2**	**R**	**1**	**8**	**Medium**
Acanthorhynchus tenuirostris	Eastern Spinebill	11	1	S	1	R	1	**1**	Very low
Entomyzon cyanotis	Blue-faced Honeyeater	105	4	S	1	R	1	**4**	Low
Lichenostomus chrysops	Yellow-faced Honeyeater	17	1	L	2	R	1	**2**	Very low
Manorina melanocephala	Noisy Miner	80-90	4	L	2	R	1	**8**	Medium
Myzomela sanguinolenta	Scarlet Honeyeater	8	1	L	2	R	1	**2**	Very low
Philemon corniculatus	Noisy Friarbird	96-122	4	L	2	R	1	**8**	Medium
Phylidonyris niger	White-cheeked Honeyeater	19	1	L	2	R	1	**2**	Very low
Grallina cyanoleuca	Magpie-lark	85	4	L	2	S	2	**16**	High
Oriolus sagittatus	Olive-backed Oriole	100	4	S	1	R	1	**4**	Low
Myiagra rubecula	**Leaden Flycatcher**	**12**	**1**	**L**	**2**	**R**	**1**	**2**	**Very low**
Anthus novaeseelandiae	Australasian Pipit	26	2	S	1	R	1	**2**	Very low
Pachycephala pectoralis	Golden whistler	25	2	S	1	R	1	**2**	Very low
Pachycephala rufiventris	Rufous whistler	25	2	S	1	R	1	**2**	Very low
Pardalote punctatus	Spotted Pardalote	9	1	S	1	R	1	**1**	Very low

Scientific Name	Common Name	Body mass (g)	Score	Flock size	Score	Flight behaviour	Score	Consequence score	Consequence category
Pardalotus striatus	Striated Pardalote	9	1	S	1	R	1	1	Very low
Pelecanus conspicillatus	**Australian Pelican**	**4000-6800**	**32**	**L**	**2**	**S**	**2**	**128**	**Extreme**
Eopsaltria australis	Eastern Yellow Robin	20	1	S	1	R	1	**1**	Very low
Podargus strigoides	**Tawny Frogmouth**	**350**	**8**	**S**	**2**	**R**	**2**	**32**	**High**
Podiceps cristatus	**Great Crested Grebe**	**900-1500**	**16**	**S**	**1**	**R**	**1**	**16**	**High**
Platycercus eximius	Eastern Rosella	100-110	4	T	4	S	2	**32**	Very High
Psephotus haematonotus	Red-rumped Parrot	60-65	4	T	4	S	1	**16**	High
Trichoglossus chlorolepidotus	Scaley Breasted Lorikeet	80-90	4	T	2	S	2	**16**	High
Trichoglossus moluccanus	Rainbow Lorikeet	120-130	4	T	4	S	2	**32**	Very High
Porphyrio porphyrio	Purple Swamphen	850-1050	8	L	2	R	1	**16**	High
Rhipidura albiscapa	Grey Fantail	8	1	S	1	R	1	**1**	Very low
Rhipidura leucophrys	Willie Wagtail	18	1	S	1	R	1	**1**	Very low
Sturnus tristis	Common Myna	80	4	L	2	S	2	**16**	High
Sturnus vulgaris	**Common Starling**	**75**	**4**	**T**	**4**	**S**	**2**	**32**	**Very High**
Threskiornis moluccus	**Australian White Ibis**	**1400-1900**	**16**	**T**	**4**	**S**	**2**	**128**	**Extreme**
Threskiornis spinicollis	Straw-necked Ibis	1100-1500	16	T	4	S	2	**128**	Extreme
Zosterops lateralis	Silvereye	11	1	L	2	R	1	**2**	Very low
Pteropus poliocephalus	Grey-headed Flying Fox	1000	16	T	4	S	2	128	Extreme

Flock size; S = solitary or widely spaced; L = loose flocks; T = tight flocks. Flight behaviour; R = rapid, direct; S = slow, meandering, erratic, or hovering.

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APPENDIX 7: PROBABILITY OF A BIRD STRIKE

The probability of a bird strike for each species found within, or around, an airport is estimated based on the abundance of the species at the airport as well as aspects of the species' ecology and behaviour.

For example, it might be less likely for an individual of flocking species to stray into the airspace compared to a species with individuals to spread out over the airfield. The widespread species might be more likely to be struck, but the flocking species will have greater consequence if bird strike does occur. Other ecological differences between species, such as habitat preference and feeding behaviour, will also affect the probability of bird strike and are considered in the model (Paton 2010).

Estimates of probability of bird strike for each species are relative to the airport. Both quantitative and qualitative methods of ranking species based on their relative probability of being involved in bird strike have been proposed by Paton (2010). These methods are outlined in the table below.

Table 20: Probability of a bird strike

Criteria	Very High	High	Medium	Low
Quantitative				
Relative abundance (% of total birds counted)	> 1	> 0.1	> 0.01	< 0.01
Frequency of occurrence (% surveys species recorded)	> 75	50 - 75	25 - 50	< 25
Area of occurrence (% airport land used)	> 75	50 - 75	25 - 50	< 25
Qualitative				
Abundance	Many	Some	Few	Occasionally
Frequency of occurrence	Most	Some	Few	Occasionally
Area of occupation	Most	Some	Few	Occasionally
Seen close to runways	Often	Some	Occasionally	Rarely

APPENDIX 8: QUALITATIVE PROBABILITY OF BIRD SPECIES 2016 AND 2020

Species in **bold** were identified by Kleinfelder during the 2016 survey period only and were not identified during the Kleinfelder 2020 survey. Despite not being identified during the current survey period, they are common species to the area and would likely use habitat within and around the aerodrome at various times of the day, month or throughout the year.

Table 21: Qualitative probability of species

Scientific Name	Common Name	Abundance	Frequency of occurrence	Area of occupation	Seen close to runway	Probability of strike
Acanthiza lineata	Striated Thornbill	Occasional	Occasional	Occasional	Rarely	Low
Acanthiza nana	Yellow Thornbill	Occasional	Some	Occasional	Rarely	Low
Acanthiza pusilla	Brown Thornbill	Occasional	Occasional	Occasional	Rarely	Low
Sericornis frontalis	White-browed Scrubwren	Occasional	Occasional	Occasional	Rarely	Low
Elanus axillaris	**Black-shouldered Kite**	**Few**	**Most**	**Most**	**Often**	**Very High**
Haliaeetus leucogaster	**White-bellied Sea Eagle**	**Few**	**Some**	**Most**	**Often**	**High**
Haliastur sphenurus	Whistling Kite	Few	Some	Most	Often	High
Anas superciliosa	Pacific Black Duck	Few	Most	Few	Occasional	Medium
Biziura lobata	**Musk Duck**	**Few**	**Some**	**Few**	**Rarely**	**Low**
Cygnus atratus	**Black Swan**	**Few**	**Most**	**Few**	**Occasional**	**Very High**
Ardea ibis	Cattle Egret	Some	Most	Most	Some	Very High
Egretta novaehollandiae	White-faced Heron	Some	Most	Most	Often	Very High
Cracticus nigrogularis	Pied Butcherbird	Some	Most	Most	Often	Very High
Cracticus tibicen	Australian Magpie	Many	Most	Most	Often	Very High

Scientific Name	Common Name	Abundance	Frequency of occurrence	Area of occupation	Seen close to runway	Probability of strike
Cracticus torquata	Grey Butcherbird	Some	Most	Most	Often	Very High
Strepera graculina	Pied Currawong	Occasional	Some	Few	Occasional	Low
Cacatua galerita	**Sulphur-crested Cockatoo**	**Some**	**Most**	**Most**	**Some**	**High**
Cacatua sanguinea	**Little Corella**	**Many**	**Most**	**Most**	**Often**	**Very High**
Calyptorhynchus funereus	Yellow-tailed Black Cockatoo	Few	Occasional	Occasional	Rarely	Low
Eolophus roseicapilla	Galah	Many	Most	Most	Often	Very High
Coracina novaehollandiae	Black-faced Cuckoo-shrike	Few	Most	Some	Occasional	Medium
Vanellus miles	Masked Lapwing	Few	Most	Some	Often	Very High
Cisticola exilis	**Golden-headed Cisticola**	**Few**	**Occasional**	**Few**	**Rarely**	**Low**
Corvus coronoides	Australian Raven	Some	Most	Most	Often	Very High
Neochmia temporalis	Red-browed Finch	Occasional	Occasional	Most	Rarely	Low
Falco cenchroides	**Nankeen Kestrel**	**Occasional**	**Most**	**Most**	**Often**	**Very High**
Falco longipennis	**Australian Hobby**	**Occasional**	**Most**	**Most**	**Often**	**Very High**
Falco peregrinus	**Peregrine Falcon**	**Occasional**	**Occasional**	**Most**	**Often**	**High**
Dacelo novaeguineae	Laughing Kookaburra	Few	Most	Some	Occasional	Medium
Todiramphus sanctus	**Sacred Kingfisher**	**Occasional**	**Occasional**	**Occasional**	**Rarely**	**Low**
Hirundo neoxena	Welcome Swallow	Many	Most	Most	Often	Very High
Malurus cyaneus	Superb Fairy-wren	Some	Most	Few	Rarely	Low
Anthochaera carunculata	Red Wattlebird	Few	Occasional	Occasional	Rarely	Low
Anthochaera chrysoptera	**Little Wattlebird**	**Few**	**Most**	**Few**	**Rarely**	**Low**
Acanthorhynchus tenuirostris	Eastern Spinebill	Occasional	Most	Few	Rarely	Low
Lichenostomus chrysops	Yellow-faced Honeyeater	Some	Most	Few	Rarely	Low
Manorina melanocephala	Noisy Miner	Some	Most	Some	Some	High
Myzomela sanguinolenta	Scarlet Honeyeater	Few	Most	Few	Rarely	Low
Philemon corniculatus	Noisy Friarbird	Some	Most	Some	Rarely	Low

Scientific Name	Common Name	Abundance	Frequency of occurrence	Area of occupation	Seen close to runway	Probability of strike
Phylidonyris niger	White-cheeked Honeyeater	Some	Some	Few	Rarely	Low
Grallina cyanoleuca	Magpie-lark	Some	Most	Most	Often	Very High
Myiagra rubecula	**Leaden Flycatcher**	**Occasional**	**Occasional**	**Occasional**	**Rarely**	**Low**
Anthus novaeseelandiae	Australasian Pipit	Occasional	Occasional	Most	Often	Medium
Pachycephala pectoralis	Golden whistler	Occasional	Some	Few	Rarely	Low
Pachycephala rufiventris	Rufous whistler	Occasional	Some	Few	Rarely	Low
Pardalote punctatus	Spotted Pardalote	Occasional	Occasional	Occasional	Rarely	Low
Pelecanus conspicillatus	**Australian Pelican**	**Few**	**Few**	**Some**	**Occasional**	**Very High**
Eopsaltria australis	Eastern Yellow Robin	Occasional	Occasional	Occasional	Rarely	Low
Podargus strigoides	**Tawny Frogmouth**	**Occasional**	**Occasional**	**Occasional**	**Occasional**	**Low**
Podiceps cristatus	**Great Crested Grebe**	**Occasional**	**Occasional**	**Few**	**Rarely**	**Low**
Platycercus eximius	Eastern Rosella	Many	Most	Most	Some	Very High
Psephotus haematonotus	Red-rumped Parrot	Some	Some	Most	Some	Very High
Trichoglossus moluccanus	Rainbow Lorikeet	Some	Few	Some	Occasional	High
Porphyrio porphyrio	Purple Swamphen	Some	Most	Some	Often	High
Rhipidura albiscapa	Grey Fantail	Occasional	Few	Few	Rarely	Low
Rhipidura leucophrys	Willie Wagtail	Occasional	Most	Some	Some	High
Sturnus tristis	Common Myna	Some	Most	Few	Occasional	Medium
Sturnus vulgaris	**Common Starling**	**Some**	**Most**	**Most**	**Some**	**High**
Threskiornis moluccus	**Australian White Ibis**	**Few**	**Most**	**Most**	**Often**	**Very High**
Threskiornis spinicollis	Straw-necked Ibis	Many	Most	Most	Often	Very High
Zosterops lateralis	Silvereye	Few	Few	Few	Rarely	Low

APPENDIX 9: RAAF BASE WILLIAMTOWN SPECIES RISK RATING

A summary of species risk ranking for RAAF Base Williamtown, with an overview of the key hazard information and potential management actions to minimise the risk of bird strike with each species is provided in below. Biological and ecological information for these species was obtained from Marchant and Higgins 1990, 1993; Marchant and Davies 1996; Higgins 1999; Higgins, Peter and Steele 2001; Higgins and Peter 2002; Higgins, Peter and Cowling 2006.

Table 22: Potential management actions of species ranked high to extreme for Williamtown RAAF Base

Rank Species	Description	Habitat preference	Habitat within Base	Management Actions
1 (extreme) Straw-necked Ibis	Large body (1.4 – 1.9 kg). Glossy-black wings and back, white underparts. Forms large flocks. Rises in updraft of thermals.	Forages in open grassland and pasture, wet or dry. Flocks often perch in dead trees.	Managed grassland, including alongside runway and sport fields.	Daily bird monitoring. Implement and monitor long grass program. Mow at night Limit the amount of pooling water within the airfield. Implement and monitor dispersal techniques. Investigate alternatives to draining water from the construction sites into the grassland.
2 (extreme) Black Swan	Large, heavy (5 – 6 kg), black bird with long neck and red bill.	Large areas of open shallow water with aquatic vegetation. Travels large distances.	Lake Cochran.	Daily bird monitoring. Install mesh or netting over Lake Cochran to discourage swans from using this habitat. Monitor and disperse any birds before installation.
3 (extreme) Galah	Medium sized parrot (330 g). Pink and grey.	Open grassland.	Managed grassland throughout the airport.	Daily bird monitoring.

Rank Species	Description	Habitat preference	Habitat within Base	Management Actions
	Often in large flocks. Flight often erratic or wild.	Feeds on ground or low shrubs in flocks.		Mow/slash grass before seed heads form to reduce this food source. Maintain grass length 20 – 30 cm. Implement and monitor dispersal techniques. Remove any hollows found in dead stags or trees and relocate to nearby bushland to prevent Galahs nesting within the airport. Relocate any removed hollows in near-by bushland.
4 (extreme) Australian Pelican	Huge bird (4 – 6.8 kg) with massive bill. Soars in thermals to great heights. Flies in flocks for long distances.	Large or small areas of open water.	Lake Cochran.	Daily bird monitoring. Install mesh or netting over Lake Cochran to discourage pelicans from using this habitat. Monitor and disperse any birds before installation.
5 (extreme) Little Corella	Medium to large parrot (0.5 kg). White with pink patch at the lores. Forms large flocks. Flight swift.	Tree-lined water courses, woodlands, open country. Feeds in large flocks on the ground. Gathers in shrubs and trees to strip the leaves.	Managed grassland throughout the airport, including alongside runway.	Daily bird monitoring. Mow/slash grass before seed heads form to eliminate this food source. Implement and monitor dispersal techniques. Remove any hollows found in dead stags or trees and relocate to nearby bushland to prevent Little corellas nesting within the airport.
6 (extreme) Australian White Ibis	Large body (1.1 – 1.5 kg). White wings, back and underparts. Forms large flocks. Rises in updraft of thermals.	Shallow fresh and tidal wetlands and pastures.	Managed grassland throughout the airport, including alongside runway.	Daily bird monitoring. Maintain grass length 20 – 30 cm. Limit the amount of pooling water within the airfield. Implement and monitor dispersal techniques.

Rank Species	Description	Habitat preference	Habitat within Base	Management Actions
				Investigate alternatives to draining water from the construction sites into the grassland.
7 (extreme) Sulphur-crested Cockatoo	Large parrot (0.9 kg). White with yellow crest. Forms huge flocks. Flap and glide flight.	Diverse – rainforest, coastal mangroves to semi-arid inland areas and partly cleared farmland. Mostly feeds on the ground.	Managed grassland throughout the airport, including alongside runway. Large trees throughout airport.	Daily bird monitoring. Mow/slash grass before seed heads form to eliminate this food source. Implement and monitor dispersal techniques. Remove any hollows found in dead stags or trees and relocate to nearby bushland to prevent cockatoos nesting within the airport.
8 (extreme) Grey-headed Flying-fox Microbats	Large (1 kg) fruit bat with red hair and black skin. Forage at night, leaving camps on dark in huge flocks. Small to medium (5–11 g) Forage at night.	Feeds on nectar and fruit in rainforests, woodlands, swamps and urban areas. Feed mostly on insects, but can also forage on small mammals and fruit, pollen and nectar.	Large flowering and fruit-producing trees throughout the airport. Around lighting which attracts insects, over water and through flyways.	Vigilant pre-take-off checks. Consider not planting large nectar- or fruit-producing trees.
9 (very high) White-bellied Sea Eagle	Large eagle (2.5 – 4.2 kg) with dark grey wings and white underparts. Soars high in updrafts of thermals.	Usually coastal but travels far inland. Hunts over waterways and adjacent land.	Forages over open areas throughout airfield.	Daily bird monitoring. Monitor and control small mammals (rodents and rabbits) within the airfield to limit the time eagles spend hunting over this space. Monitor the trees and dead stags within the airport and immediate surrounds for nests. If found, seek approval to relocate.
10 (very high) Cattle Egret	Small, white egret (350 g) with hunched posture. Forms small groups or large flocks.	Grasslands, woodlands and wetlands, as well as pastures and croplands.	Managed grassland throughout the airport, including alongside runway.	Daily bird monitoring. Maintain grass length 20 – 30 cm. Mow at night

Rank Species	Description	Habitat preference	Habitat within Base	Management Actions
				Limit the amount of pooling water within the airfield. Implement and monitor dispersal techniques. Investigate alternatives to draining water from the construction sites into the grassland.
11 (very high) White-faced Heron	Medium sized heron (550 g) with a grey body and white face.	Forages on reefs, rock pools, mudflats, farm dams, drains and swamps. Also uses pasture and cropland.	Managed grassland throughout the airport, including alongside runway.	Daily bird monitoring. Maintain grass length 20 – 30 cm. Limit the amount of pooling water within the airfield. Implement and monitor dispersal techniques. Investigate alternatives to draining water from the construction sites into the grassland.
12 (very high) Australian Magpie	Medium sized (300 g), black and white passerine. Family groups of up to 25 defend territories in which they live year-round.	Found where there is a combination of trees and open areas. They're absent only from dense forest and arid deserts.	Managed grassland throughout the airport, including alongside runway.	Daily bird monitoring. Mowing/slashing at night. Installation of anti-perching devices to prevent birds perching on airside ledges and poles. Maintain grass length 20 – 30 cm. Implement and monitor dispersal techniques. Removal of breeding males by trained specialists combined with destroying active nests. Permits and licencing required.
13 (very high) Australian Raven	Large (650 g) corvid. Black with white eyes. Usually seen in pairs but does form small flocks.	Found in all habitat types with the exception of arid Western Australia.	Habitat includes most areas throughout the airport.	Daily bird monitoring. Ensure waste bins are always covered and effective waste-disposal practices are

Rank Species	Description	Habitat preference	Habitat within Base	Management Actions
				carried out by all personnel within the RAAF base. Installation of anti-perching devices to prevent birds perching on airside ledges and poles. Monitor the airfield for carrion and remove any if found.
14 (very high) Eastern Rosella	Vividly coloured, small parrot (100 g). Forms small flocks. Flight is undulating when over short distances, but high and straight over longer distances.	Open woodlands, grasslands, farmlands and remnant bushland. Feeds on the ground.	Managed grassland throughout the airport, including alongside runway.	Daily bird monitoring. Maintain grass length 20 – 30 cm. Mow/slash grass before seed heads form to reduce this food source. Remove any hollows found in dead stags or trees and relocate to nearby bushland to prevent rosellas nesting within the airport.
15 (very high) Red-rumped Parrot	Small (60 g), green and yellow parrot with red rump. Flight swift and undulating. Feeds on the ground in pairs or small to large flocks.	Open grasslands, lightly timbered plains, farmlands and along water courses.	Managed grassland throughout the airport, including alongside runway.	Daily bird monitoring. Maintain grass length 20 – 30 cm. Mow/slash grass before seed heads form to reduce this food source. Remove any hollows found in dead stags or trees and relocate to nearby bushland to prevent parrots nesting within the airport.
16 (very high) Pacific Black Duck	Mostly brown, medium sized (0.7 – 1.5 kg) duck.). Usually found in pairs or in small flocks.	All water types throughout Australia.	Lake Cochran.	Daily bird monitoring. Install mesh or netting over Lake Cochran to discourage ducks from using this habitat. Monitor and disperse any birds before installation.
17 (very high) Common Starling	Small to medium sized passerine (70 g). Forms massive flocks at dusk before roosting, in	Most areas in SE Australia, particularly around urban developments.	Habitat includes most areas throughout the airport.	Daily bird monitoring. Installation of anti-perching devices to prevent birds perching on airside ledges and poles.

Rank Species	Description	Habitat preference	Habitat within Base	Management Actions
	which they perform aerobatic displays.			Installation of netting in hangars to prevent birds nesting within. Removal of nests. Culling
18 (high) Magpie Lark	Small to medium sized black and white passerine (85 g). Usually seen in pairs, but sometimes forms small flocks.	Found in all habitats except rainforests and the driest deserts.	Habitat includes most areas throughout the airport.	Daily bird monitoring. Installation of anti-perching devices to prevent birds perching on airside ledges and poles. Maintain grass length 20 – 30 cm. Implement and monitor dispersal techniques.
19 (high) Black-shouldered Kite	Small to medium (300 g), hovering raptor. Mostly white and grey with black shoulders and wing tips. Most often solitary or in pairs.	Found in treed grasslands, farms, along roads and in vacant lands of urban areas.	Forages over managed grassland throughout the airport, including alongside runway.	Daily bird monitoring. Monitor and control rodents within the airfield to limit the time kites spend hunting over this space. Monitor the trees and dead stags within the airport and immediate surrounds for nests. If found seek approval to relocate.
20 (high) Whistling Kite	Medium sized (800 g), mostly brown raptor. Soars in pairs or solitarily above the ground.	Woodlands, open country and wetlands.	Forages over managed grassland throughout the airport, including alongside runway.	Daily bird monitoring. Monitor and control rodents and rabbits within the airfield to limit the time birds spend hunting over this space. Monitor the trees and dead stags within the airport and immediate surrounds for nests. If found seek approval to relocate.
21 (high) Masked Lapwing	Medium (400 g) ground-dwelling bird with yellow bill and wattles covering their face.	Marshes, mudflats, beaches and grasslands.	Managed grassland throughout the airport, including alongside runway.	Daily bird monitoring. Maintain grass length 20 – 30 cm. Limit the amount of pooling water within the airfield. Implement and monitor dispersal techniques.

Rank Species	Description	Habitat preference	Habitat within Base	Management Actions
	Small groups inhabit and defend a territory throughout the year.			
22 (high) Australian Hobby	Small to medium (290 g), mostly brown raptor. Flight swift and direct.	Woodlands, open forests, farmlands with scattered trees.	Forages over managed grassland throughout the airport, including alongside runway.	Daily bird monitoring. Monitor and control rodents within the airfield to limit the time kites spend hunting over this space. Monitor the trees and dead stags within the airport and immediate surrounds for nests. If found seek approval to relocate.
23 (high) Peregrine Falcon	Large (700 – 900 g), powerful, raptor. Black hood, blue-grey wings and back, and white underparts. Flight is powerful, fast and agile.	Found in most habitats. Nests on cliffs or buildings.	Forages over managed grassland throughout the airport, including alongside runway.	Daily bird monitoring. Monitor and control small rodents within the airfield to limit the time falcons spend hunter over this space. Monitor the trees and dead stags within the airport and immediate surrounds for nests. If found seek approval to relocate.
24 (high) Purple Swamphen	Large rail (1 kg). Dark, metallic blue body with bright red bill and face shield. Small family groups occupy a territory throughout the year.	Swamps, well-vegetated lakes and river margins and adjacent grasslands and fields.	Vegetated drainage lines flowing into Lake Cochran and the adjacent land.	Daily bird monitoring. Disperse birds before they get near taxiways and runways
25 (high) Rainbow Lorikeet	Small to medium sized (120 g) parrot with green wings, blue head, red bill and orange breast. Forms large flocks and travels large distances to feed on nectar.	Most treed areas, including rainforests, forests and urban areas.	Habitat includes large flowering trees throughout the airport.	Daily bird monitoring. Remove any hollows found in dead stags or trees and relocate to nearby bushland to prevent lorikeets nesting within the airport.

Rank Species	Description	Habitat preference	Habitat within Base	Management Actions
26 (high) Lace Monitor	Large lizard with dark scales, scattered with cream spots forming solid bands. Usually solitary. Forages widely.	Well-timbered areas from dry to cool temperate forests.	Patches of remnant forest throughout the RAAF Base. May venture through most places within the base.	Monitor the base for carrion and remove promptly. Monitor the species occurrence within the base and consider relocation if it becomes a problem. Implement recommendations to prevent birds nesting within the built environments so that Lace Monitors are not attracted to these areas.
27 (high) Red Fox Brown Hare European Rabbit	The fox is a slender canine with a long bushy tail. Reddish brown above, whitish below. Mostly solitary and nocturnal. The brown hare is known for its long, black-tipped ears and fast running. The rabbit is small mammal with long back legs.	Found in most habitats.	Will use most habitats within the base.	Baiting and shooting programs Continued monitoring.

APPENDIX 10: STANDARD OPERATING PROCEDURES

WHMP-01 Wildlife Count Procedure

Objective	To assist in the detection and subsequent removal of hazards and to provide data for comparison of numbers and locations of wildlife.
Responsibilities	EMOS
Frequency	As required
Equipment	Vehicle Binoculars Bird identification field guide

Consistent application of the Wildlife Count Procedure is essential for obtaining quality data to be used for analysing trends. If hazardous conditions are identified during the course of a count, it will allow for its timely removal using active dispersal techniques.

Procedure

- The person doing wildlife counts must always follow the same route.
- The aerodrome is divided into Wildlife Count Areas.
- Within each Area, stop the vehicle at the same marked location each time and scan the entire Area using binoculars.
- Record all species and numbers observed on a Wildlife Count Form. Information to be recorded includes:
  - date
  - name of observer
  - time of commencement and completion of the count
  - weather conditions
  - species and number observed
  - area recorded (including birds transiting the airfield)
  - special notes such as mowing or ponded water that may cause additional attractions.
- The form includes frequently observed bird species and allows room for additional species and as well as unidentifiable bird types. Mammals such as rabbits, hares, kangaroos or foxes are also recorded.
- Transfer the data onto a spreadsheet or into a database for ongoing trend analysis.

Attachments

- RAAF Base Williamtown Wildlife Count Form
- RAAF Base Williamtown Wildlife Count Area Map

RAAF BASE WILLIAMTOWN WILDLIFE COUNT FORM

BIRD COUNT FORM							WEATHER CONDITIONS		
Day:						Temp:			
Date:						Windspeed:			
Start Time:						Cloud:			
End Time:						Wind Direction:			
ARO:						Rain Last 24hrs:			
Count Type (circle appropriate) Morning Afternoon						General Weather Description			
	Sector							Transiting Airfield	
Birds	1	2	3	4	5	6	7		
Mammals									
General Comments (eg sources of attraction, increases in bird numbers)									

RAAF Base Williamtown Wildlife Count Area Map

[*Insert aerial/map of airport and mark the 'Areas' and locations where wildlife counts are conducted*]

WHMP-02 Wildlife Hazard Surveillance Procedure

Objective	To detect birds and other wildlife airside and landside that may pose a hazard to aircraft. To locate eggs and nests of birds. To locate remains of birds and other animals.
Responsibilities	EMOS
Frequency	As required
Equipment	Vehicle Binoculars Radio equipment Bird identification field guide

The airside and relevant landside areas should be checked regularly for birds. Records must be kept showing the areas of the airport patrolled; numbers; location species of birds seen; action taken to disperse the birds and results. Where no wildlife is observed a note should be made to identify the times of patrols and the locations covered. This information may be used to provide evidence of adequate wildlife hazard management in the event of litigation.

Regular inspections are important to ensure early detection of bird and other wildlife hazards. They also assist with the locating eggs and nests or remains that may be the result of a bird or other wildlife strike. Detection and removal of remains will minimise the risks of Foreign Object Debris (FOD).

The timing of such inspection should be before each blocks of high aircraft activity throughout the day and prior to larger aircraft movements with emphasis on jet aircraft.

Procedure

- Inspect pavements, grassed areas, and flight paths for bird activity and search for eggs, nests and animal remains.
- Where hazardous bird/wildlife activity is observed, immediately proceed with Wildlife Dispersal Procedure WHMP 05.
- If there is an imminent threat to aircraft safety, proceed with Wildlife Culling Procedure WHMP 6.
- Where a serious hazard remains despite all efforts, advise ATC and refer to the RAAF Base Williamtown Aviation Safety Officer.
- If no activity observed log an entry in the wildlife surveillance and dispersal record form (Wildlife Dispersal Procedure WHMP-05) to show the time of the inspection and areas patrolled.

Attachment

- Nil - see Wildlife Surveillance and Dispersal Record Form (WHMP-05).

WHMP-03 Strike Reporting Procedure

Objective	To accurately record all possible information on bird and other wildlife strikes
Responsibilities	Airfield Safety Officer
Frequency	As required, within 72 hours of strike
Equipment	Vehicle Wildlife Strike Form

Strike reports provide one of the most important pieces of information regarding the risks posed by birds and other wildlife to aircraft. It is essential that all possible sources of information are investigated, and details accurately recorded.

Procedure

- Always complete a wildlife strike report form with as much information possible.
- Where a pilot report indicates a strike has or may have occurred, examine the areas where the strike was reported to have occurred for evidence of carcasses or remains.
- Contact operator or ground crews to organise inspection of the aircraft for remains, evidence of strike such as blood smear or damage to the aircraft.
- Process all remains found as per WHMP - 04 (Identification and Handling of Remains).
- Corroborate all information from squadron.
- Categorise the strike according to the definitions for confirmation and strike location (see Glossary).

Attachments

- Defence Sentinel Event Report and a RAAF Base Williamtown Wildlife Strike Form (see below).

Australian Government
Department of Defence

AE 527
Revised 26 Oct 16

Sentinel Event Report - Non-DPN (DRN) Users

Reporting a new WHS event for Non-DPN users

Fields marked with * are mandatory, and must be completed before signing or submission.

Defence Policy

Defence people are required to submit Defence WHS Events in accordance with Defence policy. All Work Health and Safety (WHS) Events related to employment in Defence, or as a result of a Defence undertaking, are to be reported using Sentinel. This includes WHS Events for all Defence employees, cadets and third parties *(contractors and the general public)*.

Legislation

The Work Health and Safety (WHS) Branch collects data on WHS Events under the Work Health and Safety Act 2011 and the Australian Radiation and Protection and Nuclear Safety Act 1998 (ARPANSA).
Some Events require additional notification to the regulators, Comcare and ARPANSA.

Comcare Notifiable Events

Under Part 3 of the Work Health and Safety Act 2011 Defence has a duty to notify the regulator of defined notifiable events that have arisen out of Defence directed/controlled activities immediately after becoming aware that the event has occurred. Notification in the first instance must be by phone - 1300 366 979. Seek advice from the Comcare contact regarding site preservation and submission of written notification of the event.

If the event has been identified as a notifiable to Comcare the event will be automatically submitted once the supervisor has completed the required supporting information from within the event.

Mandatory Defence WHS Event Reporting Timeframes

The Defence WHS Event Reporting Timeframes will assist you to determine the mandatory reporting timeframes applicable to your WHS Event.

WHS Exemptions for warlike and non-warlike operations

CDF has declared that Defence is exempt from the requirement to notify Comcare and the requirement to preserve an Event site for Comcare investigative purposes, relating to events that occur on 'warlike' or 'non warlike' operations, as determined by CJOPS in relevant operational orders. All WHS Events, including those that occur on operations, must still be reported to Defence for performance improvement and management purposes. The ADF is still required to meet its obligation under DI(G) OPS 13-15 relating to initial action and preservation of an Event site.

Security

Sentinel as a system, is approved to store material at the rating of Unclassified and For-Official-Use-Only. User access is granted subject to the conditions detailed in the Defence Secret and Restricted Network System User Acceptable Usage Standard Operating Procedures for more information on your Security obligations. Information or images contained in Sentinel must not exceed this security classification, as Notifiable Event information will be sent outside of the Defence Protected Network to the appropriate regulator.

Privacy

Privacy Act 1988 imposes obligations on the Department of Defence in relation to the collection,storage, access and alteration, use and disclosure of personal information.

The personal information collected through Sentinel is required for the assessment or the investigation stages of a WHS Events in accordance with the Work Health and Safety Act 2011.

Use of Sentinel requires that you provide personal data for use in the assessment of the investigation of a WHS Event. Defence may also be required by legislation to provide WHS Event data to external agencies such as Comcare, DVA and ARPANSA.

The provision of WHS Event data to external agencies is subject to adherence to the Privacy Act 1988, and information requests will be assessed on an individual basis.

Refer to the Defence privacy website for information about the Information Privacy Principles and the application of the Privacy Act in Defence. The Privacy Act 1988 and the Defence Security Manual also provide further information.

Be aware of the Public Interest Disclosures Act 2013 (PID Act) for further information see the Defence Public Interest Disclosure Scheme (Defence PID Scheme)

WHS Report Completion

The Supervisor of the person involved, or reporting the event, is responsible for ensuring that all relevant sections of the WHS Event report are completed within the prescribed timeframes.

The role of Supervisor is assigned to the person who was supervising the Casualty/Casualties as at the time of the event and/or was in charge of the Defence work area at the time of the event.

General public or contractors

Defence employees *(ADF and APS)* are also to complete the AD 088 - *Comcover Notification Record*,where an incident involves a member of the general public or a contractor. For further information please refer to the Defence Insurance Office website or phone 1800 990 900. The AD 088 can be found on the Web Forms system.

Compensation claims

Completion of this form is not an admission of liability or claim for compensation; however a copy of the completed form will assist in the compensation determination process. Compensation claim forms for military personnel and cadets are obtained from the Department of Veterans' Affairs (DVA) on 1300 550 461, and for APS employees from the Defence Service Centre on 1800 000 677. Claims for compensation are determined by DVA *(ADF)* and Comcare *(APS)*.

Signals

This form must be completed, even if a DISCON signal *(eg FATALCAS or NOTICAS)* has been raised.

Initial assessment

Did the event occur while on duty doing Defence work? *

◯ Yes ◯ No

Did the event occur while deployed on a declared Defence operation? *
(An ADF member posted, assigned or attached for duty to: a UN force; a foreign/multinational force; or the ADF outside Australia on declared warlike and non-warlike operations.)

◯ Yes ◯ No

Was the person involved a visitor to Defence property? *
(A visitor is any person who visits/accesses Defence workplaces but is not on duty or does not have a DRN account.)

◯ Yes ◯ No

Did the event occur during ADF organised sports? *

◯ Yes ◯ No

Did the event involve workplace bullying/harassment? *

◯ Yes ◯ No

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Wildlife Strike Form Template

Date of occurrence:		Aerodrome:	YSNW
Time of occurrence (local time):		Operation type	
Pilot in command:		Last point of departure or destination:	
Squadron:		Runway used:	
Aircraft registration:		Position on runway (ch):	
Aircraft make/model:		Light conditions	

Weather information at time of strike

		Yes
Wind direction:	Clear	
Wind speed:	Fog	
Cloud height:	Rain	
Cloud amount:		

General description of weather:

Strike category: confirmed / suspected / near miss

Location of strike: On Airfield / Vacinity / Remote

Description of location

Species

Number seen:

Number struck:

Number found: (Store carcass for identification)

Blood smear only: (Take sample for DNA ID)

Feathers only: (collect feathers for ID)

Damage: No / Yes (Take photographs of all damage)

Description of damage:

costs

aircraft downtime

missions lost/cancelled

missions delayed

Phase of flight:

descent / approach / short final / landing roll / taxi / take-off run / rotation / climb

Effect on flight: none / rejected takeoff / missed approach / precautionary landing

Speed at time of impact:

Height at time of impact:

Part/s Struck: Radome / Windshield / Nose / Engine / Propeller / Wing/Rotor / Fuselage / Landing gear / Tail / Lights / Other (specify)

Information source: ATC / Pilot / Aircraft maintenance staff / Squadron leader / Remains found

Wildlife Control measures at the time of the strike:

Additional description, information or suggestions:

Name: Date and Time:

WHMP-04 Identification and Handling of Remains Procedure

Objective	To safely collect and store bird and other wildlife remains. To accurately obtain as much information from bird and wildlife remains found at RAAF Base Williamtown.	
Responsibilities	EMOS	
Frequency	As required	
Equipment	Vehicle Tongs/tweezers Re-sealable bags Labels Hand wash	Disinfectant Freezer Gloves Reference book

For determining trends in strikes at RAAF Base Williamtown, it is essential to wherever possible identify the species involved. In order to accurately assess both the cause of death and identification of the species, carcass retrieval is essential. This information ultimately aids in better wildlife management on airport.

Procedure

- Locate remains.
- Follow the procedures below for each type of remains found. All remains should be stored for annual analysis by consultant.
- All strikes and carcasses should be reported, follow Procedure WHMP-03– Strike Reporting.

Whole Carcasses (collect sample for professional identification)

- Depending on size of sample - use disposable gloves, thick gloves or a pair of tongs to collect remains from runway, ground, aircraft etc and seal carcass in plastic bag (taking care not to contaminate the outside of the bag).
- Remove gloves and dispose, wash hands.
- Disinfect tongs and tweezers.
- Fill out strike form and place inside a separate sealed plastic bag with the carcass.
- Freeze in designated bird carcass freezer for analysis by suitably trained ecologist later.
- Bird carcasses taken during culling will be handled as outlined above. Where more than one specimen of a common and easily identifiable species is culled, one will be placed in a bag, tagged and frozen and the others disposed of appropriately (e.g. buried to exclude scavenging animals, or to landfill).
- Follow Procedure WHMP-03 Strike Reporting.

Feathers and fragments (collect sample for professional identification)

- Use disposable gloves.
- If single feathers, or with small amounts of flesh attached, place in re-sealable bag.
- Remove gloves and dispose, wash hands.
- Fill out strike form with all details and staple to bag.
- Freeze in designated bird carcass freezer for analysis by consultant later.
- Follow Procedure WHMP-03– Strike Reporting.

Safety Considerations

Dead animals may carry diseases harmful to humans. Wear gloves and if necessary disposable coveralls when handling carcasses or biological materials. Avoid direct skin contact with biological materials and avoid contaminating your normal work clothing. Ensure that the outside of sample bags, vehicles and freezers are not contaminated. Wear a mask and eye protection if there is a risk of body fluids or organic material misting into the atmosphere. Wash hands thoroughly when you are done.

If an animal is sick or injured, it may be necessary to humanely destroy the animal then process the carcass according to the procedures below. Seek veterinary advice if required and regularly liaise with local wildlife authorities to ensure your species knowledge and euthanasia competency is adequate. Regular competency checks will help avoid unnecessary euthanasia of an endangered species or delayed euthanasia of suffering wildlife.

Flying foxes and microbats may carry viruses that can cause serious disease in man and particular care must be taken when handling dead bats. A sick or injured bat should only be handled by suitably experienced and vaccinated persons. If a person is bitten or scratched by a bat:

- The wound should be immediately washed with soap or disinfectant and water for at least five minutes.
- Seek medical advice immediately.

WHMP-05 Wildlife Dispersal Procedure

Objective	To remove immediate wildlife hazards from the aerodrome.
Responsibilities	EMOS
Frequency	As required
Equipment	As required

Dispersal of wildlife hazards is an integral aspect of active management as areas on the aerodrome will remain attractive to some species and early detection and immediate removal of hazards is essential to effective management of risks.

Detection is achieved during wildlife counts (Wildlife Count Procedure WHMP-01) and wildlife hazard surveillance (Wildlife Surveillance Procedure WHMP-02). Personnel should be present on the aerodrome and equipped to manage wildlife hazards as required for scheduled counts and inspections and during routine daily surveillance.

The following details are recorded: time; areas of the aerodrome patrolled; numbers, location and species of wildlife seen; action taken to disperse the wildlife; results of the action. Some important guidelines to be followed when dispersing wildlife:

- Dispersal needs to be most intense at the end of the breeding season to discourage young wildlife from foraging at the aerodrome. Young are easily deterred from aerodromes providing they recognise the aerodrome as an unattractive and threatening environment (note that different species breed at different times of the year).
- Do not allow settling wildlife to feed in order to discourage regular visitation. It is easier and more effective to harass newcomers to the airport than birds that have established their territory on-site.
- Concentrate dispersal activities for most species in the early morning and midafternoon, prior to peak feeding periods. Early morning harassment discourages visitors settling in for the day.
- It may be necessary to continuously patrol and disperse during periods where aircraft movements are scheduled closely together.
- Where wildlife identify a particular vehicle as a risk and move to a different airside location, consider undertaking dispersal in a different type of vehicle (e.g. tractor).

Procedure

- Identify wildlife requiring dispersal.
- Position yourself between the runways and the wildlife to ensure dispersal is away from aircraft manoeuvring areas.

- Choose the most appropriate equipment for the task (See attached equipment guidelines)
- Check for no aircraft activity.
- Activate equipment.
- Determine effectiveness.
- Continue until hazard is successfully removed.
- Record details on RAAF Base Williamtown Wildlife Surveillance and Dispersal Record Form.
- Where a serious hazard remains refer to WHMP-06 Wildlife Culling.

Attachments

- Equipment Overview
- Firearm Safety Guidelines
- RAAF Base Williamtown Wildlife Surveillance and Dispersal Record Form

Equipment Overview

There are several options available for undertaking dispersal and all will be used at various times to limit the likelihood of birds habituating to any one option. Options may include:

- Vehicle siren lights and horn can be used to herd and disperse birds.
- Arm waving, lures and stock whips are inexpensive and sometimes effective means of dispersing flocks of some species of birds. The arm wave requires the officer to stand on high ground or a vehicle and flap both arms slowly at around 1 beat per second. Flocks respond as if to a predator such as a raptor and disperse. A well-used stock whip lets off a sound similar to that of a firearm and is an effective tool for dispersing some species.
- Bird distress calls transmitted by megaphone or other equipment can also be effective but must be used by trained personnel to ensure the most effective outcome as different distress calls can either attract or disperse a flock, dependent on the species.
- Trained dispersal animals, such as dogs and raptors, must only ever be used by highly trained specialists to avoid creating additional risk to aircraft.
- Pyrotechnics is a very useful tool for dispersal. To reduce the chance of habituation, use as few shots as possible to achieve the required effect and ensure the cartridge explodes as close to the wildlife as possible.

Firearms Safety Guidelines

Firearms are provided for the purpose of harassing, dispersing, and when necessary, culling of wildlife (refer to RAAF Base Williamtown Firearms Policy). Care is to be taken when harassing birds and the following rules must be observed:

- The location of the hazard in relation to any aircraft in the vicinity, whether landing, taking-off, taxiing, etc. A gun shall not be fired in the direction of or in the vicinity of any aircraft, occupied vehicle or people.
- A strict watch is to be maintained for any personnel working in the vicinity, particularly people on foot whose clothing may blend in with the background.
- Never carry a loaded gun in the vehicle or fire from the vehicle.
- Care to be taken when using a gun in the vicinity of any buildings, aerials, runway lights, windsocks, etc.
- A strict watch must be kept for helicopter and fuel tanker traffic.
- Never fire in the direction of any vehicle moving on the perimeter road or at any houses, vehicles, etc. in the vicinity of the boundary fence.
- When using Bird Frite shell ammunition in dry, hot conditions, care must be taken to ensure that the spent cartridge casing (which tends to smoulder) does not set off a grass fire.
- Guns must be thoroughly cleaned and oiled daily, preferably as soon as practicable after use.
- When not being carried in a vehicle, guns and ammunition must be stored in a locked cupboard (refer to RAAF Base Williamtown Firearms Policy).
- Wear ear and eye protection when discharging firearms.

RAAF Base Williamtown Wildlife Surveillance and Dispersal Record Form

Name	Date	Time		Area No.	Species	Actions Taken	Dispersed (Y/N)	Number Culled	Comments
		Start	End						

WHMP-06 Wildlife Culling Procedure

Objective	To remove immediate bird and wildlife hazards from the airport.
Responsibilities	EMOS
Frequency	As required
Equipment	Firearm Ammunition Permits Current culling authority/license from State/Territory Department Current weapons license necessary for weapons use

Culling is an effective last option management technique that is used to remove persistent individuals of moderate or high-risk species or where there is an imminent safety hazard. Culling is an essential part of the WHMP as it not only removes targeted individuals but reinforces the effectiveness of dispersal actions by demonstrating to resident birds that the airport is not a safe feeding area.

Where possible culling should target young inexperienced birds, during and after the breeding season and naive vagrants. Culling should be applied sparingly to groups of birds, particularly territorial species such as Australian Magpies as these birds can reduce the presence of other species.

Remove hazards from the airside area as soon as possible after they are detected. Staff are to be equipped with firearms and live ammunition suitable for wildlife culling, these are carried during the shift in a lockable storage container in vehicles.

Destroy nesting material and any eggs on the airport, with permits as required, to discourage bird nesting activities. Where nesting is found on or within buildings or structures on airport land, arrange with relevant staff to have nests removed. Where possible these areas should be modified to exclude future nesting attempts.

Seek the help of specialised agencies as necessary to assist with safe removal of some animals (such as foxes or hares/rabbits).

Where wildlife hazards cannot be immediately removed and may impede aircraft safety, the hazard is communicated immediately to ATC and the Aviation Safety Officer. NOTAMs may be issued or where necessary the runway closed.

Procedure

- Identify birds requiring culling.
    - If the species is rare or threatened permits do not cull. Other dispersal methods must be used to remove the problem individual. If the hazard persists, liaise with the Aviation Safety Officer.
- Position yourself between the critical areas and the flock/individual to ensure dispersal is away from runway and flight strips.
- Choose the most appropriate firearm for the task.
- Check for nearby human and vehicular activity.
- Cull individuals.
- Determine effectiveness.
- Continue until hazard is successfully removed.
- Record ammunition usage on the firearms issue register form and species culled on the Wildlife surveillance and dispersal record form.
- Where a serious hazard remains despite all efforts, advise ATC and refer the matter to RAAF Base Williamtown Aviation Safety Officer. NOTAMs may be issued or where the risk is extreme the runway closed.

Safety Considerations

Where culling requires access to movement areas, Defence may be required to delay aircraft movements. Culling will aim to direct the remaining birds away from runways and flight strips. All bird and wildlife culling must be undertaken humanely and safely.

Attachments

Permits are required for the management of wildlife hazards at RAAF Base Williamtown:

- Permits from NPWS to harm native wildlife (see Wildlife Culling procedure WHMP-06.)
- Firearms licenses from NSW Police are also required to deal with wildlife as set out in this procedure.

Actions under these permits and licenses require the aerodrome or personnel to adhere to specific conditions, refer to current permits for details. Originals of permits and licenses are kept on file by the RAAF Base Williamtown Aviation Safety Officer.

RAAF Base Williamtown approves the use of firearms for bird and animal hazard control only by those officers whose duties involve bird and animal dispersal and culling and who are licensed to use RAAF Base Williamtown- owned firearms.

Firearms License Holder Details

Name	Firearms License #	Category	Expiry

APPENDIX 11: STAFF CONTRIBUTIONS AND LICENSING

The following staff were involved in the compilation of this report.

Name	Qualification	Title/Experience	Contribution
Chelayne Whyte	B Geog, Dip SIS	Senior Environmental Consultant	Fieldwork and report preparation.
Andrew Walsh	B App Sc (Ecology)	Principal Ecologist NSW/Qld	Technical review
Mark Dean	BEnvSc & Mgt	Fauna Ecologist	Field surveys, report preparation
Gayle Joyce	BSc (Forestry) (Hons)	GIS Specialist	Figure preparation

Kleinfelder employees involved in the current study are licensed or approved under the *National Parks and Wildlife Act 1974* (License Number: SL100730, Expiry: 31 March 2021) and the *Animal Research Act 1985* to harm/trap/release protected native fauna and to pick for identification purposes native flora and to undertake fauna surveys.