Cairns Airport

Wildlife Hazard Management Plan

Version 5

North Queensland Airports

October 2023

Cairns airport

AVISURE
aviation | wildlife | safety

Authorisation

This Wildlife Hazard Management Plan has been prepared by Cairns Airport, a business unit of North Queensland Airports Pty Ltd and airport-appointed specialist (Avisure) to meet the applicable requirements of the Cairns Airport Aerodrome Operations Manual, the Cairns Airport Aviation Safety Management System (Part A) and the Civil Aviation Safety Regulations Part 139 (Aerodromes) Manual of Standards 2019, made under division 139.C.4 of the Civil Aviation Safety Regulations 1998.

It provides procedures to deal with danger to aircraft operations caused by the presence of wildlife on or near the aerodrome. The documented procedures are an accurate reflection of current actions and industry best practice. The organisation responsible for coordinating this plan is Cairns Airport. The North Queensland Airports Chief Operating Officer is the accountable manager as defined by the Civil Aviation Safety Regulations Part 139 (Aerodromes) Manual of Standards 2019 and the Cairns Airport Safety Management System.

Any external references made to regulations, standards and documents should be read in conjunction with this document. As these external references are in force from time to time and may be subject to change, the latest issues/amendments should be checked prior to using this document.

Cairns Airport will review this document regularly to ensure as far as possible that the information contained within is current, accurate and suitable for the intended purpose. Should any changes be found necessary, or where compliance with this policy becomes impractical or impossible, the Chief Operating Officer is to be advised immediately.

11 October 2023

Garry Porter
Accountable Manager
Cairns Airport

Date

Acknowledgement of Country

Cairns Airport acknowledges the Country on which the airport is located and business is conducted. We pay our respects to the Traditional Custodians of our Cairns region, the Djabugay and Yidin speaking peoples, many of whom can trace their relationship with this land, water, and skies back thousands of years.

We extend this respect to all Elders past, present and future, and to other Aboriginal and Torres Strait Island Peoples who call this beautiful Country home.

Record of Review

Version	Date	Description of Change
1	09/07/2015	Complete Plan rewrite.
2	29/02/2016	Complete Plan rewrite.
2.1	01/06/2017	Minor editorial amendment required during annual review of Plan.
2.2	02/01/2018	Annual review and minor adjustment to species risk and addition of Contractors.
2.3	12/03/2019	Annual review and minor adjustment to species risk.
3	04/07/2019	Review of document post Annual Technical Inspection.
4	24/02/2023	Complete Plan rewrite to meet Civil Aviation Safety Regulations Part 139 Manual of Standards (2019).
4.1	11/07/2023	Review by AOM following multiple strikes and damage to aircraft in line with MOS139 17.04 (4) – WHMP still fit for purpose.
5	10/10/2023	Annual update of WHMP. Updates to sections 1, 3, 5 and 6, species action plans, and standard operating procedures.

On receipt of this revision, please archive all previous and now obsolete copies.

Distribution

An electronic copy of this Plan is available on CAPL SharePoint and TrackerAIRSIDE™ Knowledge Centre (internal) and on the Cairns Airport website (external) to CAPL Wildlife Hazard Management Committee members[1] and other relevant stakeholders. This Plan is made available to Civil Aviation Safety Authority for inspection upon request.

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Persons printing this Plan should be aware that any hard copies are uncontrolled.

Glossary

Active Management	The use of short-term management techniques such as distress calls, pyrotechnics, trapping and culling to disperse or remove birds.
Aerodrome/Airfield	Any location where aircraft take off, land and are stored and maintained. An airfield consists of at least one runway for an aircraft to take off and land, and may contain a helipad, buildings such as control towers, hangars and terminal buildings.
Aerodrome Operator	The aerodrome is operated by North Queensland Airports.
Aerodrome Technical Inspection	means an inspection of the facilities, equipment, and operation of a certified aerodrome, conducted by, or on behalf of, the aerodrome operator to ensure detection of any deterioration that could make any of the facilities, equipment or operations unsafe for aircraft operations.
Aircraft/Aeroplane	Any machine that can derive support in the atmosphere from reactions of the air rather than the reactions of air against the earth's surface.
Aircraft Operator	A person, organisation or enterprise engaged in, or offering to engage in, aircraft operations.
Airline Operator	The operator of a Regular Public Transport air service. See *Aircraft Operator*.
Airside	A defined area of land or water intended to be used either wholly or in part for the arrival, departure and movement of aircraft which is access controlled.
Air Traffic Control	Ground based control service.
Apron	A defined area on a land aerodrome intended to accommodate aircraft for the purpose of loading or unloading passengers or cargo, refuelling, parking, or maintenance.
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.

Critical Area	Areas within or in proximity to the runway strip, approach and landing paths, and movement areas of an aerodrome.
Damaging Wildlife Strike	A wildlife strike that results in damage in accordance with one of the below definitions: A **substantial damaging wildlife strike** occurs when there is damage or structural failure incurred by an aircraft by a wildlife strike that adversely affects the structural strength, performance, or flight characteristics of the aircraft and that would normally require major repair or replacement of the affected component[2]. A **serious damaging wildlife strike** occurs when there is damage to a transport vehicle that affects the structural integrity, performance, or operational characteristics of that vehicle, and requires major repair or replacement of the affected component or components of that vehicle, or destruction of the transport vehicle[3].
Diurnal	Wildlife that are active during the daytime.
En Route	Any aircraft operation during the course of its journey. It excludes the approach, landing, take-off, and initial climb phases of flight.
Firearm	A shotgun, rifle or other weapon as defined under State and Commonwealth Legislation.
Fly Over	When birds fly over the airspace without coming to or from an airside area.
Foraging	When animals search for and obtain food.
Hazard	A source of potential harm or a situation with potential to cause loss.
Incident	An occurrence, other than an emergency/disaster, associated with the operation of an aircraft that impacts on the safety of operations.
Landside	Those areas of the airport that are not considered airside and include access roads, carparks, check-in areas etc.
Loafing	When animals rest.

2 Advisory circular 139.C-16 Wildlife hazard management.
3 Transport Safety Investigation Regulations 2003.

Manoeuvring Area	Airport areas used for taxiing, take-off, and landing of aircraft, excluding the aprons.
Manual of Standards	A legislative instrument comprised of detailed technical requirements, including uniform specifications and standard applications that augment standards set out in the Civil Aviation Safety Regulations.
Movement Area	Airport areas used for the movement of aircraft, including aprons and manoeuvring areas.
Nocturnal	Wildlife that are active during the night-time.
Notice to Airmen	A notice issued by the NOTAM Office containing information or instructions concerning the establishment, condition, or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to persons concerned with flight operations.
Passive Management	The modification of habitat, including buildings and other manufactured structures 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.
Raptor	Birds of prey such as kites, eagles, and falcons.
Risk	The chance of something happening that will have an impact upon objectives. It is measured in terms of consequences and probability.
Roosting	When birds repeatedly return to a particular place in numbers to loaf or spend the night.
Runway	A defined area on an aerodrome prepared for the take-off and landing of aircraft.
Runway Strip	A defined area around a runway, marked by gable markers, that is considered part of the runway.

Significant Strike	A significant strike is when there is damage or an adverse effect on flight. This includes aborted or non-standard procedure, precautionary or forced landing, delay/cancellation, diversion, accident or affects the serviceability of the aerodrome.
Taxiway	A defined path on an aerodrome established for the movement of aircraft between one part of the aerodrome and another including: • Aircraft stand taxi lane: A portion of an apron designated as a taxiway and intended to provide access to aircraft stands only. • Apron taxiway: A portion of the apron designated as a taxiway and intended to provide access to aircraft parking positions.
TrackerAIRSIDE™	A software package used by Cairns Airport to record and store compliance documentation, serviceability inspections, dispersal action, wildlife patrols, and wildlife and safety incidents.
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 etc.
Wildlife Count	Standardised and regular counts of birds and other animals. Usually completed by Airport Safety Officer.

Wildlife Strike	A collision between wildlife, including a bird[2] and a moving aircraft[1]. Wildlife strikes are categorised as either a confirmed, suspected, or near miss strike, with various strike designations (refer to Wildlife Strike Designation). A **suspected wildlife strike** is an event where a wildlife strike has been suspected by aircrew or ground personnel but upon inspection: no carcass from the wildlife is found; and there is no physical evidence on the aircraft of the strike having occurred. A confirmed wildlife strike is an event where: • Physical evidence of a wildlife strike is found on the runway or runway strip used by the aircraft involved (unless another reason for the death of the wildlife can be found); • Physical evidence of the strike is found on the aircraft involved following an inspection; and
Wildlife Strike (cont)	• In any other instance where it can be reasonably proved from evidence that wildlife was struck as a direct result of a moving aircraft. For example, when aircrew report they definitely saw, heard or smelt a wildlife strike. • Aircrew report that they definitely saw, heard, or smelt a bird strike. A **wildlife near miss** is deemed to have occurred whenever a pilot takes evasive action to avoid birds or animals[4,5].

4 Australian Airports Association 2015, *Managing Bird Strike Risk – Species Information Sheets*, Airport Practice Note 6, New South Wales, September 2015.
5 Australian Airports Association 2016, Wildlife Hazard Management at Airports, Airport Practice Note 9, New South Wales, March 2016.

Wildlife Strike Designation	Wildlife strikes are designated as either occurring on-aerodrome, in the vicinity of an aerodrome, or remote from aerodrome. An **on-aerodrome wildlife strike** is 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 200 ft. on arrival[5,6]. A **wildlife strike in the vicinity of an aerodrome** occurs 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[5,6]. A **wildlife strike remote from the aerodrome** occurs whenever a bird strike occurs more than 15 kilometres from an aerodrome or more than 1,000 feet above the elevation of the aerodrome[5,6].
Wildlife Survey	Standardised surveys that capture data regarding wildlife species, their behaviours, and their distribution. Completed by suitably trained and qualified wildlife ornithologists or biologists.

6 International Civil Aviation Organization 1989, Manual on the ICAO Bird Strike Information System (IBIS), Third Edition.

Abbreviations

AAWS	Australian Animal Welfare Strategy
AC	Advisory Circular
ACFT	Aircraft
ACWG	Australian Centre for Wildlife Genomics
AEPF	Adverse Effect to Planned Flight
AFRU	Aerodrome Frequency Response Unit
AGL	Above Ground Level
AIP	Aeronautical Information Package
AOM	Aerodrome Operations Manager
AOS	Aerodrome Operations Supervisor
ARFFS	Aviation Rescue Fire Fighting Service
ASCM	Aerodrome Safety and Compliance Manager
ASMS	Aerodrome Safety Management System
ASO	Airport Safety Officer
AS/NZS	Australian and New Zealand Standard
ASRI	Aerodrome Survey Risk Index
ATC	Air Traffic Control
ATIS	Automatic Terminal Information Service
ATSB	Australian Transport Safety Bureau
CAMBA	China-Australia Migratory Bird Agreement
CAPL	Cairns Airport Pty Ltd
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulation
CNS	Cairns Airport
COP	Code of Practice
CRC	Cairns Regional Council
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CTAF	Common Traffic Advisory Frequency

DES	Department of Environment and Science
DMP	Damage Mitigation Permit
DNA	Deoxyribonucleic Acid (genetic material)
EORM	Emergency and Operational Resilience Manager
EPBC	Environment Protection & Biodiversity Conservation Act
ERSA	En-route Supplement Australia
GA	General Aviation
GIS	Geographic Information Systems
ICAO	International Civil Aviation Organization
JAMBA	Japan-Australia Migratory Bird Agreement
MOS	Manual of Standards
NASF	National Airport Safeguarding Framework
NM	Nautical Miles
NOTAM	Notice to Airmen
NQA	North Queensland Airports
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement
RPT	Regular Public Transport
RTIL	Runway Threshold Indicator
RWY	Runway
SAP	Species Action Plan
SASF	Safety and Security Forum
SMS	Safety Management System
SOP	Standard Operating Procedure
SRI	Species Risk Index
TWY	Taxiway
WHA	Wildlife Hazard Assessment
WHN	Wildlife Hazard Notification
WHMP	Wildlife Hazard Management Plan
WHS	Work Health and Safety

Table of Contents

1. Introduction

1.1. WHMP Background

Cairns Airport (CNS) is a Certified Aerodrome owned and operated by North Queensland Airports Pty Ltd (NQA). Cairns Airport Pty Ltd (CAPL), a business unit of NQA, is responsible for the safe and secure operation, maintenance, commercial development, and strategic planning functions of CNS.

This Wildlife Hazard Management Plan (WHMP) has been prepared in accordance with Part 3 Section 11 of the CNS Aerodrome Operations Manual. This WHMP meets the requirements of Volume 4 to Civil Aviation Safety Regulations (CASR) 1998 Division 139.C4 subparagraph 139.095 and the CASR Part 139 (Aerodromes) Manual of Standards (MOS) 2019[7].

1.2. The Wildlife Strike Issue

The consequence of wildlife strikes with aircraft can be very serious. Wildlife strikes have caused 744 human fatalities and 664 aircraft losses since the beginning of aviation (Shaw & Dolbeer, 2023). Wildlife strikes, which involve more than just the repair of damaged engines and airframes, cost the commercial civil aviation industry an estimated USD$1.2 billion per annum (Allan, 2002). In Australia, annual estimates range from AUD$11.9 million per year (Parsons, 2022) to AUD$103 million per year (Avisure 2022, unpublished data). Although wildlife strikes rarely have catastrophic outcomes for aircraft, in Australia, it remains the leading single cause of occurrence to airline transport category operations. Even apparently minor strikes which result in no obvious damage can significantly increase airline operating costs due to downtime associated with damage investigations and repair.

Strike risk depends on the probability of colliding with wildlife and the consequence to the aircraft if collision occurs. The probability of a wildlife strike occurring increases as the number of wildlife and aircraft operating in the same airspace increases (Dolbeer, 2006). Strike probability also increases with airspeed. In practice, this means that the likelihood of colliding with a bird inflight increases when operating at high speed below 5000’ above ground level (AGL), which is where the majority of birds operate (Civil Aviation Authority of New Zealand, 2020). Wildlife density, and therefore strike probability, increases with decreasing height above ground. Operating at low altitudes over, or near, known wildlife hazards will significantly increase strike probability. In civil aviation around 93% of strikes occur at or below 3500 feet AGL (Dolbeer, 2011).

7 Herein referred to as Part 139 MOS.

The main factors determining the consequences of a strike are the number and size of animals struck, the combined closing speed at which the strike occurred, the phase of flight when struck and the part of the aircraft hit. Generally, the larger the animal, the greater the damage. Large animals have the ability to destroy engines and windshields and cause significant damage to airframe components and leading edges (Civil Aviation Authority of New Zealand, 2020). Strikes involving more than one animal (i.e., a multiple strike) can be serious, even with relatively small wildlife, potentially disabling engines and/or resulting in major accidents. While total mass struck and impact site on the aircraft are important strike consequence considerations, final impact speed is the most significant determinant as impact force varies exponentially with the square of closing speed (Civil Aviation Authority of New Zealand, 2020).

In civil aviation around 93% of strikes occur at below 3500ft AGL (Dolbeer, 2011). Consequently, management focuses almost solely on terminal airspace and management responsibility has typically resided with aerodrome operators. In addition to terminal airspace management, aircrew and air traffic controllers should be engaged in strike risk assessment and mitigation processes, and that high-risk operations consider predicted or observed wildlife movement patterns. It is also important that external stakeholders, including wildlife authorities and local landholders, are engaged to monitor and communicate local wildlife movement activity, and that both on- and off-aerodrome hazards are critically assessed.

1.3. Strategy

Part 139 MOS S.17.04 (2)(e) strategy for wildlife hazard reduction

The WHMP forms part of an overall strategic program to reduce the wildlife hazard risks (Figure 1).

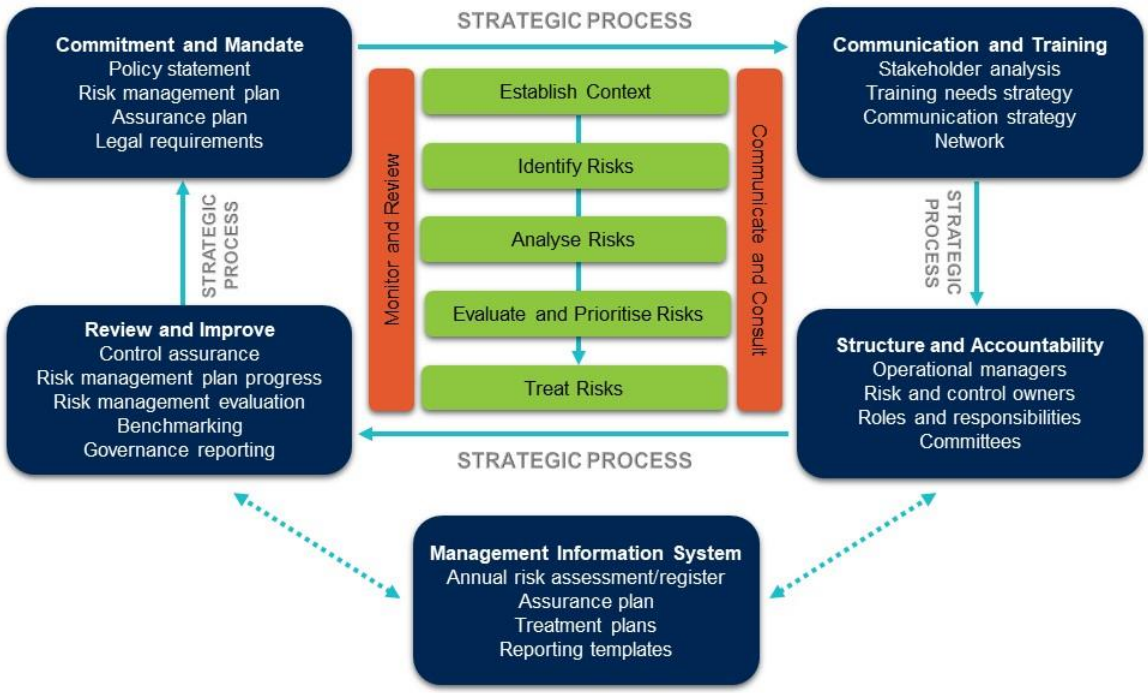


Figure 1. CNS strategic approach to wildlife hazard management.

1.4. Function

The WHMP's function is to outline the management methods employed by CAPL to manage the dynamic risk that wildlife pose to air traffic at CNS; using the Deming Wheel of plan-do-check-act whilst assuring compliance to relevant legislation (Figure 2).

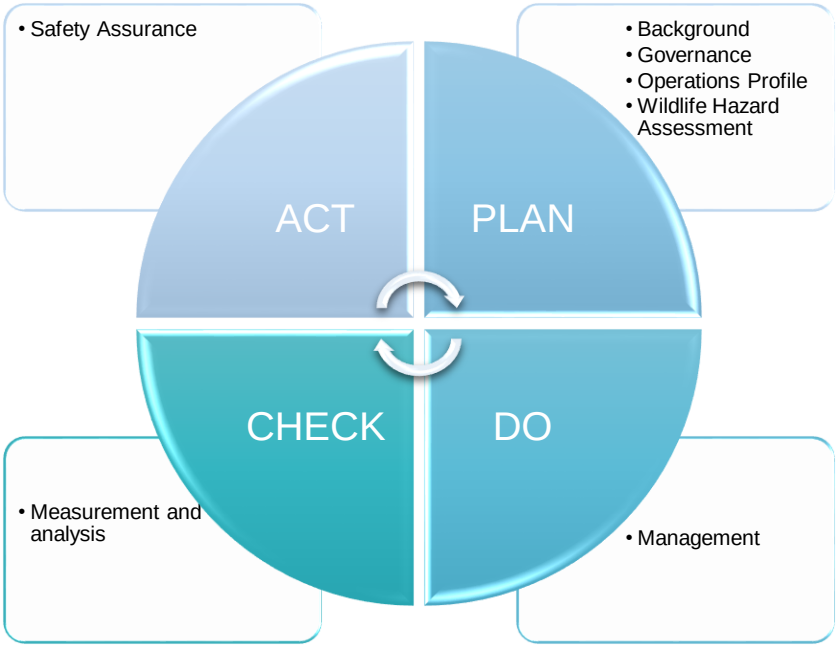


Figure 2. Wildlife risk management process at CNS.

1.5. Aims

The CNS wildlife hazard management program and this WHMP aim to reduce the frequency and severity of strikes by focusing management efforts on species and habitats that constitute significant hazards to aircraft operations at CNS.

1.6. Objectives and Key Performance Indicators

Table 1 outlines the WHMP objectives and Appendix A outlines the targets and performance indicators that are annually reviewed to measure the WHMP implementation performance.

Table 1. WHMP Objectives.

Area	Objectives
Legislation and Regulation	To develop, implement and maintain procedures and systems to ensure operations comply with applicable legislation, regulations, standards, and industry best practice.
Assurance	To review the WHMP: • annually and reassess the risk • following serious incidents • in response to operational or legislative changes.
	To conduct regular internal and external audits.
	To clearly define accountabilities and responsibilities for all personnel, contractors, and stakeholders.
Culture	To develop, embed and continually encourage a positive culture where wildlife management is a priority and the WHMP is recognised and valued.
	To develop, embed and continually encourage a reporting culture supported by CAPL senior management.
Risk Management	To understand and minimise the risk of wildlife strike through a continuous process of identifying, recording, and reviewing risks, objectives, targets, and indicators.
	To reduce the costs of unscheduled maintenance associated with wildlife strike.
	To preserve life and aviation capability through reducing the risk of wildlife strike.
	To reduce wildlife mortality.
Communication	To develop, implement and maintain effective mechanisms that encourage open communication, delivery of key messages and awareness of responsibilities under the WHMP to all CNS personnel, business partners and contractors.
Training	To ensure the availability of skilled and trained resources to develop, implement, maintain, and improve the WHMP.
	To ensure all personnel are trained and competent in their respective wildlife hazard management responsibilities.
	To have no firearm incidents.
Infrastructure and Facilities	To develop, implement and maintain a maintenance system that ensures new and existing infrastructure and facilities are kept clean, safe, and operational to reduce the wildlife attraction.

Area	Objectives
Participation and Action	To define roles, responsibilities, and procedures for managing wildlife risk.
	To actively encourage CNS staff, aircraft operators, airlines and aircraft operators, visitors, business partners and contractors to help implement the WHMP.
	To encourage activities that promote and establish positive wildlife management on airport land.

2. Governance

This section outlines the legal framework, document governance and the roles and responsibilities of the personnel responsible for the implementation of this WHMP.

2.1. Legal and other requirements

Managing wildlife strike risk on and around airports is guided by a suite of national and international legislative and regulatory requirements. This WHMP complies with the following requirements and recommendations:

- CASR Part 139 (Aerodromes) MOS
    - Section 5.17 (b) – Aerodrome Information for the Aeronautical Information Publication (AIP) and the Aerodrome Manual.
    - Section 6.22 (3) – Surface of graded area of runway strips.
    - Section 10.02 (3) and (4) - Form, contents and updating the Aerodrome Manual.
    - Section 11.08 (1), (2) and Section 11.11 - Information that must be included in the Aerodrome Manual.
    - Section 12.03 (7), (9) and 12.04 (1)– Serviceability Inspections
    - Chapter 17 – Wildlife Hazard Management.
- Civil Aviation Safety Authority (CASA) Advisory Circulars (AC)[8]
    - AC 139.C-16 v1.0 Wildlife Hazard Management.
    - AC 139.C-01 v1.0 Aerodrome Manual.
    - AC 139.C-02 v1.0 Aerodrome Personnel.
    - AC 139.C-03. v1.0 Serviceability Inspections.
    - AC 139.C-27 v1.0 Risk Management Plans for Aerodromes.
- *Air Navigation Act 1920* Section 19A & B.
- *Transport Safety Investigation Act 2003.*
- International Civil Aviation Organization (ICAO) Annex 14, Volume 1 (Aerodrome Design and Operation)[9].
- ICAO Annex 14, Volume 2 (Aerodromes - Heliports).

8 Correct as of 21 July 2023 – noting CASA is currently updating ACs.
9 Australia aligns its rules, such as the CASR Part 139 MOS, with ICAO standards

- ICAO Airport Services Manual Doc. 9184: Part 2 Land Use and Environmental Control.
- ICAO Airport Services Manual Doc. 9137: Airport Services Manual Part 3, Wildlife Control and Reduction.

Wildlife hazard management requires a complex legal framework that addresses:

- Aerodrome safety and compliance.
- Firearms safety and compliance.
- Ethics.

A detailed list of legislation is included in Appendix B.

2.2. Control of Wildlife

The CNS WHMP outlines a sustained integrated approach to wildlife control that includes a range of non-lethal and lethal methods (refer to Section 6.7.1: Active Management). Queensland's native wildlife is protected by the *Nature Conservation Act 1992* and regulations. Normally, a Damage Mitigation Permit (DMP) issued by the Department of Environment and Science (DES) is required to cull, disturb, or interfere with wildlife. CNS is listed as a strategic airport as per the Queensland State Planning Policy (2020) and as such, under Section 41 and 42 of the *Nature Conservation (Animals) Regulations 2020*, is exempt from requiring a DMP to control wildlife on the airport provided pre-conditions are met (Appendix B).

Lethal control of animals is not considered an effective method for large-scale wildlife hazard management as an isolated management tool; however, it is effective as part of a broader integrated program. CNS personnel lethally control wildlife, as required, under the *Weapons Act 1990* (*Qld*). The DMP exemption and valid firearms licence allows the lethal control of species that pose a threat to aircraft operational safety.

2.3. Firearms

All CNS firearms are licenced under Queensland law and their use complies with all requirements regarding use, maintenance, storage, and transportation.

CNS Airport Safety Officers (ASO) are licenced under *Weapons Act 1990 (Qld).*

2.4. Documentation Governance

The WHMP is a subsidiary document of the Aerodrome Operations Manual. CNS internal procedures support the WHMP and provide for safe implementation by staff and contractors. Standard Operating Procedures (SOPs) are available through SharePoint and TrackerAIRSIDE™ for ASOs. Wildlife hazard management procedures are in the Wildlife Hazard Management Standard Operating Procedure manual.

2.5. Preparation

Part 139 MOS Section: 17.04 (1) A wildlife hazard management plan must be prepared in consultation with a suitable qualified or experienced person

Airport-appointment qualified biologists (Avisure) prepared this WHMP. Refer Appendix C (Table C2) for experience and qualifications.

2.6. Roles and Responsibilities

Part 139 MOS S.11.08 (2) The aerodrome manual must identify the individuals or positions responsible for monitoring and mitigating wildlife hazards to aircraft operating at the aerodrome Part 139 MOS S.17.04 (2)(a) Identify the key aerodrome or contracted personnel and define their responsibilities or functions Part 139 MOS S.17.04 (2)(f) Include records of the qualifications and experience of key personnel identified in the plan

The Chief Operating Officer (COO) assumes overall responsibility for WHMP implementation. The key CNS personnel for ensuring safe operations are:

- Head of Operations (HoO)
- Aerodrome Operations Manager (AOM)
- Environment Manager
- Aerodrome Operations Supervisor (AOS)
- ASO

Managing the wildlife strike risk requires a cooperative effort amongst various stakeholders. Appendix C (Table C1) outlines the roles and responsibilities of all the key aerodrome and stakeholder personnel. All records of the qualifications and experience of key personnel identified in the plan are stored on SharePoint by the AOM. Refer Appendix C (Table C2) for experience and qualifications.

2.7. Stakeholder Engagement

Part 139 MOS S.11.08 (1)(e) The wildlife hazard management procedures must include details for proposed or actual sources of wildlife attraction outside the aerodrome boundary - liaising with the relevant planning authorities or proponents Part 139 MOS S.17.04 (2)(d) liaison arrangements for local planning authorities within a radius of at least 13km

Input from various on- and off-aerodrome stakeholders helps CNS to achieve an effective and integrated approach to wildlife hazard management. This is realised through the Safety and Security Forum (SASF). Wildlife hazard management is a standing agenda item in the SASF. The SASF is an important avenue for sharing information, identifying risks, and ensuring stakeholders are engaged in collaborative management of these risks. Roles and responsibilities are outlined in Appendix C.

2.8. Training

Part 139 MOS S.17.07 (1) Wildlife hazard monitoring and reporting personnel must be trained competently Part 139 MOS S.17.07 (2) Personnel engaged in wildlife hazard mitigation must be trained competently Part 139 MOS S.17.07 (3) Training records

CNS provides wildlife hazard management training to all personnel charged with wildlife management responsibilities. Training focuses on identifying and managing wildlife hazards, assessing, and communicating risks, as well as strike reporting, bird identification and regulatory requirements. CNS collates and maintains training records for at least three years. Additional training is conducted when required.

Refer to CNS Aerodrome Operations Manual 3.11.2 Training of personnel and Wildlife Hazard Management Training and Competency Assessment Procedure.

3. Operations Profile

CNS is the principal airport for the Far North Queensland (QLD). It supports the increasing demands of tourism and passenger traffic. The aerodrome supports domestic and international business, cargo, and tourism travellers with regular flights to and from Australia's capital cities, Singapore, Japan, Papa New Guinea and Bali. CNS operates 24 hours and Airservices Australia provide an Aviation Rescue Fire Fighting Service (ARFFS) for firefighting and emergency response. Table 2 summaries the CNS site profile and operational characteristics. Further information is available in the CNS Aerodrome Operations Manual and the CNS En-route Supplement Australia (ERSA).

Table 2. CNS site profile and operational characteristics.

Element	Description	
Location	Aeroglen, Queensland 2.3 nautical miles (NM) from Cairns township.	
Aerodrome Type	Certified	
Aerodrome Operator	Cairns Airport Pty Ltd	
Airlines	Operator	Operator
	Air New Zealand	QantasLink
	Air Niugini	Rex Airlines
	Airnorth	Singapore Airlines
	Alliance Airlines	Skytrans
	Jetstar	Virgin Australia
	Qantas	Qantas Freight
	Hinterland Aviation	Toll Aviation
	BONZA	
2022/23 Aircraft Movements[10]	81,090	
Runways (RWY)	15/33	
Taxiways (TWY)	TWY A, TWY B, TWY C, TWY D, TWY G, TWY Y	
Aprons	General Aviation (GA) apron. Domestic apron. International apron. International General Aviation Apron	

10 Source: Cairns Airport. Movements are the sum of arrivals multiplied by 2.

Element	Description
Navigation and Landing Aids	Runway and taxiway lights, Precision Approach Path Indicator, High Intensity Approach Lighting, VHF omnidirectional Range, Non-Directional Beacon, Instrument Landing System Localiser and Glidepath, and Distance Measuring Equipment.
Air Traffic Control	Surveillance Flight Information Service

4. Environmental and Ecological Profile

Part 139 MOS 2019 Section: 5.17 (b) Local hazards that may adversely affect aviation safety (local hazard data) must be recorded.

Part 139 MOS 2019 Section: 17.04

Cairns has a tropical climate with generally hot and humid summers and milder dryer winters. The Majority of Cairns' rainfall occurs during summer between January and March. The monsoon trough is close to Cairns from December to March bringing with it warm to hot, humid conditions and the possibility of thunderstorms and tropical cyclones. The cyclone season is normally confined to between December and April, but exceptions do occur.

The aerodrome is situated along the coast and is surrounded by areas of coastal vegetation including mangroves, various creeks, and the Barron River. The Barron River snakes around the northern end of the airfield and is subjected to flooding during an extreme weather event. Flood inundation maps developed by Cairns Regional Council (CRC) shows flooding following an extreme weather event (1% AEP) may result in the airfield being inundated (see Figure 3).

Table 3 outlines CNS environmental and ecological characteristics and Table 4 summarises natural phenomena that can attract wildlife and influence the wildlife strike risk. This information helps understand how environmental conditions can influence wildlife activity which allows CNS to proactively manage upcoming wildlife hazards.

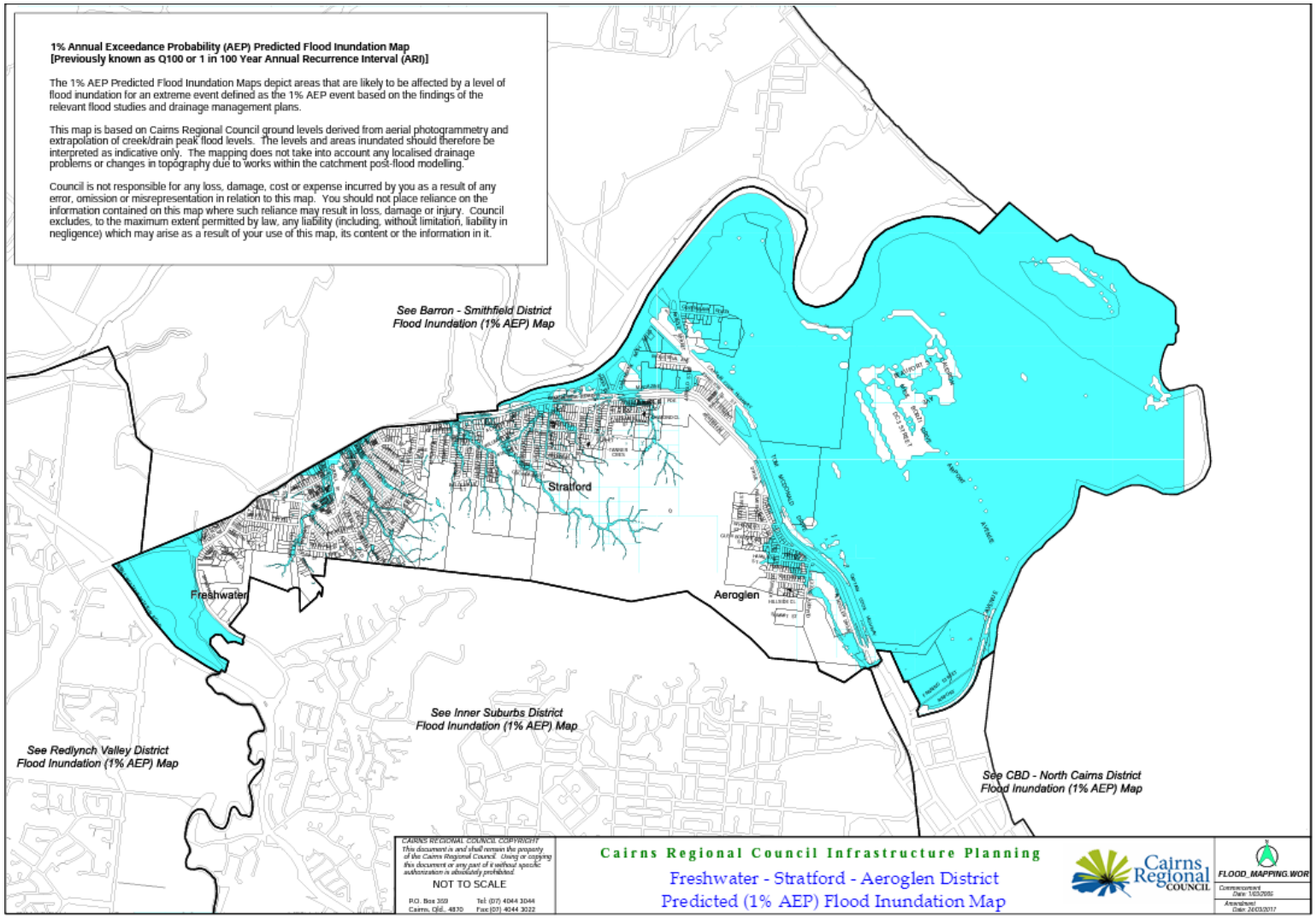


Figure 3. Stratford-Aeroglen District Predicted (1% AEP) Flood Inundation Map (Cairns Regional Council, 2017).

Table 3. CNS environmental characteristics.

Environment	Description
Elevation	10ft above mean sea level.
Area (Airside)	290ha
Geography	Humid, sub-tropical environment, wet-tropics, coastal.
Habitat	Grasslands that provide habitat for a range of bird species that either forage for seeds or hunt for prey. Adjacent areas of remnant vegetation, rivers/creeks, residential development, and coastal areas.
Habitat modification	Grass mowing, anti-perch spikes on apron signs and lights, and exclusion curtains on airside drains.
Artificial habitat	Fences, buildings, drains, and other infrastructure such as gables provide perches and nesting sites.
Climate[11]	Mean max temp: 36.0°C Mean min temp: 22.1°C Mean rainfall: 167.2 mm/month
Human Activities	Waste management: CNS remove all waste (including sewage) and covered industrial waste bins.

11 Source: Bureau of Meteorology.

Table 4. Natural phenomenon that can attract wildlife on and around CNS.

Phenomena[12]	Species attracted	Attraction
Wet season (Nov-Mar) Cyclone season (Dec-Apr)	Migratory Waders, Cattle Egrets, Fairy Martin, Tree Martin, Straw-necked Ibis, Australian White Ibis, Masked Lapwing.	Drains and water bodies on airport. Waterlogged soils can bring soil invertebrates closer to surface where they are more easily accessible to ground foraging birds.
Dry season (Apr-Oct)	Australian White Ibis, Straw-necked Ibis, Bush Stone-curlew, Fairy Martin, Welcome Swallow, wading birds and ducks: Hardhead, Pacific Black Duck, Cattle Egret, White-Faced Heron, and ibis.	Airside grassed areas on-airport and surrounding the aerodrome. Airside infrastructure, such as drains and baggage makeup areas, provide a nesting habitat for Fairy Martin and Welcome Swallow. Consistent resource availability, particularly permanent water bodies on and around CNS can attract waders particularly during drought conditions.
Heatwaves and bush fire.	Various raptors and opportunistic feeders such as Black Kite, Torresian Crow, Butcherbird, and Australian Magpie.	Exposed and fleeing animals during fires. Carrion and grass shoots after the fire.
Fruiting, flowering, and seeding.	Spectacled Flying-fox, Little Red Flying-fox, Black Flying-fox, Grey-headed Flying-fox, honeyeaters, Rainbow Lorikeet, Little Corella, Galah, Wood Duck and Pacific Black Duck.	Paperbark *(Melaleuca quinquenervia)* and gum tree (*Eucalyptus* spp.) flowers. Flowering herbaceous plants and weeds (e.g., Dandelion Weed). Grass seed (high protein food source for insects).
Atmospheric convection (thermals).	Various risk species, mainly raptors.	Thermals over the sealed surfaces on days experiencing high atmospheric convection.
Wind velocity.	Various risk species.	Wind speed influences bird behaviour, transit direction, flight energetics, flight speed, and general foraging behaviour.

12 The species listed can be a strike risk at other times however the phenomena noted in the table can elevate their risk.

Phenomena[12]	Species attracted	Attraction
Rainfall events.	Various water birds and migratory waders.	Regular rain fills rivers, creeks, drains, and low-lying land providing water for a number of birds and mammals. Poorly drained soils attract flocks of birds, in particular water birds such as ducks and wading species.
Invertebrate abundance.	Martins and swallows, Nankeen Kestrel, Whistling Kite, Black Kite and Masked Lapwing.	The emergence of flying ants during low pressure conditions can attract large flocks of aerial foraging species. Grasshoppers and locust eruptions can significantly increase bird populations.

5. Wildlife Strike Profile

This section presents an analysis of strike data provided by CNS and Australian Transport Safety Bureau (ATSB). Wildlife strikes are normalised against aircraft movement data to present an overview of the changing risk. For detailed results, refer to the Cains Airport Wildlife Hazard Assessment (Avisure, 2022).

Table 5 summarises the annual strike and risk assessment trends. The current confirmed on-airport and airport vicinity strike rate is 9.6 strikes per 10,000 aircraft (ACFT) movements (MVTS), and an Adverse Effect to Planned Flight (AEPF) strike rate is 3.7 per 100,000 ACFT MVTS; ranking CNS above the industry standard (1.07 adverse effect strikes per 100,000 ACFT MVTS) (Begier & Dolbeer 2012). Despite this, AEPF strikes per 100,000 ACFT MVTS has trended downwards since 2018/19.

Mass struck per 10,000 ACFT MVTS and confirmed on-airport and airport vicinity strikes per 10,000 ACFT MVTS have trended downwards since 2018/19 (Figure 4), decreasing the damaging strike risk.

Table 5. CNS wildlife hazard summary 2018/19 to 2022/23.

Scorecard[13]	2018/19	2019/20	2020/21	2021/22	2022/23
Total strikes	184	144	103	81	129
Confirmed strikes[14]	111	85	67	52	78
Suspected strikes[14]	53	40	18	16	43
Near miss strikes[14]	0	0	0	0	0
Damaging strikes[14]	7	7	2	2	3
AEPF strikes[14]	7	10	7	6	5
Total mass reported struck (kg)[14]	34.63	28.14	21.67	14.15	37.02
Total movements[15]	109,540	82,720	57,166	66,652	81,090
Total strikes / 10,000 ACFT MVTS	16.80	17.41	18.02	12.15	15.91
Confirmed strikes / 10,000 ACFT MVTS	10.13	10.28	11.72	7.80	9.62
Suspected strikes / 10,000 ACFT MVTS	4.84	4.84	3.15	2.40	5.30
Damaging strikes / 100,000 ACFT MVTS	6.39	8.46	3.50	3.00	3.70
AEPF strikes / 100,000 ACFT MVTS	6.39	12.09	12.25	9.00	6.17
High risk species struck / 10,000 ACFT MVTS	-	-	-	4.5	1.48
Total mass (kg) struck / 10,000 ACFT movements	3.16	3.40	3.79	2.12	4.57
% mass (kg) surveyed in critical areas	-	-	-	12.46%	6.12%
No. very high-risk species	-	-	-	1	0
No. high risk species	-	-	-	12	7
No. moderate risk species	-	-	-	26	23

13 Strike data from Cairns Airport and the ATSB.
14 On-airport and airport vicinity strikes only.
15 Movement data from Airservices Australia and Cairns Airport.

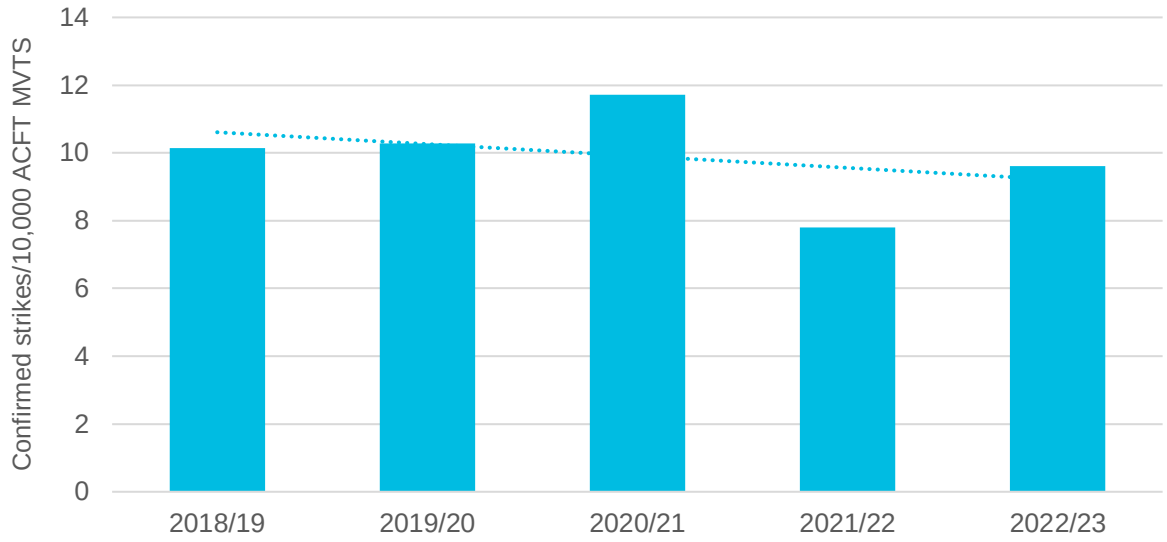


Figure 4. Total confirmed on-airport and airport vicinity strikes per 10,000 ACFT MVTS by year, CNS, 2018/19-2022/23.

Mass struck per 10,000 ACFT MVTS increased since 2021/22 and has trended upwards since 2018/19 (Figure 5) due to a Lace Monitor (moderate risk) strike (12 kg) in August 2022. ATC reported FOD (Lace Monitor remains) on the runway south of TWY B2. Aircrew did not report any strikes prior to the notification by ATC. As there was no evidence to confirm otherwise, the event was reported as a wildlife strike.

Excluding Lace Monitor, Bush Stone-curlew (high risk) accounted for the highest confirmed on-airport and airport vicinity mass struck in 2022/23 (7 kg), accounting for 28% of mass struck and the increase in mass struck per 10,000 ACFT MVTS (Figure 5).

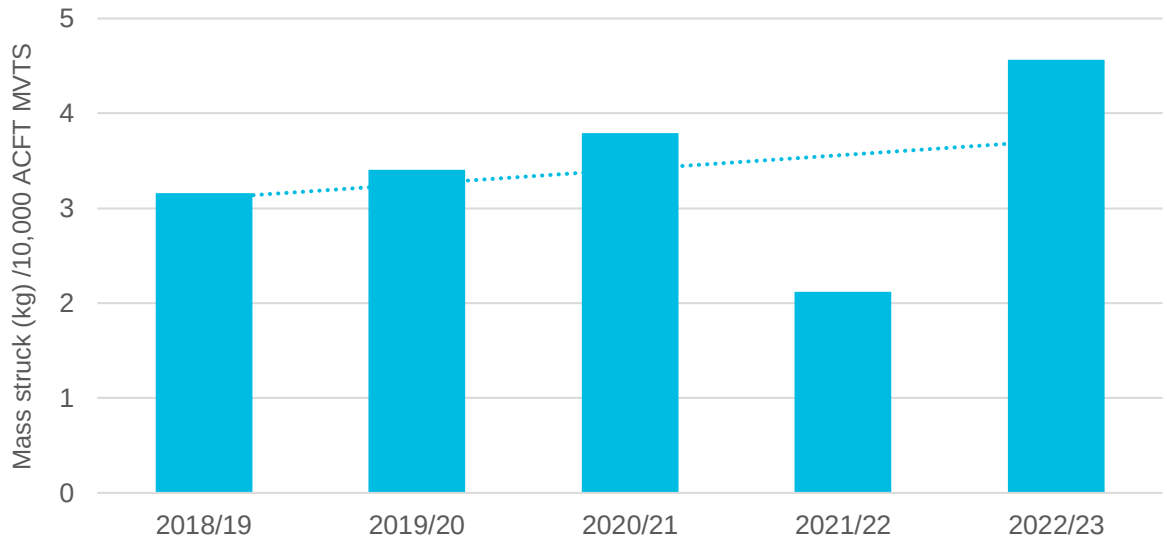


Figure 5. Mass (kg) struck per 10,000 ACFT MVTS by year, CNS, 2018/19-2022/23.

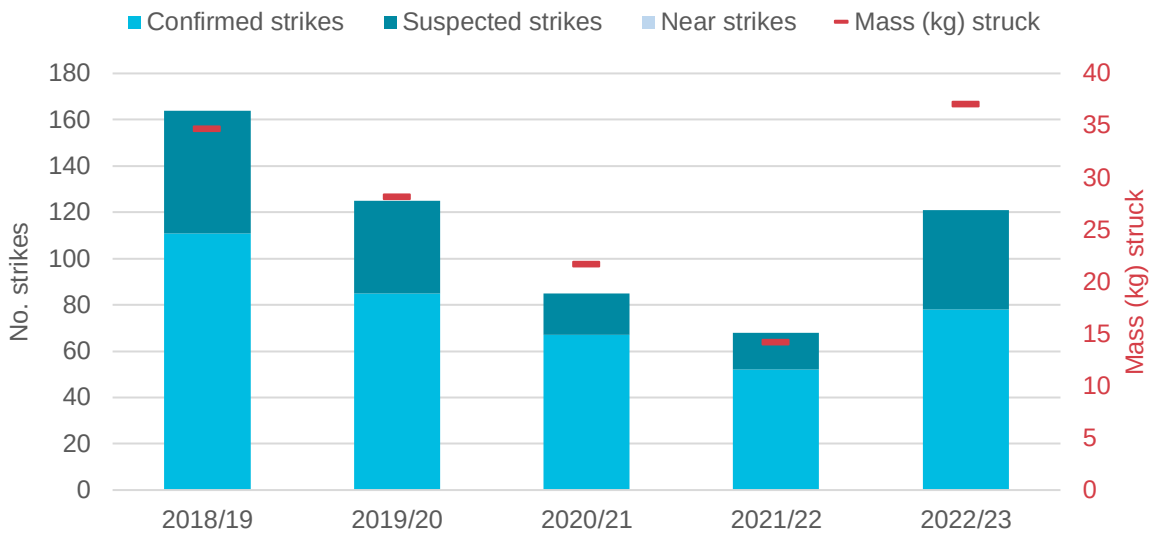


Figure 6. Total on-airport and airport vicinity wildlife strikes and mass struck per year and strike type, CNS, 2018/19-2022/23.

Strikes with Unidentified Bird (high risk) were below the five-year average (Figure 8) and accounted for 24% of on-airport and airport vicinity strikes (24), peaking in March (9) (Figure 7). An increase in DNA analysis and species identification contributed to the decrease. CNS collected samples for DNA analysis from 23 confirmed on-airport and airport vicinity strikes in 2022/23, an increase compared to the five-year average (11.8) (2017/18-2021/22). Fourteen samples are pending results with the Australian Museum. Where a species cannot be identified to species level, Unidentified Bird (0.2 kg) is used to define risk and consequence.

Bush Stone-curlew (high risk) strikes peaked in April, accounting for 33% of strikes reported that month (Figure 7). Outside of the breeding season (Jun-Dec), they form flocks and will move locally in search food, particularly during drought conditions (Marchant & Higgins 1993). The Bureau of Meteorology reported below average rainfall in Cairns in April 2023 (BOM, 2023) which could have increased their activity in the Cairns region as they search for reliable permanent waterbodies, such as drains and the Barron River.

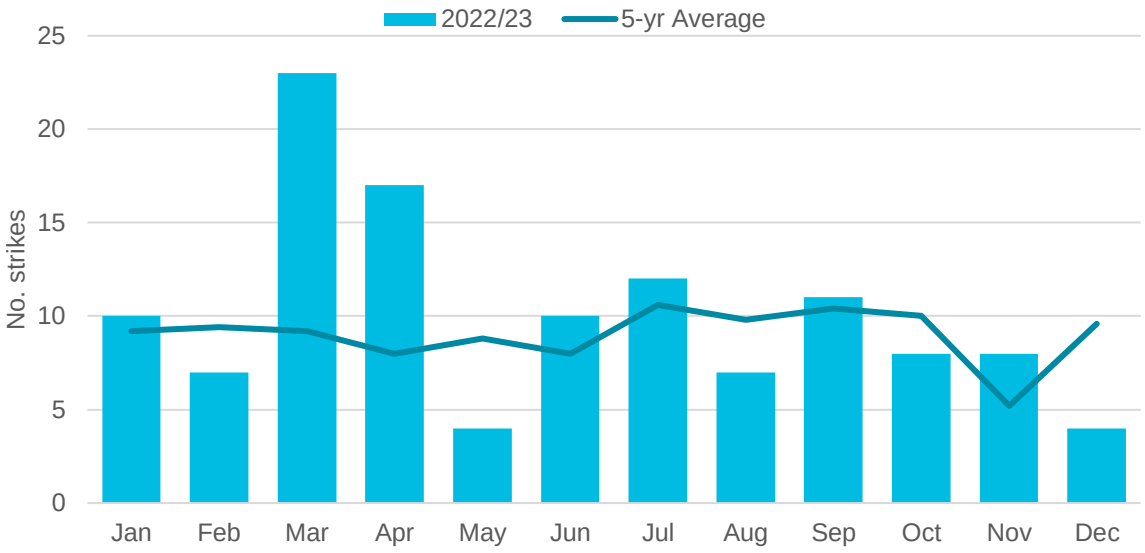


Figure 7. Total strikes (on-airport and airport vicinity) and the 5-year average by month, CNS, 2017/18-2022/23.

Masked Lapwing (high risk) accounted for 12% of confirmed on-airport and airport vicinity strikes in 2022/23 (Figure 8) peaking between March and June (Figure 7). Peak activity coincided with their annual breeding season (winter) as adults search for breeding habitat such as airports. They also congregate in small flocks prior to the start of the breeding season, posing a multiple strike risk. Avisure recorded nesting, including a family of chicks, during the February 2023 site visit. Breeding airside increases local populations and increases the associated strike risk for both nocturnal and diurnal aircraft operations.

Unidentified Microbat (low risk) strikes exceeded the five-year average (1/year) (2017/18-2021/22) (Figure 8) due to four strikes reported in March 2023. Carcasses were collected from each event however were unable to be accurately identified to species level. Due to their small body mass (1.8 g), they pose a low damaging strike risk to aircraft operations.

Common Myna (low risk) strikes exceeded the five-year average (0.4/year) (Figure 8) due to strikes in November and December, coinciding with peak nesting activity. Avisure identified 27 Common Myna nests airside during the November 2022 site visit, including five eggs. This was the highest number of nests recorded airside by Avisure in 2022/23. The strike in November was the first Common Myna strike at CNS since November 2019. Breeding airside increases local populations and elevates the strike risk.

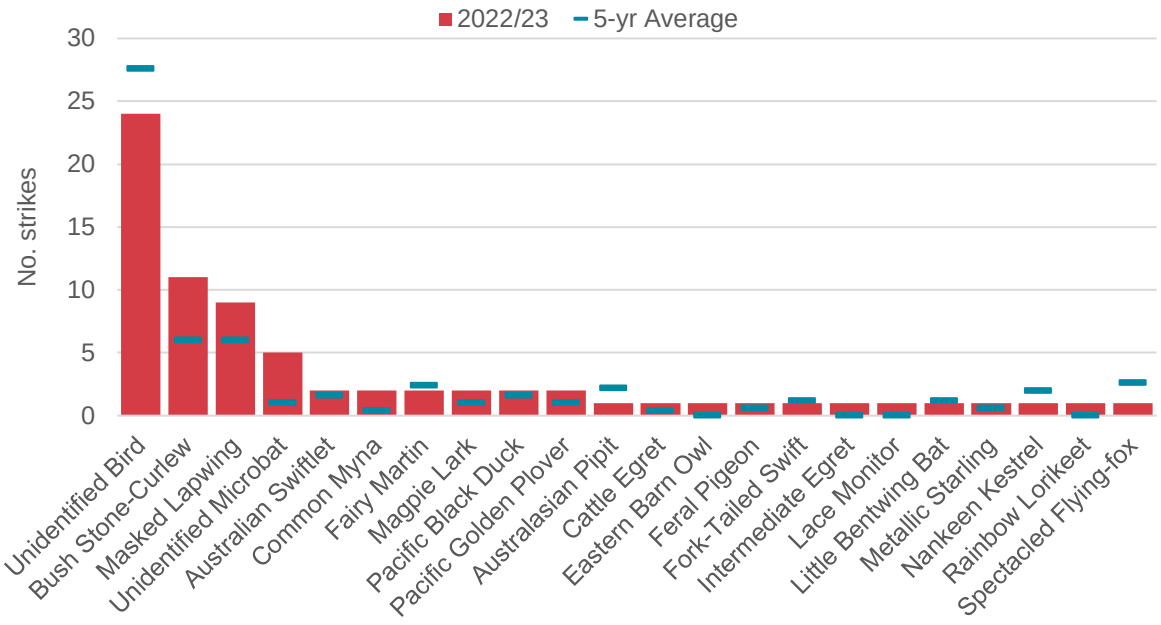


Figure 8. Total confirmed on-airport and airport vicinity species struck versus 5-year average, CNS, 2017/18-2022/23.

Strikes peaked between 0600-0800 hours and 1800-1900 hours when conditions are warm enough for birds to forage, but cool enough to not exert high energy (Figure 9). Strikes in the morning coincided with a peak in aircraft movements.

Strikes with Bush Stone-curlew (high risk) and Masked Lapwing (high risk) accounted for 27% of strikes occurring between 1700-1900 hours (Figure 9), a decrease since 2021/22 (38%). They are nocturnal and will forage airside from dusk, posing a strike risk at night. Masked Lapwings will also forage during the day.

Flying-foxes (high risk) and bats (low risk) accounted for 22% of strikes occurring between 1800-2300 hours (Figure 9), coinciding with their daily fly out from camps to forage. This is an increase since 2021/22 (5%). Spectacled Flying-fox and microbat strikes also occurred between 0400-0500 hours. Flying-foxes and microbats will return to their camps throughout the night and pose a strike risk from dusk to dawn.

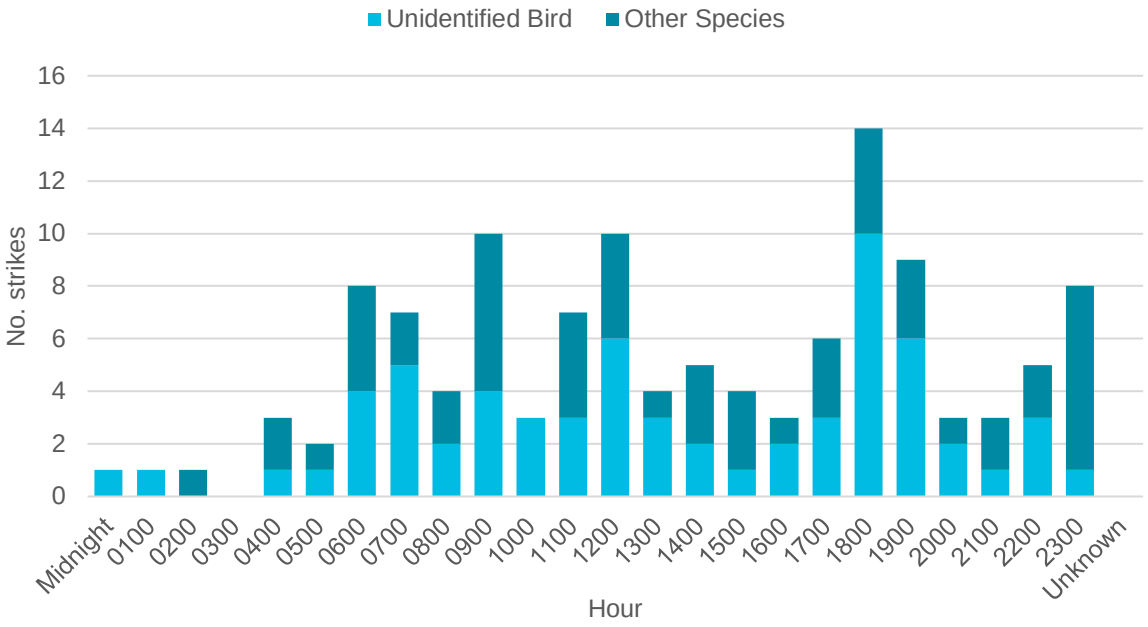


Figure 9. Total strikes (on-airport and airport vicinity strikes) by hour differentiating between Unidentified Bird strikes and other species, CNS, 2022/23.

5.1. Strikes Affecting Flight

Bush Stone-curlew (high risk) strikes (2) accounted for 40% of AEPF strikes in 2022/23 (Table 6) including two damaged aircraft and flight delays. This is an increase since 2021/22 (0) and is above the five-year average (0.8/year).

Table 6. Adverse effect strikes, CNS, 2022/23.

Date	Operator	Flight Phase	Location	Strike Type	Species	No.	Effect Type
04/07/2022	Regional Express	Take-off Run	On-airport	Confirmed	Unidentified Duck	1	Delay
15/07/2022	Virgin Australia	Landing Roll	On-airport	Confirmed	Cattle Egret	2	Delay
10/04/2023	Jetstar	Touchdown	On-airport	Confirmed	Bush Stone-curlew	1	Damage and delay
12/04/2023	Jetstar	Unknown	On-airport	Confirmed	Unidentified Microbat	1	Damage and delay
24/04/2023	Regional Express	Landing Roll	On-airport	Confirmed	Bush Stone-curlew	1	Damage and delay

All AEPF strikes occurred on RWY 15, predominantly during the landing roll (40%). Confirmed on-airport and airport vicinity AEPF strikes on landing (2) were consistent with the five-year average (2/year) (2017/18-2021/22) however has trended downwards since 2017/18 (Figure 10). Strikes are more likely to occur during this flight phase as aircraft operate the same altitude as most bird species for longer. The ATSB reported that flight crews have less time to recognise, plan and react to a strike during the take-off, approach, or landing phases (ATSB, 2002).

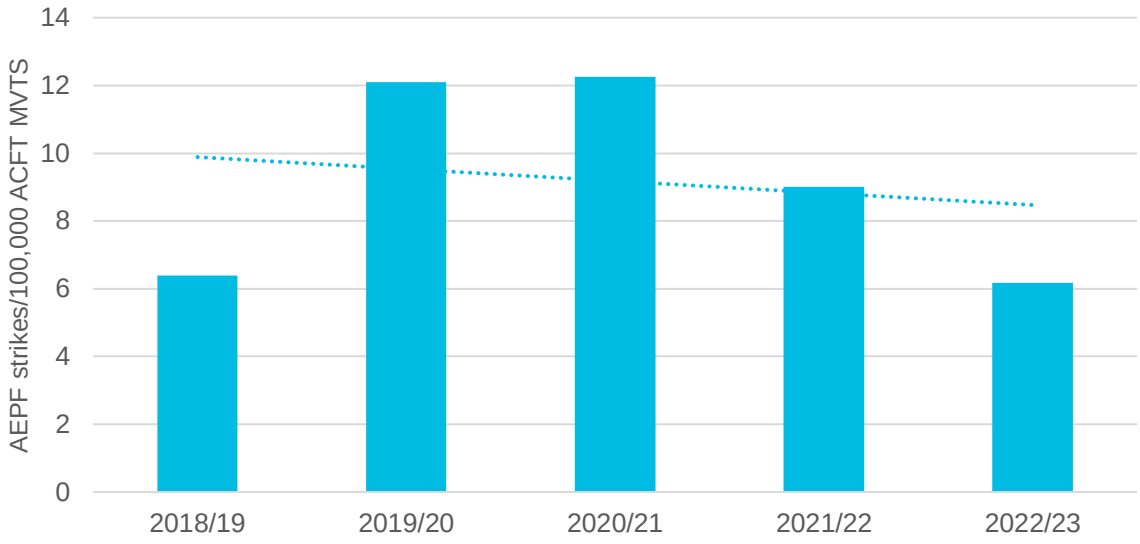


Figure 10. AEPF strike rate per 100,000 movements, CNS, 2018-2022.

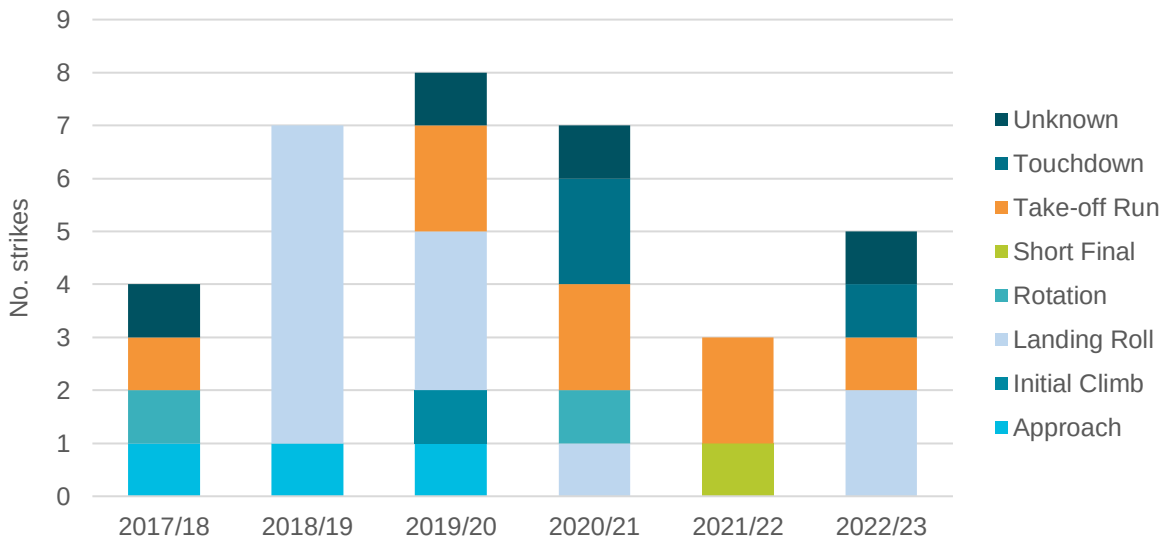


Figure 11. Number of confirmed on-airport and airport vicinity AEPF strikes per year by flight phase, CNS, 2017-2022.

5.2. Wildlife Hazard Assessment

Part 139 MOS S.11.08 (1)(b) assessing any wildlife hazard Part 139 MOS S.17.02 (1)(2) Wildlife hazard assessment and trigger criteria Part 139 MOS S.17.04 (2)(c)(iii) risk assessment and analysis

Wildlife Hazard Assessments (WHA) evaluate program progress and analyses program data to help inform and improve the WHMP. Trigger events or risk changes (e.g., increased aircraft operations, significant changes in wildlife numbers, off-aerodrome developments) may require more frequent assessments. Avisure completed a WHA of CNS's wildlife management program which included:

- Risk assessment:
  - based on strike history and airside wildlife surveys, including wildlife numbers, behaviour, and presence in critical areas of the aerodrome.
- Hazard identification – a broad assessment of the aerodrome's hazard profile that affect CNS's wildlife strike risk profile including:
  - environment profile,
  - airside wildlife attracting areas and facilities,
  - landside wildlife attracting areas and facilities,
  - off-aerodrome wildlife attracting sites,
  - analysis of Avisure surveys.

5.3. CNS Safety Management System (SMS) Risk Assessment

Part 139 MOS Section: 17.02 (2)

CNS' risk register identifies wildlife risks and control actions as they relate to the key areas of financial, reputation, regulatory, environmental, safety, business interruption and people (internal). The wildlife strike risk has been ranked as a high residual risk (Cairns Airport, 2023).

6. Wildlife Risk Assessment

Part 139 MOS Section: 17.02 (1 and 3).

Avisure assessed the risk using strike data from CNS and ATSB, and on-airport survey data from quarterly surveys in 2022/23. Refer to Appendix E for risk assessment methods, Appendix D and for survey methods. Table 7 summarises the combined results to provide the overall risk ranking of high and moderate risk species.

The risk assessment identified seven high risk species and 23 moderate risk species, including five new risk species compared to the 2021/22 risk assessment.

Table 7. Overall species risk rankings, CNS, August 2023.

Species	Overall Risk	Survey Risk		Strike Risk
		Diurnal	Nocturnal	
Masked Lapwing	High	Moderate	Moderate	High
Pacific Black Duck	High	-	Moderate	High
Bush Stone-curlew	High	-	Moderate	High
Straw-necked Ibis	High	Low	-	High
Spectacled Flying-fox	High	-	-	High
Unidentified Flying-fox	High	-	-	High
Unidentified Bird	High	-	-	High
Radjah Shelduck	Moderate	Moderate	Moderate	Moderate
Cattle Egret	Moderate	Moderate	-	Moderate
Beach Stone-curlew	Moderate	Moderate	Moderate	-
Grey Teal	Moderate	Moderate	Moderate	-
Black-necked Stork	Moderate	Moderate	Low	-
Brahminy Kite	Moderate	Low	-	Moderate
Feral Pigeon	Moderate	Low	-	Moderate
Pacific Golden Plover	Moderate	-	Very Low	Moderate
Lace Monitor	Moderate	-	-	Moderate
Unidentified Duck	Moderate	-	-	Moderate
Black Kite	Moderate	-	-	Moderate
Orange-footed Scrubfowl	Moderate	-	-	Moderate
Unidentified Heron	Moderate	-	-	Moderate
Unidentified Ibis	Moderate	-	-	Moderate
Unidentified Raptor	Moderate	-	-	Moderate
Wandering Whistling-Duck	Moderate	-	-	Moderate
Whistling Kite	Moderate	-	-	Moderate

Species	Overall Risk	Survey Risk		Strike Risk
		Diurnal	Nocturnal	
Black Flying-fox	Moderate	-	-	Moderate
Little Red Flying-fox	Moderate	-	-	Moderate
Eastern Grass Owl	Moderate		-	Moderate
Australian White Ibis	Moderate	Moderate	-	-
White-headed Pigeon	Moderate	Moderate	-	-
Australian Pelican	Moderate	Moderate	-	-

Pacific Black Duck activity (14/diurnal survey) increased in 2022/23 contributing to its high risk rank (Figure 12). In particular, large flocks (12-18 birds) loafed in drains adjacent to TWY Bravo during the May midday and afternoon surveys. Their large body mass (1.045 kg), tendency to flock and low ability to avoid aircraft poses a damaging multiple strike risk. CNS have recorded eight confirmed Pacific Black Duck strikes in the past five years, including two multiple strikes and one damaging strike.

A flock of six Australian White Ibis transited critical airspace during the May morning survey, accounting for its moderate risk rank (Figure 12, Table 7). Ibis activity fluctuates with rainfall as foraging and breeding conditions increase, particularly during the breeding season (Jul-Jan). Roosting surrounding the aerodrome influences transit their frequency through terminal airspace as flocks move between foraging and roost sites. Due to their large body mass (1.95 kg), flocking tendency, and low ability to avoid aircraft, they pose a damaging strike risk. In Australia, 50 Australian White Ibis strikes resulted in aircraft damage between 2009 and 2017 (ATSB 2019).

Masked Lapwing activity (13/diurnal survey) increased since 2021/22 (6/diurnal survey), peaking in May, accounting for its moderate risk SRI (Figure 12). In particular, a flock of 47 loafed on sealed areas near the southern helipads. They congregate in small flocks prior to the start of their breeding season in August, which may have contributed to the increased activity.

Black-necked Stork activity continues (1/diurnal survey) as 1-2 birds loafing in ponded water and grassed areas around the old cross runway and southern end of the airfield. Although no critical areas were infringed, its large body mass (4.1 kg) contributed to its moderate risk rank (Table 7). Storks are largely sedentary and will occupy the same area for many years particularly when resources are favourable (Marchant & Higgins, 1990). Due to their low ability to avoid aircraft and tendency to return to historic foraging sites, their presence poses a damaging strike risk. In 2018 an Australian airport reported damage to a B738 after striking a Black-necked Stork on landing (Ring et al., 2019).

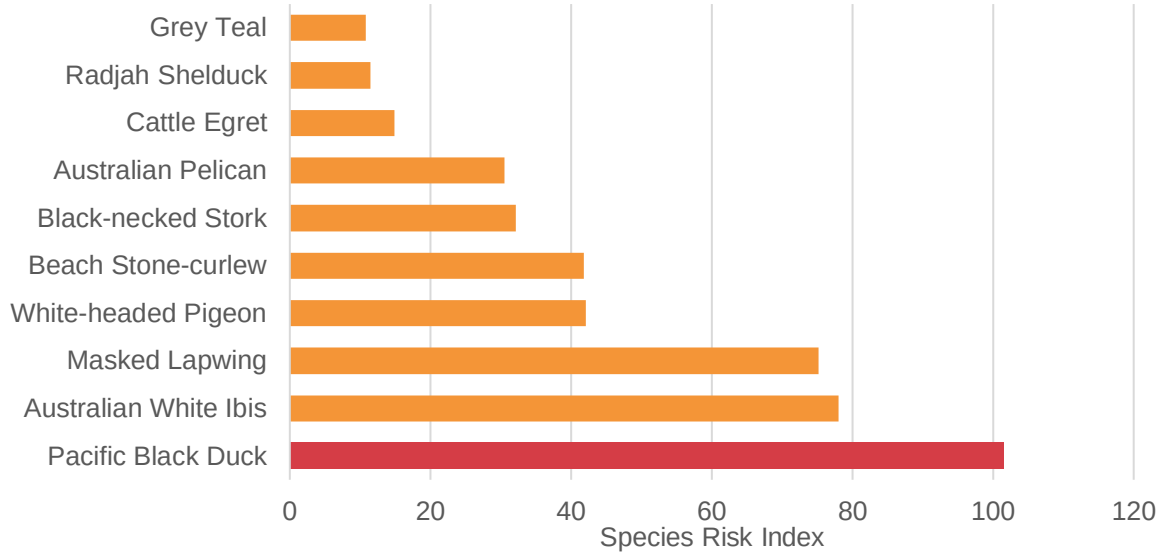


Figure 12. Species risk index (SRI) for high and moderate risk species observed during diurnal surveys (red = high, orange = moderate), CNS, 2022/23.

Masked Lapwing nocturnal activity increased in 2022/23 (10/survey), peaking in November, accounting for its SRI (Figure 13). Activity in November coincides with their breeding season (winter to spring) as adults use wide open grassed areas for nesting, such as airports. When territorial, such as during breeding, adults remain on territory overnight (Marchant & Higgins, 1993) posing a strike risk to nocturnal aircraft operations. Forty-four percent of confirmed Masked Lapwing strikes in 2022/23 occurred at night, including one multiple strike with three lapwings.

Beach Stone-curlew nesting and loafing in grassed areas around the cross runway strip throughout on-airport surveys contributed to its continued moderate risk rank. CNS reported multiple strikes with curlews between October 2012 and September 2017 (Cairns Airport, 2017), but none since. CNS monitor breeding adults by the old cross runway to improve species conservation.

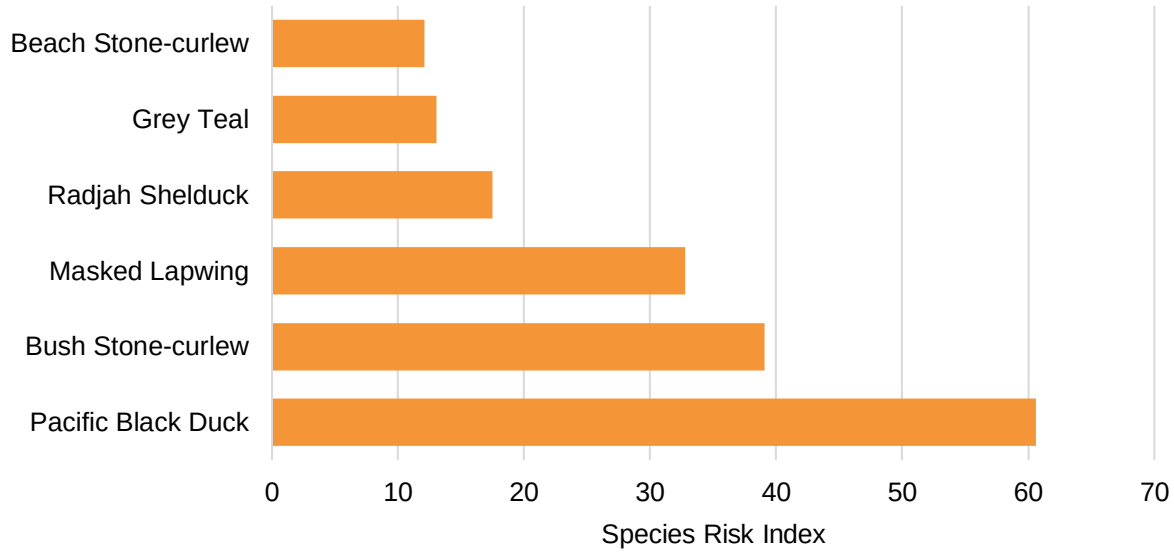


Figure 13. SRI for species observed during nocturnal surveys (orange = moderate, CNS, 2022/23).

Other species which were not ranked in the above assessment may be hazardous at different times in response to seasonal variations or other events. Terrestrial wildlife, such as wallabies, pose a significant risk to aircraft operations if permitted airside through open gates or gaps under the fence.

6.1. On-airport Attractants

Part 139 MOS S.5.17 (b) continual wildlife hazards at the aerodrome or its vicinity must be recorded
Part 139 MOS S.17.04 (2)(b)(i) Identify sources and locations of wildlife attractions - on the aerodrome

CNS has a propensity for wildlife strikes due to its high diurnal and nocturnal wildlife activity. Like most airports, CNS attracts wildlife due to the habitat and resource availability (e.g., grass to forage, airport infrastructure to perch, etc.). Table 8 outlines on-aerodrome attractants and the high and moderate risk species attracted to that area.

Figures 14 and 15 show how the wildlife used the airfield during 2022/23 surveys. Common Myna (low risk), Magpie Lark (low risk) and Australasian Pipit (low risk) accounted for 63% of all birds recorded foraging in grass during on-airport surveys (Figure 14 and 15). When allowed to seed, grass will attract granivorous species such as sparrows, mannikins, and Galahs, posing a multiple strike risk.

Masked Lapwing (high risk) and Bush Stone-curlew (high risk) accounted for 15% of species recorded using grass areas (Figure 14). Both species are attracted to open short grassed areas for foraging and nesting activity. Masked Lapwing was recorded nesting in grassed areas in 2022/23 at the northern end of the airfield and near the Fire Station.

Airside drains attracted hazardous wildlife including Pacific Black Duck (high risk), Radjah Shelduck (moderate risk), Grey Teal (moderate risk) and Black-necked Stork (moderate risk) (Figure 14). Due to their large body masses (>475 g), and activity throughout the airside area, they pose a damaging strike risk to aircraft operations.

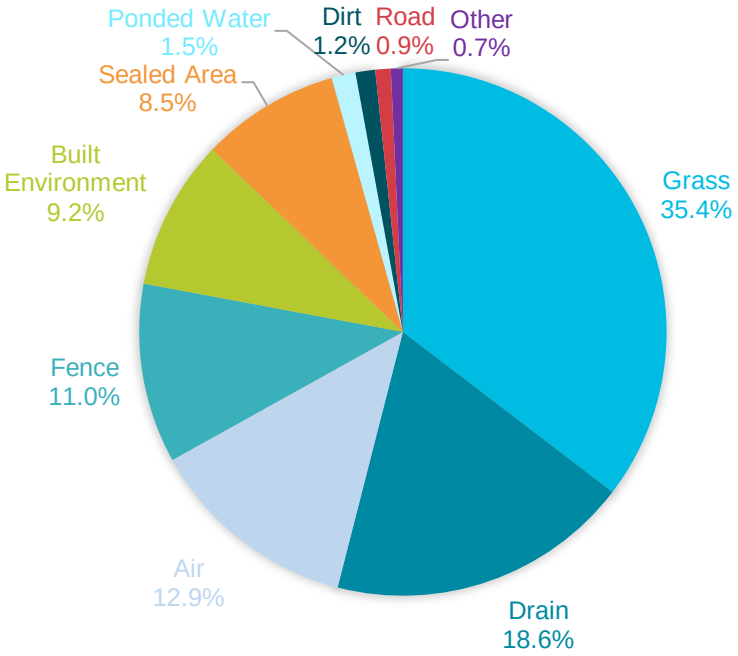


Figure 14. Habitat use by wildlife observed, CNS, Nov 2021-Feb 2022 (*Other includes trees, sand, bank and billabong).

Common Myna (low risk) accounted for 40% of wildlife nesting airside (Figure 15), peaking in November. Nesting focused in the International Baggage Makeup Room, and Avisure performed quarterly nest removal works as part of the wildlife hazard management program.

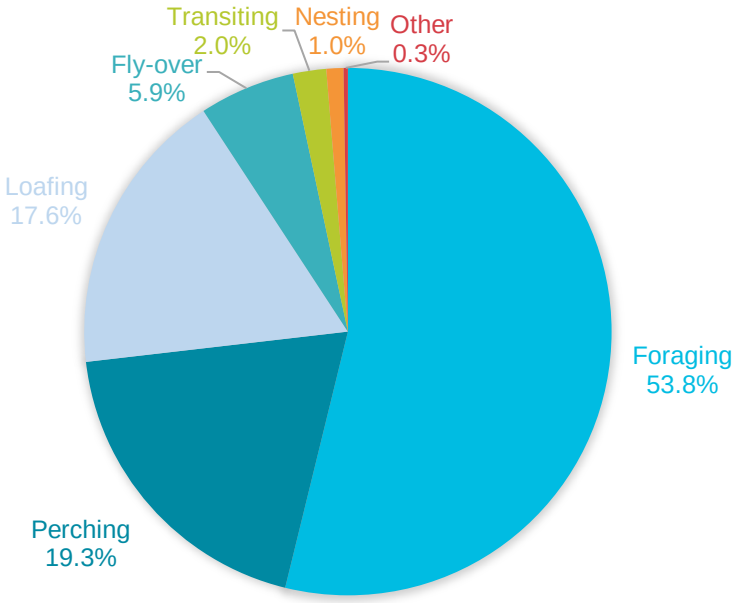


Figure 15. Behaviour of wildlife observed, CNS, 2022/23 (*Other includes basking and roosting).

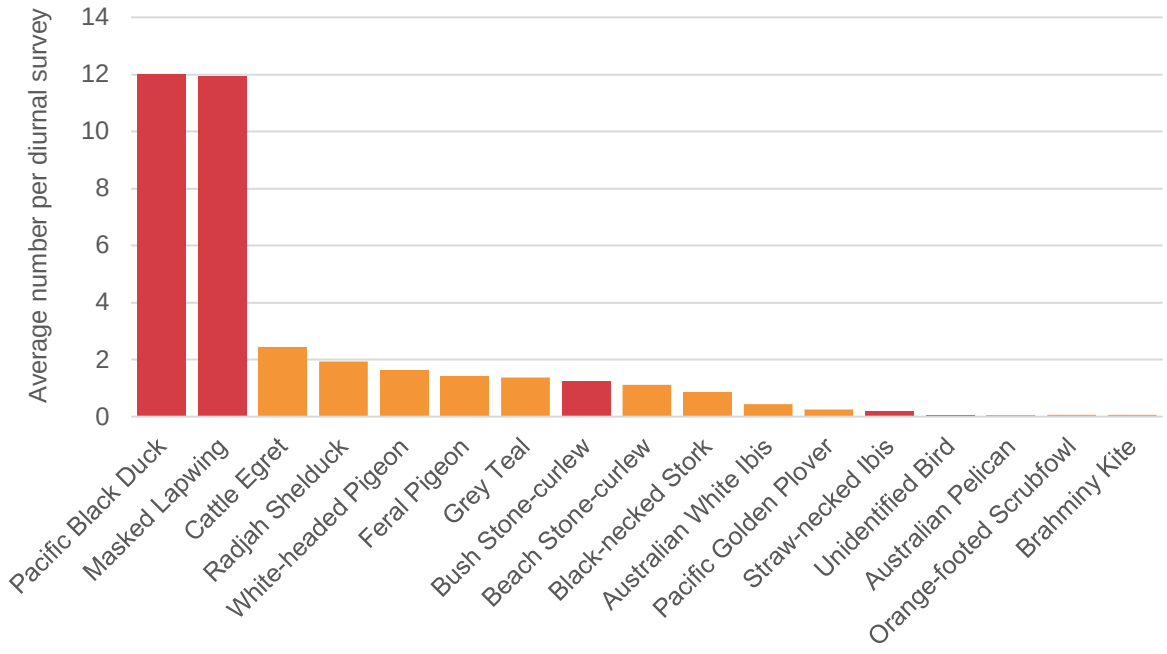
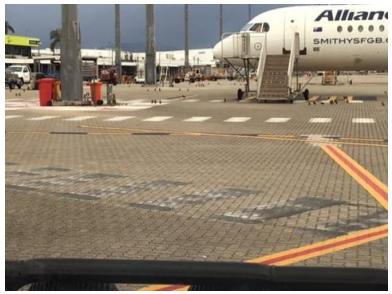


Figure 16. Average number of high, and moderate risk birds observed per diurnal survey (red = high risk, orange = moderate risk), CNS, Nov 2021-Feb 2022.

Table 8. On-airport and landside wildlife hazard attractant and the high and moderate risk species attracted, CNS, 2022/23.

Area	Hazard Description	High and Moderate Risk Species	
Drains and depressions 	Drains and depressions retain water following rain events. Waterlogged soils in these areas force invertebrates closer to the surface, making them more accessible to foraging birds. Areas of retained water also provide frog-breeding habitat.	Pacific Black Duck Bush Stone-curlew Straw-necked Ibis Radjah Shelduck Cattle Egret Beach Stone-curlew Grey Teal	Black-necked Stork Unidentified Duck Unidentified Heron Unidentified Ibis Wandering Whistling-Duck Australian White Ibis Australian Pelican
Grass areas 	Hazardous water birds are present after rain when the ground remains moist. Grass regularly attracts foraging Australian Magpies and Torresian Crows. Insects and small mammals are easily accessible to raptors and herons following mowing and heavy rain. Grass areas provide ideal nesting habitat for Masked Lapwing and curlews.	Masked Lapwing Pacific Black Duck Bush Stone-curlew Straw-necked Ibis Cattle Egret Beach Stone-curlew	Black-necked Stork Feral Pigeon Lace Monitor Orange-footed Scrubfowl Australian White Ibis

Area	Hazard Description	High and Moderate Risk Species
Sealed Areas 	Aircraft manoeuvring areas provide high ground for insects and molluscs during rain which attracts foraging birds. During hot periods when the hot air rises from the concrete, it creates ideal thermalling conditions for birds or heating opportunity for reptiles.	Masked Lapwing Bush Stone-curlew Pacific Golden Plover Feral Pigeon Lace Monitor
Perimeter fence 	Gaps in gates and underneath fence lines may allow airside access for terrestrial mammals such as Swamp Wallaby, Red Fox, and European Brown Hare. Fencing also provides perching opportunity for various moderate and high-risk birds.	Brahminy Kite Feral Pigeon Black Kite Unidentified Heron Whistling Kite Eastern Grass Owl
Built environment 	This includes the terminal building, baggage makeup areas, apron lighting, hangars, fire station, windsocks, the NDB, and other airside infrastructure. These structures provide perches, shelter, and potential nesting sites for various wildlife.	Brahminy Kite Feral Pigeon Black Kite Unidentified Heron Whistling Kite Eastern Grass Owl

Area	Hazard Description	High and Moderate Risk Species
Flora 	Melaleuca and Eucalyptus flowering in the vicinity of the aerodrome attracts hazardous species such as Rainbow Lorikeets, flying-foxes, and honeyeaters. Other flora can attract seed eaters such as cockatoos, and large trees can provide perching opportunity for a number of birds, including pigeons and mynas.	Spectacled Flying-fox Black Flying-fox Unidentified Flying-fox Eastern Grass Owl White-headed Pigeon Little Red Flying-fox
Landside Vegetation 	Various ornamental trees and landside habitats, such as the HIAL paddock, provide foraging, roosting, and breeding opportunities.	Spectacled Flying-fox Black Flying-fox Unidentified Flying-fox Eastern Grass Owl White-headed Pigeon Little Red Flying-fox Black Kite Brahminy Kite Whistling Kite Feral Pigeon
Airspace 	Transit area between foraging and roosting sites; thermals.	All high and moderate risk species (excl. Lace Monitor)

Area	Hazard Description	High and Moderate Risk Species
Construction work 	Airside, landside, and off-airport construction activities can elevate wildlife activity above normal levels. Areas of temporary water retention can attract ducks and other water birds. Earthworks disturb soils that attract birds to forage on the exposed invertebrates and temporary stockpiles of soil or other material can provide additional loafing and perching opportunities for birds. Pipes and other construction material can provide temporary shelter and, in some cases, birds such as Fairy Martins have established nests in these materials.	Masked Lapwing Bush Stone-curlew Feral Pigeon Unidentified Bird Australian White Ibis Unidentified Ibis

6.2. Off-airport Attractants

Part 139 MOS S.17.01 (2) The aerodrome operator, must attempt to monitor sites within 13km of the aerodrome

Part 139 MOS S.17.04 (2)(b)(ii) Identify sources and locations of wildlife attraction in the vicinity of the aerodrome

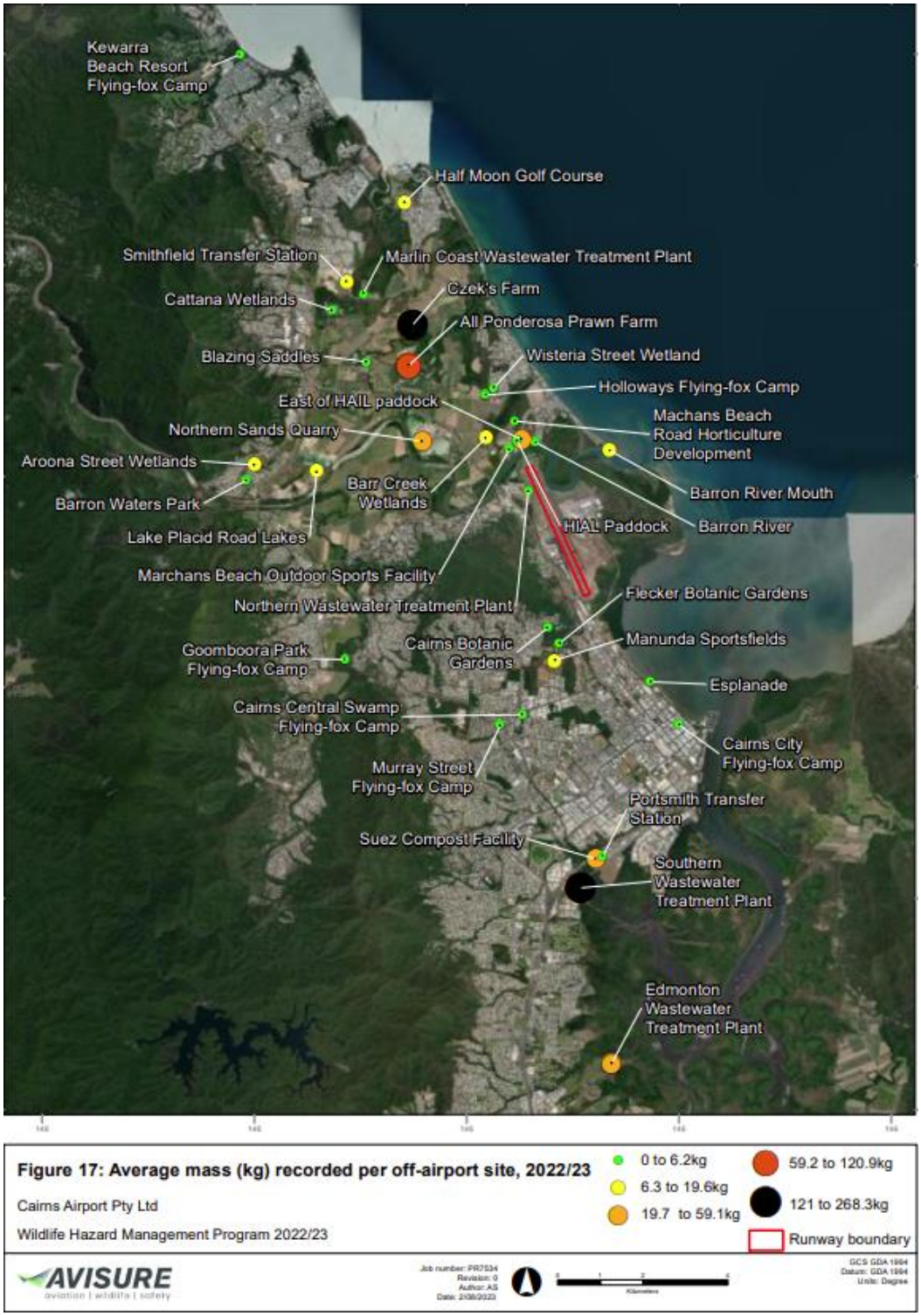
Off-airport wildlife populations can contribute significantly to the strike risk at an airfield. When assessing habitats that have the potential to attract hazardous wildlife it is important to analyse the impacts of potentially conflicting airspace between birds and aircraft. Their movements may intersect aircraft flight paths either over the airfield, in the approaches, or in areas used for low-level circuit operations. In addition, regional and local wildlife populations may fluctuate in response to seasonal, climactic, or other environmental variables, increasing the strike hazard.

Habitats surrounding the immediate boundary include Barron River to the north, agricultural and residential land use to the north of the Barron River, and mangroves surrounding the west, east and south.

Avisure identified 34 off-airport sites within 15 km of CNS that attracted, or had the potential to attract, wildlife (Figure 17). Appendix F ranks the risk of each off-airport site against the National Airport Safeguarding Framework (NASF) and suggests the appropriate actions to monitor the risk.

PR7534_MP17_OffAirport_DensityMap.pdf

Figure 17. Location of off-airport sites in the vicinity of Cairns Airport.



6.3. Flying-fox Surveys

There are 44 known Spectacled Flying-fox camps in the Cairns region, however only less than half are occupied at any one time (Cairns Regional Council, 2022). CRC monitor the flying-fox camps with DES as part of the National Flying-fox Monitoring Program (Figure 18). The data is managed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and publicly available from the Commonwealth Department of Environment and Energy.

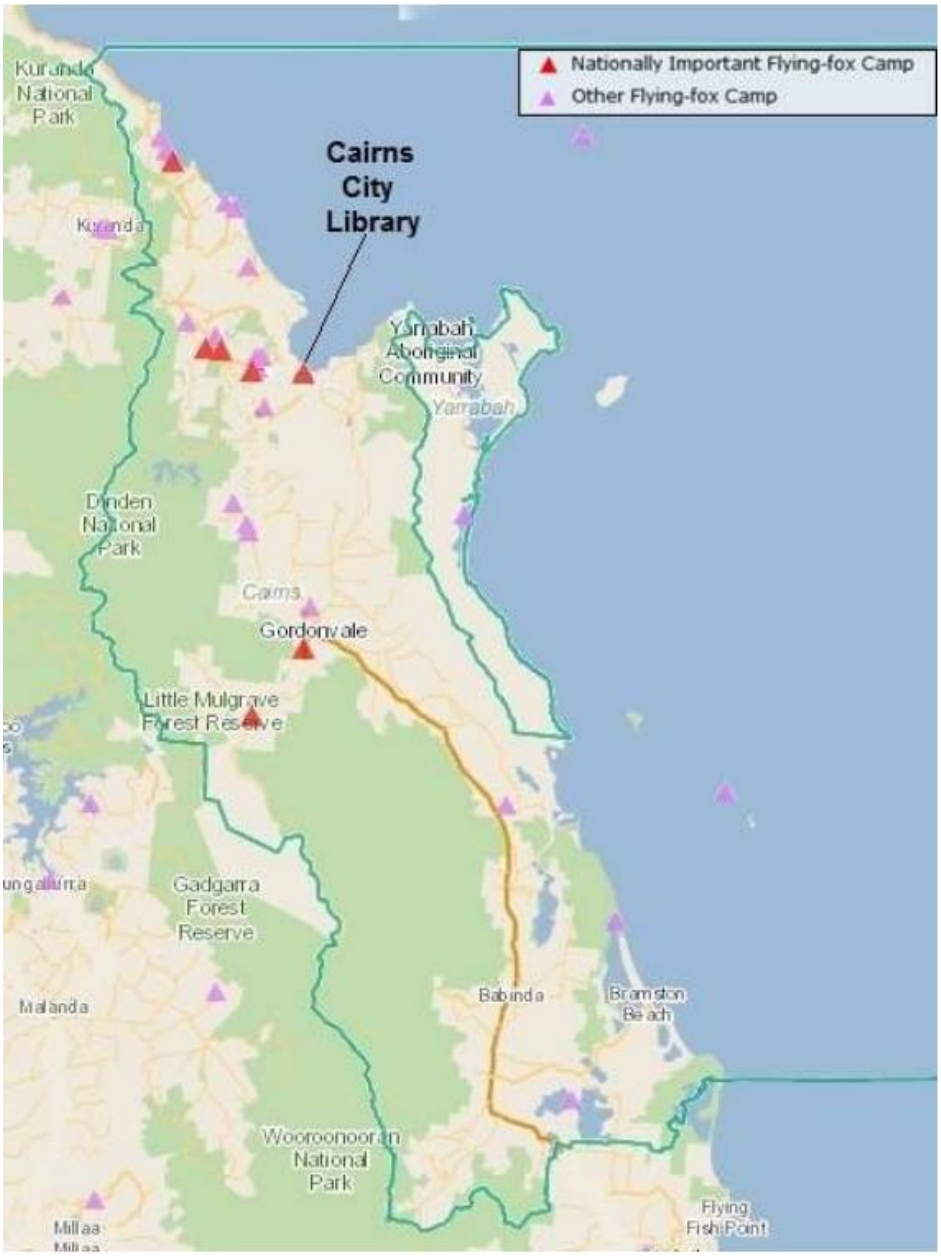


Figure 18. Location of known flying-fox roosts in the Cairns region (outlined in green) (Cairns Regional Council, 2019).

7. Management

The section outlines wildlife hazard management at CNS, including:

- Hazard Detection
- Hazard Monitoring
- Hazard Communication
- Wildlife Strike Reporting
- Hazard Mitigation.

Each element is detailed below.

7.1. Hazard Detection

Part 139 MOS S.11.11 (b) monitoring airside access control points, such as fencing

Part 139 MOS S.12.03 (9) The serviceability inspection must check for damaged fences, unsecured gates, and signs of attempted entry

Part 139 MOS S.12.03 (7) The serviceability inspection requirements

Part 139 MOS S.17.01 (1) As part of the aerodrome serviceability inspection, the aerodrome operator must monitor and record wildlife activity and presence

Part 139 MOS S.17.04 (2)(c)(i) procedures for detection

Assessing the actual or potential wildlife hazard prior to flight and landing informs aircrew of potential strike risks and informs decision-making to mitigate the risk of a strike. Routine detection of hazards at CNS is achieved through regular runway and flight strip inspections and during airside wildlife surveillance (Table 9). This ensures early detection of wildlife hazards in airside areas, particularly inside critical aircraft movement areas.

Table 9. Detecting wildlife hazards.

Task	Description	Frequency	Responsible	Procedure/Reference
Flight strip inspections	Check aircraft movement areas for wildlife.	As required	ASO	Aerodrome Serviceability Inspections SOP
Serviceability inspections	Inspect for wildlife as part of mandatory serviceability inspections.	Daily	ASO	Aerodrome Serviceability Inspections SOP
Perimeter fence inspections	Check for breaches that could allow airside access to terrestrial animals.	Daily	ASO	Aerodrome Serviceability Inspections SOP

Task	Description	Frequency	Responsible	Procedure/Reference
Wildlife patrols (routine)	Check airside areas for wildlife.	As required	ASO	Aerodrome Serviceability Inspections SOP
Wildlife patrols (post-strike)	Check airside areas for evidence of wildlife and associated hazards following a strike event.	As required	ASO	Aerodrome Serviceability Inspections SOP
Flying-fox counts	Flying-foxes are counted as they transit the critical RWY 15/33 airspace.	Daily	ASO	Flying-fox Counts SOP

7.2. Hazard Monitoring

Part 139 MOS S.11.08 (1) The wildlife hazard management procedures must be included or referenced in the aerodrome manual

Part 139 MOS S.17.01 (2) The aerodrome operator, must attempt to monitor sites within 13km of the aerodrome

Part 139 MOS S.17.04 (2)(c)(ii)(iv)(d) procedures for monitoring and reporting

Hazard monitoring provides essential information to identify shifts in hazards and risks. It also provides evidence of regulatory conformance and enables efficacy assessments of the WHMP.

CNS regularly check the airside and landside areas for sources of wildlife attraction including drains, aerodrome infrastructure, grasslands, waste management practices, as well as proposed and existing landscaping. Developments on or in the vicinity of the aerodrome, which include construction or land use changes, are monitored for their wildlife attraction potential.

CNS complete standardised airside bird counts which are used to monitor trends in bird numbers and hazards. The data is entered into TrackerAIRSIDE™ for further analysis. On behalf of CNS, consultants perform quarterly off-airport bird counts. Data is entered into the Off-airport Survey Database for further analysis and presented in wildlife summary reports. Monitoring frequency, beyond the activities detailed in Table 10, is a matter of professional judgement by CNS and depends on wildlife numbers, species composition, and weather and aircraft activity.

Table 10. Identifying and monitoring wildlife hazards.

Task	Description	Frequency	Responsible	Procedure/ Reference
Airside wildlife counts	Regularly complete standardised wildlife counts.	Weekly	ASO	Airside Wildlife Counts SOP
On-airport wildlife counts	Regularly complete standardised wildlife counts.	Monthly	Paul Fisk (Consultant)	Airside Wildlife Counts SOP
		Quarterly	Avisure (Consultant)	N/A
Off-airport Wildlife counts	Regularly complete standardised wildlife counts.	Monthly	Paul Fisk (Consultant)	Off-airport Wildlife Surveys SOP
		Quarterly	Avisure (Consultant)	
Detecting flying-fox hazards	Flying-foxes are counted as they transit the critical RWY 15/33 airspace.	Daily	ASO	Flying-fox Counts SOP

Non-routine hazard monitoring is achieved through a review of on- and off-airport development proposals and land-use changes (Table 11). This monitoring helps to assess if wildlife hazards will be created, or enhanced, and how it will contribute to the CNS strike risk.

Table 11. Other monitoring activities

Task	Description	Frequency	Responsible	Procedure/Reference
Development on CNS land	Applications for development on CNS land are assessed for wildlife attraction.	As required	MA	Off-airport Development and Stakeholder Liaison
Development in the vicinity of CNS	Liaise with local authorities / landholders to ensure that CNS (the aerodrome operator) is consulted in development applications or land use planning decisions.	As required	MA	Off-airport Development and Stakeholder Liaison

7.3. Hazard Communication

Part 139 MOS S.11.08 (1)(d) reporting requirements of wildlife hazards to aircraft
Part 139 MOS S.12.04 (1) reportable occurrences to the NOTAM office
Part 139 MOS S.17.04 (2)(c)(iv)(d) procedures for reporting
Part 139 MOS S.17.05 Wildlife hazard reporting

Managing the wildlife strike risk requires a cooperative effort amongst key stakeholders communicating the hazard so that appropriate mitigation can be implemented. Communicating wildlife hazards to aircrew increases their awareness, which subsequently informs decision-making that can avoid a strike. In addition, communicating wildlife hazards to aerodrome operators helps inform their awareness, contributing to improved wildlife management practices and a safer environment for aircraft operations.

The ASO communicates hazards to ATC. NOTAMs, Bird Watch Condition Reports and Automatic Terminal Information System (ATIS) updates are issued in response to significant short-term hazards, and the ERSA is used to communicate long-term, on-going, and seasonal hazards.

If a wildlife hazard is assessed as being a serious and imminent threat to aircraft operations, ASOs directly advise ATC to communicate the hazards to pilots.

Wildlife hazards are a key agenda item in SASF meetings. This forum aides the development and implementation of the CNS WHMP and communication with on- and off-aerodrome stakeholders. Other communication tools include monthly and quarterly wildlife hazard reports, and WHMP updates.

Effective hazard communication requires two elements:

1. Clear channels of communication via processes that are efficient, timely and easy to access/receive.

2. Providing notifications that are well-informed, are up to date, are unambiguous, and provide useful information to the intended recipient (i.e. notifications must provide the recipient with sufficient information to understand the hazards and make decisions. Notifications that simply state that a bird hazard exists do not provide sufficient detail about the hazard in order to avoid a strike).

Table 12. Communicating wildlife hazards.

Task	Description	Frequency	Responsible	Procedure/Reference
Wildlife Hazard Notification	Communicating the wildlife hazard to aircrew and airlines to inform pilots of changed risk levels through direct ATC-pilot communication, NOTAM, and AIP.	As required	ASO ATC	Wildlife Hazard Notification SOP
Bird Watch Condition Report	Communicating the wildlife hazard to internal and external stakeholders.	As required	AOEM	Wildlife Hazard Notification SOP
Survey Summaries	Summary of hazards and significant observations found in on and off airport wildlife surveys.	Eight monthly surveys (non-quarterly survey months)	Paul Fisk (Consultant)	Data Review Procedure CNS Wildlife Summary Reports
Wildlife Info-cards	Summary of hazards and significant observations found ASO wildlife count and dispersal data.	Monthly	Avisure (Consultant)	CAS Monthly Wildlife Info-cards
Wildlife Hazard Summary Report	Summary of strike and monitoring data; wildlife hazard assessment and recommendations to mitigate wildlife strike risk.	Quarterly	Avisure (Consultant)	CNS Quarterly Wildlife Hazard Summary Reports
WHMP Update	Provides stakeholders with an update of the wildlife management program, strike trends, and hazardous species.	Annual	AOM	WHMP Review SOP

7.4. Meetings

Part 139 MOS S.11.08 (1)(e) liaising with the relevant planning authorities or proponents

Part 139 MOS S.17.04 (2)(d) liaison arrangements for local planning authorities within a radius of at least 13km

Input from various on- and off-aerodrome stakeholders helps CNS to achieve an effective and integrated approach to wildlife hazard management. When advised through CRC, CNS liaises with landowners to ensure the airport is consulted on land uses within the vicinity of the airport that may not be compatible with airport operations. Wildlife hazard management is a standing agenda item for the meetings outlined in Table 13.

Table 13. Meetings

Task	Description	Frequency	Responsible	Procedure/Reference
Safety and Security Form Meetings	Review program against quarterly recommendations and goals, quarterly report, and wildlife issues.	Quarterly	MA AOEM Avisure	Quarterly Safety and Security Meetings Off-airport Development and Stakeholder Liaison SOP

7.5. Wildlife Strike Reporting

Part 139 MOS Section: 17.01 (3) The aerodrome operator must attempt to monitor any reported wildlife aircraft strike events at, or in the vicinity of, the aerodrome.

CNS ASOs recorded wildlife strikes regardless of type (e.g., strike, suspected strike, near miss strike) or location (e.g., on-aerodrome, off-aerodrome, remote form the aerodrome). CNS enters all strikes into TrackerAIRSIDE™ and sends reports to the ATSB. The reports are also sent to Avisure for inclusion into monthly, quarterly, and annual reports. Refer to Table 14 for the methods used.

Efforts are made to identify the species involved in strikes. In cases when the collection of biological remains is required, staff strictly adhere to health and safety requirements. Carcasses from bird strikes, or carcasses found on airport that may be the result of bird strike, are stored in a freezer for identification by an ornithological consultant. The Australian Museum may examine stomach contents for indicators of food attractants on airport. Where only remnants of strike victims are available, material is collected for DNA analysis or feather identification using the Australian Centre for Wildlife Genomics (ACWG) service at the Australian Museum.

CNS investigate all significant strike incidents.

Table 14. Reporting wildlife strikes.

Task	Description	Frequency	Responsible	Procedure/ Reference
Reporting and investigating strikes.	Report all strikes, regardless of type or location.	As required	ASO Aircrew Ground Crew	Wildlife Strike Reporting SOP
Identifying all strikes, processing and handling of strike remains.	Collect struck remains when possible.	As required	ASO Aircrew Ground Crew	Identification and Handling Wildlife Remains SOP

Task	Description	Frequency	Responsible	Procedure/ Reference
Store strike remains that require further analysis.	Store strike remains in a designated freezer where further analysis of the remains is required (e.g., carcass evaluation, DNA analysis).	As required	ASO	Identification and Handling Wildlife Remains SOP

7.6. Hazard Mitigation

Part 139 MOS S.11.08 (1)(c) mitigating any wildlife hazard

Part 139 MOS S.11.11 Unauthorised entry to aerodrome

Part 139 MOS S.17.04 (2)(e) strategy for wildlife hazard reduction

Part 139 MOS S.17.06 Wildlife hazard mitigation

Strategies for managing wildlife strikes at CNS focus on managing populations on and surrounding the airport. Management actions are classified as either:

- Active management – directly removing or reducing the numbers of wildlife; and
- Passive management – modifying habitats or other aspects of the environment to indirectly remove or reduce the number wildlife.

7.6.1. Active management

Part 139 MOS S.17.04 (2)(c)(v) mitigation, including passive and active strategies

Active management methods employed at CNS include wildlife dispersal and lethal control. Lethal control of wildlife may be necessary, but in general, animals are not destroyed unless there is an immediate danger to essential facilities or to the safety of an aircraft. All care is taken to ensure that lethal control is a last resort and is only used after all other non-lethal harassment measures have been taken.

Wildlife hazard levels and aircraft movements determine the frequency and intensity of active management. The overall objective is to separate aircraft and wildlife which is achieved by influencing wildlife or aircraft to minimise the likelihood of occupying the same airspace at the same time. Refer to Table 15 for the methods used.

Hazard removal actions and their outcomes are important sources of information. All active management actions and their outcomes are recorded via TrackerAIRSIDE™, as required in the Aerodrome Operations Manual. This provides a record for comparison and analysis and may provide evidence of adequate wildlife hazard management in the event of litigation.

Table 15. Active management methods.

Task	Description	Frequency	Responsible	Procedure/Reference
Wildlife dispersal	Using tools and techniques to harass wildlife from the airside area, in particular from critical aircraft movement areas.	In response to hazards	ASO	Wildlife Dispersal SOP
Wildlife lethal control	Using lethal control (under permit) to manage immediate and significant strike risks, including nest removal.	In response to hazards	ASO	Wildlife Dispersal SOP Wildlife Culling including Nest Removal SOP
Handling wildlife carcasses and other remains	Safe handling practices to manage wildlife remains, and how to process for forensic analysis.	As required	ASO	Identification and Handling of Wildlife Remains SOP
Safe use of firearms	Use and maintenance of firearms for dispersal and lethal control.	As required	ASO	Firearm Use SOP

7.6.2. Passive management

Part 139 MOS S.6.22 (3) Effective drainage

Part 139 MOS S.17.04 (2)(c)(v) mitigation, including passive and active strategies

Passive management aims to manage wildlife hazards by preventing access to food or other resources. Grassland areas are attractive to many of the species that pose risks to aircraft at CNS, as such, the grass is frequently mowed to reduce the presence of hazardous species. Refer to Table 16 for the methods used.

Table 16. Passive management methods.

Task	Description	Frequency	Responsible	Procedure/Reference
Airside grass management	Airside grass is maintained at heights appropriate to deter hazardous species.	Ongoing	Ground personnel	Habitat and Land Management SOP CNS Aerodrome Operations Manual Section 3.11.6 Wildlife Hazard Mitigation
Landscape management	Landscaped areas (e.g., gardens, trees, etc.) are managed to reduce the attraction to hazardous species.	Ongoing	Ground personnel	Habitat and Land Management SOP

7.7. Species Action Plans

Species Action Plans (SAPs) support the WHMP and provide the actions required hazardous wildlife. SAPs for the following species are provided in a separate document:

Masked Lapwing

Pacific Black Duck

Bush Stone-curlew

Straw-necked Ibis

Spectacled Flying-fox

Unidentified Flying-fox

Radjah Shelduck

Cattle Egret

Beach Stone-curlew

Grey Teal

Black-necked stork

Brahminy Kite

Feral Pigeon

Pacific Golden Plover

Lace Monitor

Unidentified Duck

Black Kite

Orange-footed Scrubfowl

Unidentified Heron

Unidentified Ibis

Unidentified Raptor

Wandering Whistling-Duck

Whistling Kite

Black Flying-fox

Little Red Flying-fox

Eastern Grass Owl

Australian White Ibis

White-headed Pigeon

Australian Pelican

7.8. Measurement and Analysis

Part 139 MOS S.17.02 (1) Any detected wildlife hazard must be assessed for its potential risk to aircraft operations

Part 139 MOS S.17.04 (2)(c)(iii) risk assessment and analysis

CNS continually measure and analyse the performance of the WHMP through data reviews. Refer to Table 17 for methods used.

CNS recognises the strength of its monitoring program is in good record keeping. Records of the monitoring activities are kept in relevant diaries, TrackerAIRSIDE™ entries, spreadsheets, and database. Wildlife strike and survey data are maintained electronically to easily identify trends in strikes and in wildlife activity.

Strike and survey data are used to complete risk assessments to identify high and moderate risk species. Data is used in routine reporting which ensures all staff and managers are equipped with the information needed to adapt hazard management activities and the WHMP when required. Dispersal and culling data are reviewed to evaluate for effectiveness and to ensure compliance to wildlife protection legislation.

Table 17. Data management methods.

Task	Description	Frequency	Responsible	Procedure/Reference
Strike data management	Maintain records of wildlife strikes and review monthly in a scorecard to assess changes in populations.	Ongoing	AOM	Data Review SOP CNS Aerodrome Operations Manual Section 3.11.4 Wildlife Hazard Monitoring
Program data management	Electronically store wildlife data (e.g., surveys, strikes, dispersal) to monitor program progress and identify trends.	Monthly	AOS	Data Review Procedure CNS Aerodrome Operations Manual Section 3.11.4 Wildlife Hazard Monitoring
Review data and program trends	Review the data to analyse seasonal trends. Produce Scorecard Reports.	Monthly	AOM	Data Review SOP
Risk assessment	Regularly complete standardised wildlife surveys and risk assessment.	Quarterly	Avisure	Data Review SOP CNS Quarterly Wildlife Hazard Summary Reports

8. Safety Assurance

Part 139 MOS S.17.04 (3)(4) implementation and review of the wildlife hazard management plan

The COO is responsible for the successful WHMP implementation. This is achieved by managing change, continually reviewing, and improving the program and management plan, and regularly assessing progress against the objectives to ensure it remains effective.

CNS continually evaluates and reviews compliance to legislation, policies, and procedures through monthly and annual program assessments. Refer to Table 18 for methods used.

The airport, in consultation with a suitably qualified aviation biologist with experience in aviation wildlife risk, in accordance with the CASR Part 139 MOS, reviews the WHMP as follows:

a) if an aircraft experiences multiple wildlife strikes;

b) if an aircraft experiences substantial damage following any wildlife strike;

c) if an aircraft experiences an engine ingestion of wildlife;

d) if the ongoing presence of wildlife is observed on the aerodrome in size or in numbers reasonably capable of causing an event mentioned in paragraph (a), (b) or (c);

e) at least every 12 months, but if during a period of 12 months the plan was reviewed under paragraph (a), (b), (c) or (d), at least every 12 months after that review.

WHMP reviews are also triggered:

- If there is a significant change in wildlife activity or strike rate occurs;
- If there is a strike or series of strikes involve rare, threatened, or endangered species[16],
- In response to a major weather event;
- If there is significant changes to organisational structure, operational or personnel;
- At the request by DES, or other environment departments, or airlines.
- At the discretion of CASA or AOM.

16 *The Environment Protection and Biodiversity Conservation Act 1999* establishes processes that help protect threatened species and promote their recovery. Within the context of wildlife hazard management on airports, of consideration is the effect that management actions may have on threatened species. If a threatened species is struck, a review of the WHMP and associated procedures and management actions is required as it may require departmental approval and department consultation.

Table 18. Review Methods.

Task	Description	Frequency	Responsible	Procedure/Reference
Program implementation assessment	Summary reports analysing program effectiveness and implementation through surveys, observations, and data analysis.	Monthly	Avisure (Consultant)	Monthly Wildlife Info-cards Data Review SOP
		Quarterly		Quarterly Wildlife Hazard Management and Recommendation Reports Data Review SOP
Program progress reports	Summary reports that overview current hazards, identify issues requiring attention, and comment of program progress and compliance.	Annually	AOM	Data Review SOP
Safety and Security Forum (SASF) Reporting	Deliver a presentation to the SASF summarising WHMP progress.	Quarterly	AOM Avisure (Consultant)	Off-airport Development and Stakeholder Liaison SOP
Major Review	Review Program against Key Performance Indicators, legislation, and audit practices against procedures.	As required	AOM Avisure (Consultant)	CNS Wildlife Hazard Assessment Report WHMP Review SOP
WHMP Update	Review and audit the WHMP.	Annually	AOM Avisure (Consultant)	WHMP Review SOP

8.1. External Audits

In addition to reviews, external audits are also used as an independent evaluation of the program and to improve any deficiencies identified. Audit results are incorporated into the wildlife management program.

Airlines, CASA, and/or aviation consultants may complete external audits.

8.1.1. Permits

As of 22 August 2020, under the Nature Conservation (Animals) Regulation 2020, CNS is exempt from a DMP to lawfully take or relocate wildlife from airport property.

8.2. Research, Trials, and Initiatives

If CNS identifies the need to research various aspects of wildlife hazard management, the targeted research provides information to improve WHMP implementation and allows for more effective hazard management. Refer to Appendix G for a summary of the key research and initiatives undertaken.

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Appendix A: WHMP Key Performance Indicators

Legislation and Regulatory Requirements					
Objective: To develop, implement and maintain procedures and systems to ensure operations comply with applicable legislation, regulations, standards, and industry best practice.					
Target	**Performance Indicator**	**Type**	**Evidence**	**Procedure**	**Who**
Continual improvement to meeting legislative compliance.	Compliance to legal requirements is conducted at least annually.	Leading	Record of review	WHMP Review	Avisure CNS

Assurance					
Objectives: To review the WHMP: • annually and reassess the risk following serious incidents • in response to operational or legislative changes • to conduct regular internal and external audits. • to clearly define accountabilities and responsibilities for all personnel and contractors.					
Target	**Performance Indicator**	**Type**	**Evidence**	**Procedure**	**Who**
Regular reviews of CNS wildlife hazard management program.	Review of WHMP Procedures at least annually.	Leading	Record of review	WHMP Review	Avisure CNS

Culture					
Objectives: To develop, embed and continually encourage a positive culture where wildlife management is a priority and the WHMP is recognised and valued. To develop, embed and continually encourage a reporting culture.					
Target	Performance Indicator	Type	Evidence	Procedure	Who
Develop an awareness program, highlighting the importance of multiple stakeholder involvement in managing the strike hazard.	Awareness campaign developed and rolled out to pilots, ATC, aerodrome maintenance staff, environment managers and wildlife managers.	Leading	Awareness campaign	Wildlife Strike Reporting Wildlife Hazard Communication	CNS

Risk Management					
Objectives: To understand and minimise the risk of wildlife strike through a continuous process of identifying, recording, and reviewing risks, objectives, targets, and indicators. To reduce the costs of unscheduled maintenance associated with wildlife strike. To preserve life and aviation capability through reducing the risk of wildlife strike. To reduce wildlife mortality.					
Target	Performance Indicator	Type	Evidence	Procedure	Who
To understand the daily risk posed by wildlife at CNS.	Wildlife patrols (routine) recorded in TrackerAIRSIDE™.	Leading	TrackerAIRSIDE™	Aerodrome Inspection Habitat and Land Management	ASO

Risk Management					
To understand the daily risk posed by wildlife at CNS.	Wildlife surveys undertaken.	Leading	Monthly wildlife surveys	Airside Wildlife Counts Off-airport Wildlife Surveys	ASO Consultants
	Scorecard performance conducted monthly.	Leading	Scorecard	Data Review	Avisure
To understand the wildlife hazard risk posed by wildlife at CNS following a strike.	Wildlife strikes reported.	Leading	Wildlife database	Aerodrome Serviceability Inspections Wildlife Strike Reporting Identification and Handling of Wildlife Remains	ASO
To reduce the risk of wildlife strike by undertaking runway inspections prior to the arrival and departure of aircraft and checking fence lines.	Wildlife patrols (routine) and fence line inspections recorded in TrackerAIRSIDE™.	Leading	TrackerAIRSIDE™	Aerodrome Serviceability Inspections Airside Wildlife Counts	ASO
Disperse all hazardous wildlife posing a risk.	Dispersal conducted.	Leading	Wildlife dispersal data	Aerodrome Serviceability Inspections Wildlife Dispersal	ASO

Risk Management					
To understand the effectiveness of the dispersal effort.	Dispersal conducted, and data recorded.	Leading	Wildlife dispersal data	Aerodrome Serviceability Inspections Data Review Wildlife Dispersal	ASO
Yearly strike rate reductions.	Reduced wildlife strikes per 10,000 movements.	Lagging	Wildlife strike database	Wildlife Strike Reporting Data Review	CNS
Yearly mass struck reductions.	Reduced mass struck per 10,000 movements.	Lagging	Wildlife strike database	Wildlife Strike Reporting Data Review	CNS
Yearly strike rate reductions involving high risk wildlife strikes.	Reduced high risk wildlife strikes per 10,000 movements.	Lagging	Wildlife strike database	Wildlife Strike Reporting Data Review	CNS
Yearly strike rate reductions involving damaging wildlife strikes.	Reduced damaging wildlife strikes per 100,000 movements.	Lagging	Wildlife strike database	Wildlife Strike Reporting Data Review	CNS
Yearly strike rate reductions involving strikes where species is unidentified.	Reduced number of strike reports that do not identify wildlife species.	Leading	Wildlife strike database	Wildlife Strike Reporting Data Review	CNS

Communication					
Objective: To develop, implement and maintain successful tools that encourage open communication, delivery of key messages and awareness of responsibilities under the WHMP to all personnel, business partners and contractors.					
Target	Performance Indicator	Type	Evidence	Procedure	Who
Timely reporting of wildlife strikes.	Strikes reported to the ATSB within 72 hours.	Leading	ATSB	Wildlife Strike Reporting Data Review	ASO
Report all strikes.	All strikes reported.	Leading	ATSB	Wildlife Strike Reporting Data Review	ASO
Investigate all serious incidents and damaging strikes.	Strike investigated.	Leading	ATSB Strike investigation	Wildlife Strike Reporting Data Review	AOM
Develop standardised phraseology and a mechanism for communicating wildlife hazards.	Wildlife Hazard Notification (WHN) process developed and in use.	Leading	WHNs Bird Watch Condition Reports ERSA entry NOTAM use	Wildlife Hazard Communication	ASO
	Real time wildlife hazards issued to Surveillance Flight Information Service (ATC) and operationally relevant information in hands of pilots.	Leading	Communications during the exercise when wildlife hazard exists	Wildlife Hazard Communication Aerodrome Serviceability Inspections	ASO

Communication					
	Standardised phraseology adopted for communication between pilots, ATC, wildlife officers and others relaying wildlife information.	Leading	Communications during the exercise when wildlife hazard exists	Wildlife Hazard Communication Aerodrome Serviceability Inspections	ASO

Training					
Objectives:	To ensure there are sufficient skilled and trained resources available to develop, implement, maintain and improve the WHMP. To ensure personnel are competent, provided with adequate information and training appropriate to their duties. To have no firearm incidents. To improve operational responses to wildlife hazards through appropriate training of engineers, ATC, and wildlife managers.				
Target	Performance Indicator	Type	Evidence	Procedure	Who
Develop and implement a training program for ASO or their equivalent.	Syllabus developed.	Leading	Competency evaluation	Wildlife Hazard Management Training and Competency Assessment	CNS
	Trainee ASO (or equivalent) provided suitable training during initial training.	Leading	Competency evaluation		
	Experienced ASO or equivalent received refresher training.	Leading	Competency evaluation		
Improved understanding of the wildlife hazard.	All visiting aircraft operators are briefed on the wildlife hazard at the aerodrome and the procedures implemented.	Leading	Induction records	N/A	CNS

Infrastructure and Facilities					
Objective: To develop, implement and maintain a maintenance system that ensures new and existing infrastructure and facilities are kept clean, safe, and operational to reduce the wildlife attraction.					
Target	Performance Indicator	Type	Evidence	Procedure	Who
On-airport wildlife attraction reduction.	Appropriate habitat management with reduced utilisation of habitats by wildlife.	Leading	Wildlife surveys conducted by specialists Habitat management projects – e.g. grass height	Habitat and Land Management WHMP Review	CNS
Off-airport wildlife attraction reduction.	Increased awareness, assessment and management of sites that are attracting, or have the potential to attract, wildlife.	Leading	Planning Liaison/Community Group Minutes	Off-airport Development and Stakeholder Liaison SASF Meeting Minutes	CNS Avisure

Participation and Action					
Objectives: Define roles, responsibilities, and procedures for managing wildlife risk at CNS. To actively encourage aircraft operators, visitors, business partners and contractors to participate in the WHMP. To encourage activities that promote and establish positive wildlife management on airport.					
Target	Performance Indicator	Type	Evidence	Procedure	Who
Ongoing consultation with CNS stakeholders.	Facilitation of regular meetings with relevant stakeholders and delineation of responsibilities.	Leading	Agenda developed that includes Wildlife Hazard Management	Off-airport Development and Stakeholder Liaison SASF Meeting Minutes	CNS Avisure
	Number of meetings completed.	Leading	Meeting Minutes	Off-airport Development and Stakeholder Liaison SASF Meeting Minutes	CNS Avisure

Appendix B: Legal and other requirements

Australian Context

CASA enacts and enforces the Civil Aviation Safety Regulations 1998. Managing wildlife on and around airports must consider a suite of legislative and regulatory requirements. Section 17 of the CASR Part 139 (Aerodromes) MOS 2019 outlines the requirements for managing wildlife hazards.

Table B1. Australian aviation legislation and standards.

Instrument	Body/Department	Description	Link
Civil Aviation Act 1998	CASA	Establishes CASA functions in relation to civil aviation, with a particular emphasis on safety.	https://www.legislation.gov.au/Details/F2021C00238
Civil Aviation Safety Regulations 1998	CASA	Details Commonwealth legislation regarding all aspects of civil aviation safety and establishes the regulatory framework. Part 139 (Aerodromes) contains specific requirements for wildlife hazard management.	

Instrument	Body/Department	Description	Link
CASR Part 139 (Aerodromes) MOS 2019	CASA	Part 139 prescribes the aerodrome requirements. Sections relevant to wildlife hazard management focus on: bird hazard information for the Aeronautical Information Package (AIP) (5.17, 17.05.1); bird hazard information for the Aerodrome Manual (AM) (11.08, 11.11); drainage and drains in the runway strip (6.22.3); requirements for serviceability inspections (12.03, 17.01); Notice to Airman (NOTAM) requirements for bird hazards (5.17, 12.04, 17.05.2); bird strike report (17.01.3, 17.05.3), Reporting Officer responsibilities and training (17.06, 17.07), animal hazard management requirements (17.01, 17.02, 17.06); requirements for the wildlife hazard management plan (17.02.3, 17.03, 17.04); and requirements for bird hazard information in the safety management system (17.02.2, 25.03.4).	https://www.legislation.gov.au/Details/F2020C00797
Advisory Circular (AC) 139.C-16 v1.0 Wildlife Hazard Management	CASA	The AC is intended to provide recommendations and guidance for Part 139 compliance, by providing interpretative and explanatory material to assist aerodromes.	https://www.casa.gov.au/sites/default/files/2023-06/advisory-circular-139.c-16-wildlife-hazard-management.pdf
Transport Safety Investigation Act 2003	ATSB	Bird strikes are defined as reportable matters, of which written reports must be submitted within 72hrs.	https://www.atsb.gov.au/media/48094/tsi_act_regs.pdf
National Airports Safeguarding Framework Guideline C	Department of Infrastructure, Transport, Regional Development and Communications[17]	Aims to develop informed land use planning decisions to safeguard airports and their adjacent communities from wildlife hazards based on the international and national regulatory framework. The NASF allocates risk categories to incompatible land uses (very low to high), adhering to ICAO guidelines relative to radial distances from aerodromes, and recommends actions (incompatible, mitigate, monitor, no action) for both existing and proposed developments.	https://www.infrastructure.gov.au/sites/default/files/documents/3.1.4_Guideline_C.pdf

20 Formerly the Department of Infrastructure and Transport.

Table B2. NASF land use guidelines.

Land Use	Wildlife Attraction Risk	Actions for Existing Developments			Actions for Proposed Developments/ Changes to Existing Developments		
		3 km radius (Area A)	8 km radius (Area B)	13 km radius (Area C)	3 km radius (Area A)	8 km radius (Area B)	13 km radius (Area C)
Agriculture							
Turf farm	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Piggery	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Fruit tree farm	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Fish processing /packing plant	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Cattle /dairy farm	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Poultry farm	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Forestry	Low	Monitor	Monitor	No Action	Monitor	Monitor	No Action
Plant nursery	Low	Monitor	Monitor	No Action	Monitor	Monitor	No Action
Conservation							
Wildlife sanctuary / conservation area - wetland	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Wildlife sanctuary / conservation area - dryland	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Recreation							
Showground	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Racetrack / horse riding school	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Golf course	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Sports facility (tennis, bowls, etc)	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Park / Playground	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Picnic / camping ground	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Commercial							
Food processing plant	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Warehouse (food storage)	Low	Monitor	Monitor	No Action	Monitor	Monitor	No Action
Fast food / drive-in / outdoor restaurant	Low	Monitor	Monitor	No Action	Monitor	Monitor	No Action
Shopping centre	Low	Monitor	Monitor	No Action	Monitor	Monitor	No Action
Office building	Very Low	Monitor	No Action	No Action	Monitor	No Action	No Action
Hotel / motel	Very Low	Monitor	No Action	No Action	Monitor	No Action	No Action
Car park	Very Low	Monitor	No Action	No Action	Monitor	No Action	No Action
Cinemas	Very Low	Monitor	No Action	No Action	Monitor	No Action	No Action
Warehouse (non-food storage)	Very Low	Monitor	No Action	No Action	Monitor	No Action	No Action
Petrol station	Very Low	Monitor	No Action	No Action	Monitor	No Action	No Action
Utilities							
Food / organic waste facility	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Putrescible waste facility - landfill	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Putrescible waste facility - transfer station	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Non-putrescible waste facility - landfill	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Non-putrescible waste facility - transfer station	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Sewage / wastewater treatment facility	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Potable water treatment facility	Low	Monitor	Monitor	No Action	Monitor	Monitor	No Action

Table B3. Australian legislation and standards.

Instrument	Body/Department	Description	Link
Environment Protection and Biodiversity (EPBC) Act 1999	Commonwealth Department of Environment	The EPBC Act provides the framework for the protection of the Australian natural environment and its biodiversity and establishes processes that help to protect threatened species and ecological communities, and as well as promoting their recovery. Within the context of wildlife hazard management on airports, of principal consideration is the effect management actions, such as dispersal and lethal control, may have on threatened species. The management of species listed as either Critically Endangered, Endangered, Vulnerable or Conservation Dependent under the Act, may require Departmental approval and Airports may need to consult the Department for clarification. Whether an action is likely to impact upon animal species that are rare, endemic or otherwise valuable, such as listed threatened species and listed migratory species, either directly or on their feeding, nesting, breeding areas is of particular importance. Direct mortality of these species or removal of their habitat to remove or minimise hazards is undesirable but may be necessary where the risk to safety is deemed too significant. Each situation requires specific evaluation (see EPBC Referral Guidelines). The EPBC Act also identifies species protected under the various international migratory bird treaties (detailed next).	https://www.legislation.gov.au/Details/C2016C00777
Nature Conservation (Animals) Regulations 2020	Department of Environment and Science (QLD)	A Damage Mitigation Permit (DMP) issued by the Department of Environment and Science (DES) is required to cull, disturb, or interfere with wildlife. CNS is listed as a strategic airport as per the State Planning Policy (2020) and as such, under Section 41 and 42 of the Nature Conservation Regulations 2020, is exempt from requiring a DMP to control wildlife on the airport provided pre-conditions are met:	https://www.legislation.qld.gov.au/view/pdf/asmade/sl-2020-0136

Instrument	Body/Department	Description	Link
Nature Conservation (Animals) Regulations 2020	Department of Environment and Science (QLD)	The standing authorisation applies to strategic airports identified in the Queensland State Planning Policy.	
		The animal is causing, or may cause, damage at an airport and/or its presence at an airport is, or may be, a threat to a person's health and wellbeing.	
		The airport owner has made a reasonable attempt to prevent or minimise the threat (e.g. by installing a fence or an audio/visual deterrence device).	
		That action has failed.	
		The taking will not adversely affect the survival of the animal in the wild.	
		The proposed way of taking the animal is humane.	
		The owner of an airport must keep a record of an animal taken, removed or relocated, under this authorisation.	
Nature Conservation Act 1992	Department of Environment and Science (QLD)	Conservation of nature in Queensland through dedication, declaration and management of protected areas and the protection of native wildlife and its habitat.	https://www.legislation.qld.gov.au/view/html/inforce/current/act-1992-020
Japan-Australia Migratory Bird Agreement (JAMBA)	Commonwealth Department of Environment	Agreement between Australia and Japan to conserve migratory birds and their habitats. Wildlife species listed under international agreements afford them legislative protection in order to maintain populations and individuals.	http://www.austlii.edu.au/au/other/dfat/treaties/1981/6.html
China-Australia Migratory Bird Agreement (CAMBA)	Commonwealth Department of Environment	Agreement between Australia and China to conserve migratory birds and their habitats. Wildlife species listed under international agreements afford them legislative protection in order to maintain populations and individuals.	http://www.austlii.edu.au/au/other/dfat/treaties/1988/22.html

Instrument	Body/Department	Description	Link
Korea-Australia Migratory Bird Agreement (ROKAMBA)	Commonwealth Department of Environment	Agreement between Australia and the Republic of Korea to conserve migratory birds and their habitats. Wildlife species listed under international agreements afford them legislative protection in order to maintain populations and individuals.	http://www.austlii.edu.au/au/other/dfat/treaties/2007/24.html
Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)	Commonwealth Department of Environment	Wildlife species listed under international conventions afford them legislative protection to maintain populations and individuals.	http://www.cms.int/
Australian Animal Welfare Strategy (AAWS),	Department of Agriculture and Water Resources	Developed to ensure the humane treatment of all animals in Australia. The Strategy: • Provides an assessment of the relative humaneness of pest-animal control methods. • Provides SOPs that detail animal welfare impacts for target and non-target species and describe techniques and their application, as well as considering health and safety. • A model COP for each of the key pest animal species provides general information on best practice management, control strategies, species biology and impact, and the humaneness of current control methods.	http://www.agriculture.gov.au/animal/welfare/aaws

Instrument	Body/Department	Description	Link

Damage by Aircraft (DBA) Act 1999	Department of Infrastructure, Regional Development and Cities	• Imposes strict and unlimited liability.
		• Applies if a person or property on land or water suffers personal injury, loss of life, material loss, damage or destruction caused by:
		  ○ Impact with aircraft in flight
		  ○ Impact with aircraft that damaged or destroyed while in flight
		  ○ Impact with persons, animal or thing that dropped or fell from aircraft in flight
		  ○ Something that is a result of (1), (2) or (3).
		• If the act is applied, the owner or operator of the aircraft are jointly and severally liable.
		• Damages are recoverable under the DBA Act without proof of intention or negligence.
			https://www.legislation.gov.au/Details/C2013C00130

Off-aerodrome Hazards

Table B4. Summary of Australian regulatory and legislative requirements and recommendations for managing off-aerodrome wildlife hazards.

Regulation / Standard	Requirement / recommendation
CASR Part 139 MOS 2019. Section 11.08 (4)	The wildlife hazard management procedures must be included or referenced in the aerodrome manual to deal with hazards to aircraft operations caused by the presence of wildlife on or in the vicinity of the aerodrome, including details of the arrangements for proposed or actual sources of wildlife attraction outside the aerodrome boundary – liaising with the relevant planning authorities or proponents to facilitate wildlife hazard mitigation.
CASR Part 139 MOS 2019. Section 17.01 (1) (b)	As part of the aerodrome serviceability inspection, the aerodrome operator must monitor and recorded wildlife activity that is visible in the vicinity of the aerodrome or from the aerodrome.
CASR Part 139 MOS 2019. Section 17.01 (2)	The aerodrome operator, in consultation with the local planning authority, must attempt to monitor sites within 13 km of the aerodrome reference point that attract wildlife.
CASR Part 129 MOS 2019. Section 17.04 (2) (b)	The wildlife hazard management plan must at least identify sources and locations of wildlife attraction on the aerodrome and in the vicinity of the aerodrome which are likely to cause wildlife to transit the take-off, approach and transitional surfaces.
CASR Part 139 MOS 2019. Section 17.04 (2) (d)	The wildlife hazard management plan must at least specify the liaison arrangements for local planning authorities within a radius of at least 13 km from the aerodrome reference point.
CASA AC 139.C-16 v1.0 Section 2.2.5	The wildlife hazard management procedures should include: e) for proposed or actual sources of attraction outside the aerodrome boundary – liaising with the relevant planning authorities to facilitate wildlife hazard mitigation.

Regulation / Standard	Requirement / recommendation
CASA AC 139.C-16 v1.0 Section 2.3.8	Stakeholder engagement is a crucial aspect of an aviation management program. Involving and collaborating with various stakeholders helps to ensure a comprehensive and effective approach to wildlife management. Engage with stakeholders ensure that diverse perspectives are considered, fosters cooperation, and promotes a shared commitment to wildlife safety in aviation.
CASA AC 139.C-16 v1.0 Section 3.1.6	The wildlife hazard management plan must, as a minimum, include: f) specific liaison arrangements for local planning authorities within a radius of at least 13 km from the aerodrome reference point.
CASA AC 139.C-16 v1.0 Section 3.2.1	For effective wildlife hazard management processes, wildlife activities, including bird activities, should be continuously monitored within and in the vicinity of the aerodrome.
CASA AC 139.C-16 v1.0 Section 3.2.4	For aerodromes, where wildlife hazard management is established, the aerodrome operator must monitor and record the following as part of the aerodrome serviceability inspection: b) wildlife activity that is visible in the vicinity of the aerodrome and from the aerodrome.
CASA AC 139.C-16 v1.0 Section 3.2.6	The aerodrome operator, in consultation with the local planning authorities, must attempt to monitor sites within 13 km of the aerodrome that do or could attract wildlife.
CASA AC 139.C-16 v1.0 Section 3.2.11	Monitoring practices in the vicinity of an aerodrome: a) the aerodrome operator should establish a process to monitor and record the presence of wildlife activity that is visible within the vicinity of the aerodrome, or visible from the aerodrome. b) aerodrome operators, in consultation with the local planning authorities should conduct an inventory of sites that attract wildlife within a defined radius around the aerodrome, paying particular attention to sites close to the airside and the approach and departure paths. c) the radius for monitoring sites that attract wildlife should be 13km around the aerodrome reference point. However, the radius may be extended or reduced, based on a wildlife evaluation of the aerodrome vicinity.

Regulation / Standard	Requirement / recommendation
CASA AC 139.C-16 v1.0 Section 3.2.11	d) monitoring in the vicinity of the aerodrome may include but is not limited to: i. areas used for waste, recycling, offal, or sewage ii. wetlands, marshes, areas of water discharge and open waterways; areas containing significant food sources for high-risk species iii. national parks, wildlife reserves and other significant wildlife corridors. e) the identification of these areas can be achieved by: i. the observation of wildlife transiting across the aerodrome between separate sources of attraction ii. the physical observation of land uses in the aerodrome environment iii. any wildlife hazard reports received from pilots, authorities and/or the public. f) offsite aerodrome attraction sources (such as animal sale centres, picnic areas, aeration facilities, waste disposal and landfill areas etc.). g) climactic or seasonal considerations, such as the presence of wildlife at certain times of year.
CASA AC 139.C-16 v1.0 Section 3.5.3	For hazards identified in the vicinity of the aerodrome, the aerodrome operator should endeavour to engage with the local planning authorities to highlight the problem sources and implement mitigation measures.
CASA AC 139.C-16 v1.0 Section 3.5.7.2	Aerodrome operators should develop an inventory of sites, both within and in the vicinity of the aerodrome, which attract wildlife.
CASA AC 139.C-16 v1.0 Section 3.5.7.4	Off-aerodrome management may often require the support of local authorities and hazard mitigation measures should be initiated in associated with such agencies.

Regulation / Standard	Requirement / recommendation
CASA AC 139.C-16 v1.0 Section 3.5.7.5	The factors contributing to off-aerodrome wildlife activities depends on how the land use planning is implemented in those regions. The concept of compatible land use planning emphasises the relationship between airports and their neighbouring communities. It involves careful study and coordinated planning to ensure that land use around airports does not negatively impact aircraft safety.
CASA AC 139.C-16 v1.0 Section 3.5.7.6	Aerodrome operators should engage with local planning authorities and relevant stakeholders, to plan and implement compatible land use around aerodromes. Effective communication between aerodrome operators and local authorities is encouraged to raise awareness of safety concerns. Incompatible land use should be prevented or addressed through risk assessment processes.
CASA AC 139.C-16 v1.0 Section 3.5.7.7	Where necessary, local planning authorities may also be involved in the wildlife hazard management program. The strategies for compatible land use surrounding the aerodrome may be included in the WHMP or program.
CASA AC 139.C-16 v1.0 Section 3.5.7.8	Regular monitoring of sites with hazardous wildlife and periodic comprehensive land use surveys are recommended. Modern technology, such as satellite detection, can aid in registering and monitoring different land use types.
CASA AC 139.C-16 v1.0 Section 3.5.7.9	Engaging with neighbourhood groups may also prove beneficial in wildlife hazard management. For instance, collaboration with local farmers is important to encourage agricultural practices that are less attractive to hazardous species.
CASA AC 139.C-16 v1.0 Section 3.5.7.10	A list of types that should be prevented, eliminated or mitigated includes: a) fish processing b) agriculture c) cattle feed lots d) garbage dumps and landfill sites e) factory roofs and parking lots, or other infrastructure f) theatres and food outlets g) wildlife refuges h) artificial and natural lakes i) golf or polo courses, etc. j) animal farms k) slaughterhouses

International Context

Australia has international obligations as a contracting state to ICAO. As a signatory of the Convention on International Civil Aviation, Australia is required to maintain aviation rules that align with the requirements of the Convention. This includes standards for wildlife hazard management at civilian airports in accordance with Annex 14, Volume 1 (Aerodrome Design and Operation), which establishes requirements for the management of collisions between wildlife and aircraft and requires authorities to take actions to reduce the prevalence of wildlife attracting sites in the vicinity of airports. ICAO's regulations and standards inform CASA regulations and recommendations for wildlife management at airports and are therefore relevant to the airport bird and bat strike risk assessment.

Table B5. International regulations and standards.

Instrument	Body/Department	Description	Link
ICAO Annex 14, Volume 1 (Aerodrome Design and Operation)	ICAO	Establishes requirements for the management of collisions between wildlife and aircraft and requires authorities to take actions to reduce the prevalence of wildlife attracting sites in the vicinity of airports.	https://store.icao.int/en/annex-14-aerodromes
ICAO Airport Services Manual Doc. 9184: Part 2 Land Use and Environmental Control	ICAO	Provides airport personnel with guidance on land use planning within the vicinity of aerodromes, and the need for good planning and control measures. It focusses on how the airport impacts on its surroundings, and vice versa, with regard to people, flora, fauna, the atmosphere, water courses, air quality, soil pollution, rural areas, and the environment in general. It frequently discusses the significance of how some land use in the vicinity of airports, such as landfills, can influence an airport's strike risk profile. Appendix 2, Land-use Guidelines for the Avoidance of Bird Hazards, is particularly useful however it does remind readers that … "Any land use that had the potential to attract birds in the airport vicinity should be subject of a study to determine the likelihood of bird strikes to aircraft using the airport".	https://store.icao.int/en/airport-planning-manual-land-use-and-environmental-management-doc-9184-part-2

Instrument	Body/Department	Description	Link
ICAO Doc 9137 - Airport Services Manual Part 3, Wildlife Control and Reduction, (2012)	ICAO	Elaborates on the wildlife management responsibilities of airports, providing guidance on the development and implementation of effective airport wildlife management programs. It includes recommendations on hazard review and habitat management and identifies a recommended boundary for monitoring off-aerodrome wildlife hazards and land uses.	http://www.birdstrike.org/wp-content/uploads/2014/10/ICAO-AirportServicesManual-Part3-FourthEdition-2012.pdf
Bird Strike Guidelines	International Air Transport Association	Recommend the correct way to handle animal remains.	https://www.icao.int/APAC/Documents/APAC%20Guidance%20on%20National%20Procedures%20for%20Recording%20and%20Reporting.docx.pdf
International Best Practice Standards for Airport Bird Control	World Birdstrike Association (previously the International Bird Strike Committee)	Provides a series of standards relevant to all aspects of integrated wildlife hazard management programs on- and off- airports.	https://www.birdstrike.co.uk/ibsc-standards

Table B6. Relevant Codes of Practice and Guidelines.

State	Code Name	Authority	Link
Commonwealth	National Codes of Practices (Commercial and Non-Commercial) for the Human Shooting of Kangaroos and Wallabies.	Department of the Environment	http://www.environment.gov.au/biodiversity/wildlife-trade/publications/national-codes-practice-humane-shooting-kangaroos-and-wallabies
	Model Codes of Practice and Standard Operating Procedures for the humane capture, handling or destruction of feral animals in Australia.	Department of the Environment	http://www.environment.gov.au/biodiversity/invasive-species/publications/model-codes-practice-feral-animals
	Standard operating procedure BIR001: Shooting of pest birds.	N/A	https://www.pestsmart.org.au/shooting-of-pest-birds/
	Standard operating procedure FOX003: Ground Shooting of Foxes.	N/A	https://pestsmart.org.au/toolkit-resource/ground-shooting-of-foxes/
	Standard operating procedure HAR001: Ground Shooting of Hares.	N/A	https://pestsmart.org.au/toolkit-resource/ground-shooting-of-hares/
	Standard operating procedure RAB009: Ground Shooting of Rabbits.	N/A	https://www.pestsmart.org.au/ground-shooting-of-rabbits/
	Standard operating procedure for the shooting of flying-foxes.	N/A	http://www.environment.nsw.gov.au/resources/wildlifelicences/10861SOP.pdf

ICAO and Off-airport Hazards

Within the context of wildlife hazards, ICAO defines the airport vicinity into two radial distances from the Airport Reference Point; Area A being 3km, and Area B being 8km. These distances have been based in the known activity of birds, in general, aligned with standard aircraft flight paths around airports. Within these distances, ICAO provides land-use guidelines for acceptable and unacceptable land uses). ICAO also indicate that the placement of food waste landfills within 13km of and aerodrome is of concern.

Furthermore, the International Bird Strike Committee's Best Practice Standards (2006) recommend the establishment of a 13 km circle from the Aerodrome Reference Point, within which an inventory of wildlife hazards should be established, and risk assessments completed to determine the level of contribution to the strike risk.

Table B7. ICAO Land Use Guidelines for the Avoidance of Bird Hazards (Source: ICAO Doc 9184, Appendix 2).

Land Use	Area A	Area B	Land Use	Area A	Area B
Agriculture			*Commercial**		
Landscape nurseries*	YES	YES	Offices	YES	YES
Tree farming*	YES	YES	Retail sales	YES	YES
Stock farming*	YES	YES	Hotels and motels	YES	YES
Dairy farming*	YES	YES	Restaurants	YES	YES
Sod farming	NO	YES	Parking lots	YES	YES
piggeries	NO	YES	Indoor theatres	YES	YES
Fruit tree farming	NO	YES	Warehouses	YES	YES
			Shopping centres	YES	YES
Wildlife Sanctuaries			Service stations	YES	YES
Bird sanctuaries	NO	NO	Cemeteries	YES	YES
Game reserves	NO	NO	Drive-in restaurants	NO	YES
			Food-processing plants	NO	YES
Recreational					
Golf courses*	YES	YES	*Municipal Utilities*		
Parks*	YES	YES	Water treatment	YES	YES
Playgrounds*	YES	YES	Non-food garbage landfill	YES	YES
Athletic fields*	YES	YES	Food garbage disposal	NO	NO
Riding fields*	YES	YES	Source: ICAO Doc 9184 (originally sources from Transport Canada Land use in the Vicinity of Airport		
Tennis, lawn bowling*	YES	YES			
Picnic and campgrounds	YES	YES	*These are general guidelines for planning and land-use zoning only. The avoidance of bird hazards during airport operations is another subject that can involve special controls to keep land free from food and shelter for birds		
Riding academies	NO	YES			
Racetracks	NO	YES			
Fair grounds	NO	YES			

Appendix C: Roles and Responsibilities

Table C1. WHMP roles and responsibilities, CNS Airport.

Position	Responsibilities
Chief Operating Officer	Endorse the final WHMP.
	Attend or send a delegate to attend the SASF.
	Provide resources for implementing the WHMP.
Aerodrome Operations Manager	Review all proposed developments on CNS controlled land that has the potential to increase the risk of wildlife strikes or select a delegate to review all proposed developments. Request modifications to proposals where a risk increase is likely.
	Ensure landowners within 13km of CNS advise CNS of land use changes or developments that have potential to influence wildlife hazards at CNS. Request modifications to proposals where a risk increase is likely.
	Distribute all NOTAMs and Bird Watch Condition Reports to the SASF members.
	Maintain the WHMP under continuous review.
	Ensure DNA samples are sent to the Australian Museum for analysis and results are updated to ATSB and Avisure.
	Attend the SASF meetings or delegate a representative.
	Liaise with the AOS to expand the wildlife dispersal tools to include stockwhip, handheld spotlight, electronic starter pistol, and wildlife catcher pole.
	Liaise with maintenance teams to install exclusion devices, such a drain curtains and netting, in airport infrastructure to decrease wildlife nesting attraction.
	Ensure the Cairns Airport ERSA and ATIS is updated to communicate wildlife hazards to stakeholders.

Position	Responsibilities
	Oversee works to manage airside water that attract wildlife (e.g. drains and temporary retention areas).
Aerodrome Operations Manager	Aerodrome Operations Manager Ensure nesting exclusion devices are installed and maintained.
	Coordinate input from any external wildlife hazard management specialists.
	Ensure all wildlife strike data is updated following DNA analysis results.
	Invite representatives from the following stakeholders to the Safety and Security Forum to discuss wildlife hazards: • Department of Environment and Science • Cairns Regional Council (Waste and Water) • Czek's Farm • Suez • Machans Beach Road Outdoor Sports Facility • All Ponderosa Prawn Farm
	Ensure the CNS Aerodrome Manual includes references to relevant sections of the WHMP.
	Develop Memorandum of Understandings, including wildlife hazard communication and standing authorisation for subcontractors to complete wildlife surveys, with the following sites: • Cairns Regional Council (wastewater treatment plants and transfer stations) • Czek's Farm • Suez Compost Facility • Machans Beach Road Outdoor Sports Facility • All Ponderosa Prawn Farm.
	Chair the SASF meetings or delegate a representative.

Position	Responsibilities
	Coordinate interactions with SASF stakeholders for the management of land use surrounding the airport.
Aerodrome Operations Manager	Liaise with ATSB to receive wildlife strike summary reports and ensure CNS wildlife strike data is up to date.
	Review all proposed developments, including landscaping plans, on CNS controlled land that has the potential to increase the wildlife strike risk.
	Oversee the implementation and review of the WHMP.
	Issue the WHMP and procedures to relevant staff and ensure implementation.
	Ensure ASOs are trained and competent in the functions required for wildlife hazard management, including inspections, bird counts, bird and animal identification and behaviour, bird harassment and reporting techniques. Ensure refresher training is kept up to date.
	Ensure TrackerAIRSIDE™ is updated to record all wildlife hazards.
	Ensure ASOs receive working at heights training and certification to assist with egg and nest removal.
	Ensure ASOs and other relevant CNS staff deal adhere to the procedures and actions detailed in the WHMP.
	Ensure ASOs remove all wildlife nests and eggs from airside areas to decrease habituation.
	Ensure ASOs identify all strike carcasses, or seek advice from consultants, and DNA samples are collected and, where required, sent to the Australian Museum for analysis to assist with species identification.
	Liaise with the AOS to update TrackerAIRSIDE™ forms as per the Wildlife Hazard Assessment (2022).
	Liaise with airport operators, local government, and other stakeholders to assist in identifying and managing wildlife issues. Invite relevant external stakeholders to SASF meetings to assist with wildlife management at off airport sites.
	Assess all developments, on and off airport, for their wildlife strike risk.
	Issue Wildlife Hazard Notifications, including NOTAM, Bird Watch Condition Reports, and updating ERSA and ATIS.
	Ensure the CNS Aerodrome Manual includes references to relevant sections of the WHMP.

Position	Responsibilities
	Attend the SASF meetings or delegate a representative.
Aerodrome Operations Manager	Provide information regarding wildlife hazards and their management at CNS to regulatory authorities and operational publications as required.
	Provide input in the revision of the WHMP and associated procedures.
	Ensure compliance with permit conditions.
	Where necessary, assist with the management and control of birds and other wildlife in occupied buildings and hangars.
	Liaise with the MA to develop and implement a wildlife hazard awareness campaign aimed at airports, ATC, aerodrome maintenance staff, environment managers and wildlife managers.
	Liaise with off-airport landowners and facility managers to develop and/or update wildlife hazard management plans.
	Liaise with MA and AOS to expand the wildlife dispersal tools to include stockwhip, handheld spotlight, electronic starter pistol, and wildlife catcher pole.
	Ensure TrackerAIRSIDE™ forms are kept up to date and meet legislative requirements.
	Liaise with DES to receive quarterly flying-fox camp data as part of the National Flying-fox Monitoring Scheme.
	Liaise with MA to investigate options to install exclusion devices to prevent airside nesting of hazardous wildlife.
	Update the CNS Aerodrome Manual to meet new CASR Part 139 MOS requirements.
Airport Operations Supervisor	Attend the SASF meetings or delegate a representative.
	Provide information regarding wildlife hazards and their management at CNS to regulatory authorities and operational publications as required.
	Provide input in the revision of the WHMP and associated procedures.
	Ensure compliance with permit conditions.

Position	Responsibilities
Airport Operations Supervisor	Liaise with the AOM to develop and implement a wildlife hazard awareness campaign aimed at airports, ATC, aerodrome maintenance staff, environment managers and wildlife managers.
	Update TrackerAIRSIDE™ forms as per the Wildlife Hazard Assessment (2022).
	Liaise with AOM to expand the wildlife dispersal tools to include stockwhip, handheld spotlight, electronic starter pistol, and wildlife catcher pole.
	Where necessary, assist with the management and control of birds and other wildlife in occupied buildings and hangars.
	Attend wildlife hazard management training and firearms training as required.
ICT Business Analyst Programmer	Maintain the database detailing species and number of wildlife culled as part of airfield management.
	Liaise with the AOM to update all wildlife strike data with DNA results from the Australian Museum.
	Send CNS monthly wildlife data to Avisure for analysis.
CNS Airport Safety Officers	Communicate immediate wildlife hazards to ATC to update the ATIS.
	Undertake standardised inspections during the day and night and assess, record and report as described in the relevant sections of the WHMP and any procedures.
	Undertake weekly Wildlife Counts.
	Manage wildlife and their habitats as described in the relevant sections in the WHMP and adhere to wildlife management procedures.
	Ensure that all mowing practices align with the WHMP.
	Ensure all vegetated areas, drainage systems and any bird deterrent measures are maintained.
	Disperse wildlife that pose a risk to safe aircraft operations and preventing nesting airside.
	Use, store and maintain firearms and ammunition as required by CNS's firearms policy and procedures.
	Record management actions as per wildlife management procedures.

Position	Responsibilities
CNS Airport Safety Officers	Report bird strikes.
	Perform wildlife egg and nest removal airside as per the Nature Conservation (Animals) Regulations 2020.
	Collect and maintain dispersal data, including firearm and ammunition use.
	Coordinate with aircrews and ground support personnel the collection of all strike remains and assist with species identification.
	Collect and store wildlife carcasses from confirmed/possible strikes for identification and organise disposal.
	Use firearm safely and in accordance with the Firearms Procedures and Safe Work Method Instructions.
	Regularly review waste management practices at the airport to secure food and waste attractants for birds and other wildlife.
	Provide input in the revision of the WHMP and associated procedures.
	Attend the SASF meetings.
CNS Ground Staff	Mow grassed areas at night in high-risk areas to reduce wildlife attraction.
Avisure (Consultant)	Undertake quarterly standardised airside wildlife surveys.
	Undertake quarterly standardised wildlife surveys for off-airport land use areas identified as a risk to the airport and report as described in the relevant sections of the WHMP.
	Prepare wildlife strike data and depredation data and monitor species risk and hazards.
	Provide monthly, quarterly, and annual reports to CNS.
	Where required, provide training to CNS staff.
	Provide expert advice on environmental and wildlife hazard when required.
	Where required, review off-airport development applications for wildlife attraction.
	Update the Wildlife Hazard Management Plan.
	Attend the SASF meetings.

Position	Responsibilities
Paul Fisk (Consultant)	Undertake monthly standardised airside wildlife surveys.
	Undertake monthly standardised wildlife surveys for off-airport land use areas.
	Provide monthly reports to CNS.
Aircraft Operators	Require air and ground crews to promptly inform ASOs of all wildlife strikes or hazardous conditions.
	Require ground staff to relay evidence of strikes including damage, carcasses, feathers, or other material to ASOs for collection.
	Provide details of strikes to the ASO.
	Maintain awareness of the WHMP and forward recommendations to Aerodrome Operations Manager.
	Where appropriate, consider changing operations to avoid hazardous times and locations.
	Attend SASF meetings.
CNS Staff and Contractors	Ensure waste is disposed of appropriately and bins and other waste storage facilities are maintained with closed lids or other suitable covering wherever practicable.
Airport Tenants	Ensure waste is disposed of appropriately and bins and other waste storage facilities are maintained with closed lids or other suitable covering wherever practicable.
	Report observations of bird nesting in all infrastructure to the ASOs.
	Attend SASF meetings.
Safety and Security Forum	Meet quarterly.
	Share information, identify risks and ensure stakeholders are engaged in collaborative management of these risks.
	Discuss relevant wildlife issues and management practices.
	Review the WHMP.

Position	Responsibilities
Safety and Security Forum	Review bird strike reports, cull reports, bird count reports, and overall strike statistics and discuss strategies for improvement as required.
	Review performance against Scorecard outlined in the Data Review SOP.
	Discuss on- and off-airport strategies to manage wildlife hazard.

Table C2. Qualifications and experience of personnel responsible for the development and implementation of the CNS WHMP.

Name	Industry experience	Position	Qualifications, courses, and licences	Relevant experience
CNS staff responsible for the development and implementation of the WHMP				
Davy Semal	15 years	Aerodrome Operations Manager	• Civil Aviation Safety Authority Drug and Alcohol Management Plan Supervisor, October 2022 • International Airport Professional - Global ACI-ICAO Airport Management Professional Accreditation Programme (AMPAP), September 2022 • Cert IV Leadership and Management, February 2019 • Airport Reporting Officer and Works Safety Officer Refresher Training, 2019 • Aviation Safety Management System, April 2017 • Airport Reporting and Works Safety Officer Training, 2016 • Basic Wildlife Hazard Management Training (2-day course), Avisure, July 2016 • Commercial Pilot License – Aeroplane, January 2011 • Avisure Wildlife Hazard Management Training, August 2023	• Commercial Pilot for North Queensland Aero Club (2 years) • Flight Operations Management in remote Northern Territory (3 years). • Aerodrome Operations Management in Northern Australia and Queensland (6.5 years)

Name	Industry experience	Position	Qualifications, courses, and licences	Relevant experience
Lucy Friend	8 years	Environment Manager	• Bachelor of Science, Environmental Management, 2015 • Graduate Certificate of Data Science, Science and Engineering, 2018	• Environment Manager NQA, 8 years.
Mark Musumeci	6 years	Aerodrome Operations Supervisor	• Airside Safety Essentials Course, 2021 • ARO/WSO Refresher Course, 2021 • Wildlife Hazard Management Essentials, 2021 • QLD Category A, B Weapons Licence (current) • Avisure Wildlife Hazard Management Training, August 2023	• Operations Supervisor – Hinterland Aviation (2014-2016) • Airport Safety Officer – Cairns Airport (2016-2018) • Aerodrome Operations Supervisor – Cairns Airport (2018-Current)
Craig Tatlow	10 years	ASO	• AAA Wildlife Hazard Management, 2021 • Avisure Wildlife Hazard Management Training, August 2023	• CNS ASO, 10 years
Bruno Fogale	20 years	ASO	• AAA Wildlife Hazard Management, 2021 • Avisure Wildlife Hazard Management Training, August 2023	• CNS ASO (20 years)
Shane Porter	20 years	ASO	• AAA Wildlife Hazard Management, 2021 • Avisure Wildlife Hazard Management Training, August 2023	• CNS ASO (15 years)

Name	Industry experience	Position	Qualifications, courses, and licences	Relevant experience
Jamie Hughes	15 years	ASO	• Cert IV in Training and Assessment • AAA Wildlife Hazard Management, 2021 • Avisure Wildlife Hazard Management Training, September 2023	• CNS ASO (15 years)
Liam West	12 years	ASO	• AAA Wildlife Hazard Management, 2021 • Avisure Wildlife Hazard Management Training, August 2023	• CNS ASO (12 years)
Steven Harris	5 years	ASO	• AAA Wildlife Hazard Management, 2021 • Avisure Wildlife Hazard Management Training, September 2023	• CNS ASO (5 years)
Leonard Talbot	8 years	ASO	• AAA Wildlife Hazard Management, 2021 • Avisure Wildlife Hazard Management Training, August 2023	• CNS ASO (8 years)
Frank Veric	1 year	ASO	• AAA Wildlife Hazard Management, 2022 • Avisure Wildlife Hazard Management Training, August 2023	• CNS ASO (1 year)
Mark Ashby	10 years	ASO	• AAA Wildlife Hazard Management, 2022 • Avisure Wildlife Hazard Management Training, August 2023	• CNS ASO (1 year)

Name	Industry experience	Position	Qualifications, courses, and licences	Relevant experience
Avisure Consultants involved in the development of the 2022/23 WHMP				
Alexandra Stone	7 years	Senior Wildlife Biologist	• Certificate II in Information Technology, John Paul College 2010 • Certificate II in Animal Studies, Australian Agricultural College Corporation 2011 • Bachelor of Applied Science (Wildlife Science), University of Queensland 2016 • Aerodrome Reporting and Works Safety Officer, Australian Airports Association, 2020 • Queensland Category A, B, C and H Weapons Licenses	• Wildlife biologist for numerous airport wildlife hazard management projects (6.5 years). • Experienced in wildlife hazard assessments and compliance audits, WHMP preparation, wildlife hazard management training, wildlife surveys, wildlife dispersal and GIS mapping.
Martin Ziviani	18 years	Senior Wildlife Biologist	• Bachelor of Environmental Science, Griffith University, 1990 • Aerodrome Reporting and Works Safety Officer, Australian Airports Association, 2020	• Wildlife biologist for numerous airport wildlife hazard management projects (18 years). • Experienced in wildlife hazard assessments and compliance audits, WHMP preparation, wildlife hazard management training, wildlife surveys, and wildlife dispersal.

Name	Industry experience	Position	Qualifications, courses, and licences	Relevant experience
Kylie Patrick	20 years	Principal Consultant	• Bachelor of Applied Science (Environmental Management), Southern Cross University, 1996 • Bachelor of Applied Science (Ecology), Queensland University of Technology, 2003	• Wildlife biologist and project manager for numerous airport wildlife hazard management projects (19 years). • Experienced in wildlife hazard assessments and compliance audits, wildlife hazard management plans, wildlife surveys and dispersal, off-airport wildlife hazard assessments, and wildlife hazard management training.
Tyler Rogers	8 years	Wildlife Biologist	• Bachelor of Science (Biology and Environmental Science), Trent University 2012	• Wildlife Biologist for Vancouver International Airport wildlife hazard management program (8 years). • Experienced in WHMP preparation, wildlife surveys, and wildlife dispersal for numerous wildlife hazard management programs.
Madelynne O'Neill	3 months	Graduate Wildlife Biologist	• Bachelor of Environmental Science, Griffith University 2023	• Biologist for numerous airport wildlife hazard management projects (3 months). • Experienced in wildlife surveys and wildlife hazard reporting.

Appendix D: Risk Assessment Methods

Part 139 MOS Section: 17.02

Definitions

(Source: AS/NZS 31000:2018 Risk Management)

Hazard	A source of potential harm or a situation with a potential to cause loss.
Risk	The chance of something happening that will have an impact (either positive or adverse) on objectives and is measured in terms of the probability (or likelihood) of an event and its consequences.
Likelihood	A qualitative description of probability or frequency.
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.

Management of bird and other wildlife hazards at Aerodromes requires an understanding of wildlife populations, their behaviour, and the risk management process. This assessment followed the process outlined in Australian and New Zealand Standard 31000:2018 Risk Management, Figure D1.

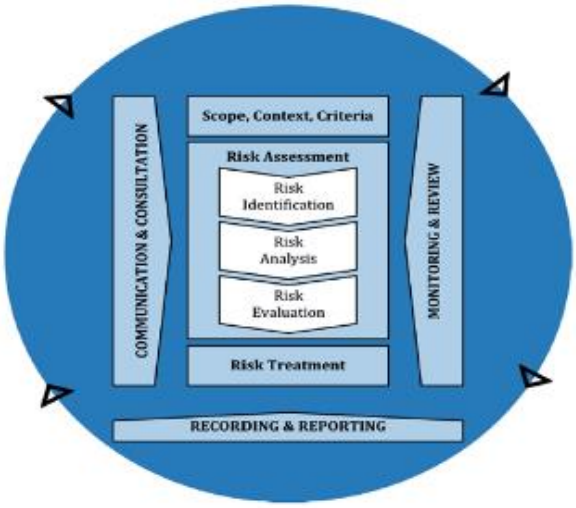


Figure D1. The risk management process (Source: AS/NZS 31000:2018 Risk Management).

Previous efforts to rank species according to risk level have involved one of the following:

- Using national databases to indicate risk level across a country (Dolbeer et al., 2000). This lacks the resolution required to determine risk at a particular Aerodrome, although may be useful as a guide.
- Subjective assessment based on knowledge of bird species present, interpretation of the strike history and professional judgement. This is the primary methodology used by advisors to Aerodromes worldwide.
- A more formalised, yet still subjective assessment of risk based on scoring a species for categories such as population size, bird mass, flock size, time of day, location on Aerodrome, time spent in air, etc. (Carter, 2001; Morgenroth, 2003). This assessment is open to the vagaries of professional interpretation and cannot be easily used to compare one Aerodrome with another, or objectively compare one year to the next.
- A determination of probability of strike based on bird strike history at the Aerodrome over the previous five years to determine a yearly average for each species and using percentage of strikes causing damage for each species in a national bird strike database to determine consequence levels (Allan et al., 2003). This methodology does not consider the effect of differences in numbers of aircraft movements both between Aerodromes and across the same Aerodrome for different time periods. It also cannot categorise species which have not been struck in the previous five years period but remain a significant risk. It is also dependent on effective bird strike reporting which is consistent over time.

Survey Risk Assessment (Shaw, 2004)

Avisure has developed a model for determining risk categories using professional bird survey data. The survey data is used to derive probability factors (population size, position on Aerodrome, time spent in air and the species ability to avoid) and consequence factors (bird mass and flock size) for all species recorded. The combination of these probability and consequence factors give a numerical risk index, the Species Risk Index (SRI). This provides a real-time method of risk assessment as it is able to react to observed changes in airside bird assemblages and movement patterns.

The following tables outline the risk rating for wildlife species according to calculated SRI, and the risk ranking of an Aerodrome.

Table D1. Species Risk Index and Aerodrome Survey Risk Index for determining risk categories based on survey data.

SRI ranges used to rate risk for each species		ASRI ranges used to rate risk of an Aerodrome	
SRI	Risk rating	ASRI	Risk rating
>1000	Very high	>10000	Very high
100 to 999.9	High	1000 to 9999.9	High
10 to 99.9	Moderate	100 to 999.9	Moderate
1 to 9.9	Low	10 to 99.9	Low
< 1	Very low	< 10	Very low

The process intends to provide a transparent, logical and systematic approach to the identification and treatment of wildlife related risks at the aerodrome.

References

Allan, J., 2006, *A Heuristic Risk Assessment Technique for Birdstrike Management at Airports*. Risk Analysis, Vol. 26, No. 3, pp. 723-729, June 2006.

Carter, N., 2001, *All Birds are not Created Equal: Risk Assessment and Prioritisation of Wildlife Hazards at Airfields.* In Bird Strike 2001, Calgary, Canada.

Dolbeer, R., Wright, S., and Cleary, E., 2000, *Ranking the hazard level of wildlife species to aviation*, Wildlife Society Bulletin 28:372–378.

Morgenroth, C., 2003, *Development of an index for calculating the flight safety relevance of bird species for an assessment of the bird strike hazard at Aerodromes*. Bird and Aviation 23.

Shaw, P., 2004, *A model for determining risk categories for birds at Aerodromes using bird survey data*. Bird Strike Conference 2004, Baltimore, USA.

Standards Australia/Standards New Zealand, 2018, *AS/NZS 31000:2018 Risk Management Risk Management – Principles and Guidelines*. Sydney, New South Wales, Australia.

Appendix E: Avisure Survey Methods

Avisure divided the airside area into sectors, assigned each an observation point, and completed four surveys (early morning, middle of the day, late afternoon, and post-dusk). The observation points overlooked each sector (Figure E1).

Diurnal Surveys

The observer travelled from one observation point to the next following a set route through each sector making observations while en-route. The observer spent five minutes at each observation point, recording all wildlife seen. Birds in transit or thermalling in the aerodrome boundary or in aircraft flight paths are recorded regardless of whether they are in the current sector or not. Binoculars were used to assist with identification of wildlife. Information recorded in the database included: time, species, number sighted, and position, estimated height above ground level, heading and activity (breeding, chasing, foraging, perching, sheltering, thermalling or transiting). Survey records also include ambient conditions (first and last light, rainfall, temperature, air pressure, wind speed and direction).

Nocturnal Survey

The observer travelled from one observation point (Figure E1) to the next in a continuous motion, stopping when necessary to identify species, using a spotlight and vehicle high-beams to illuminate as much of the airside habitat as possible. The observer drove the vehicle at or less than 15 kph to allow effective scanning with the spotlight. Binoculars assisted with identification of wildlife. Information recorded in the database included: time, species, number sighted, and position, estimated height above ground level, heading and activity (breeding, chasing, foraging, perching, sheltering, thermalling or transiting). Survey records also include ambient conditions (first and last light, rainfall, temperature, air pressure, wind speed and direction.

Off-airport Surveys

The observer travelled to each off-airport site as outlined in the WHMP off-airport schedule (Figure E2). Depending on the site, the observer walked from one observation point to the next in a continuous motion, stopping when necessary to identify species, or spent ten minutes at one advantage point, recording all wildlife observed during this time. Birds observed in transit or thermalling within the site's boundary, or vacating the site, were recorded. Binoculars assisted with identification of wildlife. Information recorded in the database included; time, species, number sighted, and position, estimated height above ground level, heading and activity (breeding, chasing, foraging, perching, sheltering, thermalling or transiting). Survey records also include ambient conditions (rainfall, temperature, air pressure, wind speed and direction).

Limitations:

- Sampling was not always from independent replicates: wildlife could be counted twice if they move between sectors with common boundaries, although this was avoided where possible.
- Visibility in areas such as drainage channels and reed beds are lower, thus wildlife in these areas may be under-represented in the data.
- Observations of transiting and thermalling birds, regardless of whether or not they were inside the particular observation sector, may have increased the representation of some bird species which tend to transit or thermal. In some circumstances, transiting birds may have been missed due to the position of the observer.
- The cryptic nature of some bird species may result in the under-representation of these species in the data.
- Ideally, simultaneous all sector counts must get a true representation of species and numbers.

Despite its limitations, this method is satisfactory for good trend analysis if applied consistently between time and operators.

PR7534_MPE1_AirsideSurveyMap.pdf

Figure E1 Avisure diurnal survey locations at CNS.

Figure E1: On-airport wildlife survey route, CNS

Cairns Airport Pty Ltd

Wildlife Hazard Management Program 2022/23

Survey start & end points

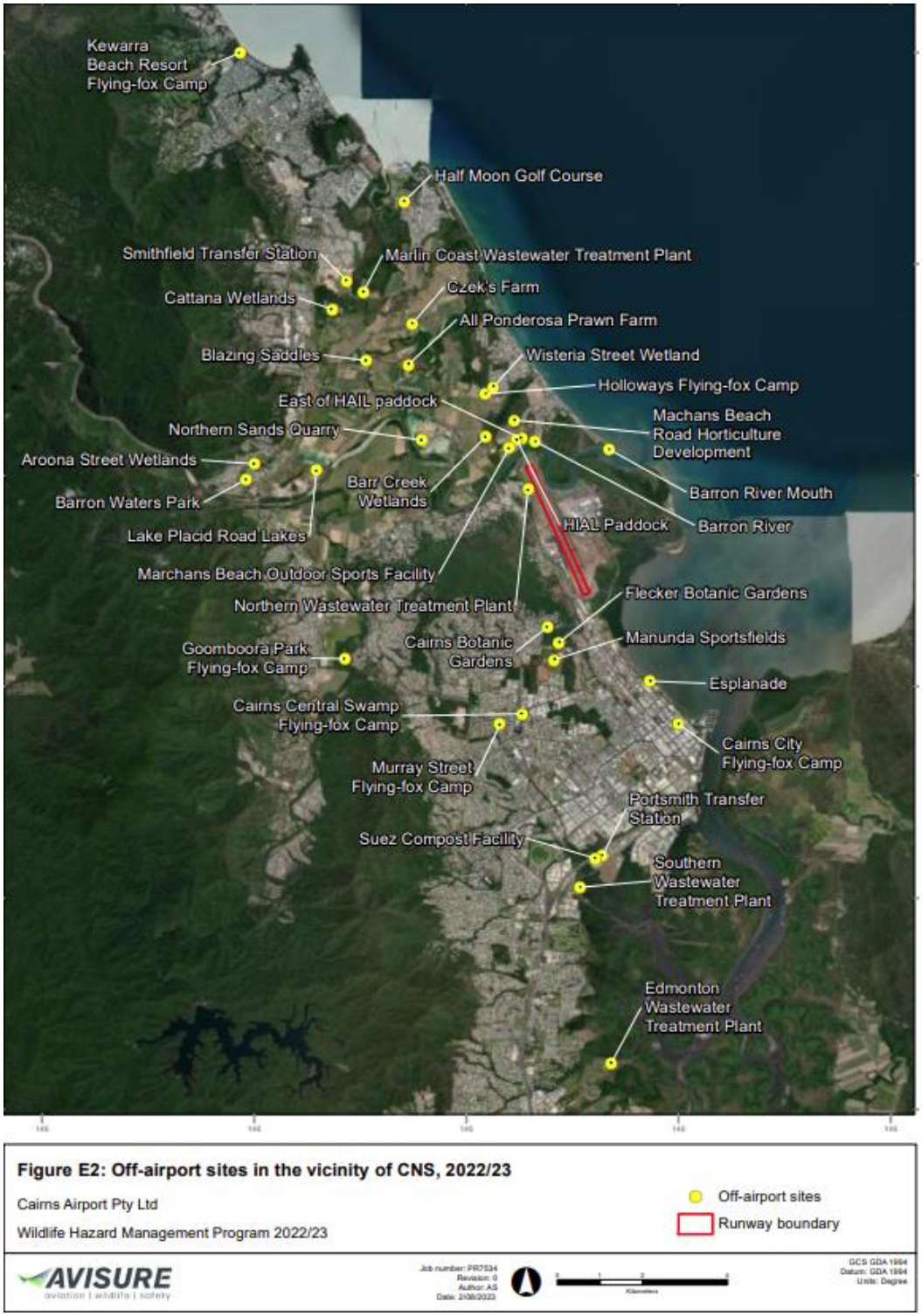
Survey points

Diurnal survey route

Runway boundary

PR7534_MPE2_OffAirportMap.pdf

Figure E2 Off-airport sites in the vicinity of CNS.



Appendix F: Off-airport Sites NASF Risks

Table F1. CNS off-airport site recommended monitoring actions based on NASF guidelines.

Feature	Distance[18] (km)	Description	High/Moderate Species	NASF Type	NASF Risk	NASF Action	Monitoring Action
<3km							
Northern Wastewater Treatment Plant 	1.1	Wastewater treatment plant bordering CNS	Masked Lapwing	Sewage/wastewater treatment facility	Moderate	Mitigate	Quarterly (Avisure) Daily (ASO)
Barron River 	2.1	Natural river surrounded by mangroves	Radjah Shelduck	Wildlife sanctuary / conservation area - wetland	High	Mitigate	Quarterly (Avisure) Daily (ASO)

21 From the ARP

Feature	Distance[18] (km)	Description	High/Moderate Species	NASF Type	NASF Risk	NASF Action	Monitoring Action
<3km							
HIAL Paddock 	2.08	Paddock surrounded by paddocks, a river, and a man-made waterbody	Cattle Egret Masked Lapwing Straw-necked Ibis	N/A	N/A	N/A	Quarterly (Avisure) Daily (ASO)
Barron River Mouth 	2.1	Natural river surrounded by beaches and an ocean	Beach Stone-curlew	Wildlife sanctuary / conservation area - wetland	High	Mitigate	Quarterly (Avisure)
Machans Beach Outdoor Sports Facility 	2.2	Man-made water body surrounded by paddocks	Nil	Sports facility	Moderate	Mitigate	Quarterly (Avisure) Daily (ASO)

Feature	Distance[18] (km)	Description	High/Moderate Species	NASF Type	NASF Risk	NASF Action	Monitoring Action
<3km							
East of HIAL paddock	2.3	Paddock surrounded by paddocks, a river, and a man-made waterbody	Australian White Ibis Bush Stone-curlew Cattle Egret Straw-necked Ibis	N/A	N/A	N/A	Quarterly (Avisure) Daily (ASO)
Cairns Botanic Gardens 	2.4	Botanic Gardens surrounded by suburbs	Nil	Wildlife sanctuary / conservation area - wetland	High	Mitigate	Annually (Avisure)
Marchans Beach Road Horticulture Development 	2.6	Open grassed areas proposed for development	Nil	N/A	N/A	N/A	Quarterly (Avisure)
Barr Creek Wetlands	2.7	Natural waterbody surrounded by swamp and farmland	Beach Stone-curlew Bush Stone-curlew	Wildlife sanctuary / conservation area - wetland	High	Mitigate	Quarterly (Avisure)

Feature	Distance[18] (km)	Description	High/Moderate Species	NASF Type	NASF Risk	NASF Action	Monitoring Action
<3km							
Flecker Botanic Gardens 	2.8	Botanic Gardens with large waterbodies surrounded by suburbs	Orange-footed Scrubfowl Pacific Black Duck	Wildlife sanctuary / conservation area – wetland	High	Mitigate	Quarterly (Avisure)

Feature	Distance[18] (km)	Description	High/Moderate Species	NASF Type	NASF Risk	NASF Action	Monitoring Action
≥ 3km and ≤ 8km							
Holloways Flying-fox Camp 	3.5	Vegetated area surrounded by suburbs	Nil	Wildlife sanctuary / conservation area - wetland	High	Mitigate	Annually (Avisure)
Wisteria Street Wetland 	3.6	Vegetated area surrounded by suburbs	Nil	Wildlife sanctuary / conservation area - wetland	High	Mitigate	Quarterly (Avisure)
Northern Sands Quarry 	3.7	Man-made quarry surrounded with waterbodies	Australian Pelican Black-necked Stork Brahminy Kite Masked Lapwing Pacific Black Duck Radjah Shelduck	N/A	N/A	N/A	Quarterly (Avisure)

Feature	Distance[18] (km)	Description	High/Moderate Species	NASF Type	NASF Risk	NASF Action	Monitoring Action
≥ 3km and ≤ 8km							
Esplanade 	4.2	Man-made footpath along the beach and surrounded by parkland	Nil	N/A	N/A	N/A	Annually (Avisure
Cairns Central Swamp Flying-fox Camp 	4.5	Vegetated area surrounded by suburbs	Nil	Wildlife sanctuary / conservation area - wetland	High	Mitigate	Quarterly (Avisure)
Murray Street Flying-fox Camp 	4.9	Vegetated area surrounded by suburbs	Nil	Wildlife sanctuary / conservation area - dryland	Moderate	Monitor	Annually (Avisure)

Feature	Distance[18] (km)	Description	High/Moderate Species	NASF Type	NASF Risk	NASF Action	Monitoring Action
≥ 3km and ≤ 8km							
All Ponderosa Prawn Farm 	5.1	Man-made waterbodies surrounded by farmland and mangroves	Australian White Ibis Grey Teal Masked Lapwing Pacific Back Duck Radjah Shelduck	Fish processing / packing plant	High	Mitigate	Quarterly (Avisure)
Cairns City Flying-fox Camp 	5.4	Vegetated area surrounded by suburbs	Nil	Wildlife sanctuary / conservation area - dryland	Moderate	Monitor	Quarterly (Avisure)
Lake Placid Road Lakes 	5.7	Man-made lakes surrounded by parks and suburbs	Black-necked Stork Cattle Egret Masked Lapwing Pacific Black Duck Unidentified Duck	Wildlife sanctuary / conservation area - wetland	High	Mitigate	Quarterly (Avisure)

Feature	Distance[18] (km)	Description	High/Moderate Species	NASF Type	NASF Risk	NASF Action	Monitoring Action
≥ 3km and ≤ 8km							
Goomboora Park Flying-fox Camp 	5.8	Vegetated area surrounded by suburbs	Nil	Wildlife sanctuary / conservation area - dryland	Moderate	Monitor	Annually (Avisure)
Czek's Farm 	5.8	Man-made farm dams surrounded by mangroves and sugar cane.	Australian White Ibis Cattle Egret Masked Lapwing Pacific Black Duck Wandering Whistling-Duck	Wildlife sanctuary / conservation area - wetland	High	Mitigate	Quarterly (Avisure)
Blazing Saddles 	5.8	Man-made farm dam surrounded by vegetation and suburbs.	Cattle Egret Masked Lapwing	N/A	N/A	N/A	Quarterly (Avisure)

Feature	Distance[18] (km)	Description	High/Moderate Species	NASF Type	NASF Risk	NASF Action	Monitoring Action
≥ 3km and ≤ 8km							
Manunda Sportsfields 	5.9	Man-made sports ovals	Feral Pigeon Masked Lapwing Straw-necked Ibis	Sports facility	Moderate	Mitigate	Quarterly (Avisure)
Aroona Street Wetlands 	7.0	Man-made waterbodies surrounded by suburbs and a retirement village	Australian White Ibis Pacific Black Duck Straw-necked Ibis	Wildlife sanctuary / conservation area - wetland	High	Mitigate	Annually (Avisure)
Marlin Coast Wastewater Treatment Plant 	7.1	Wastewater treatment plant	Masked Lapwing Pacific Black Duck Radjah Shelduck	Sewage/wastewater treatment facility	Moderate	Monitor	Quarterly (Avisure)

Feature	Distance[18] (km)	Description	High/Moderate Species	NASF Type	NASF Risk	NASF Action	Monitoring Action
≥ 3km and ≤ 8km							
Barron Waters Park 	7.17	Man-made waterbodies surrounded by parks and suburbs	Masked Lapwing Pacific Black Duck Straw-necked Ibis	Wildlife sanctuary / conservation area - wetland	High	Mitigate	Quarterly (Avisure)
Cattana Wetlands 	7.2	Man-made waterbodies surrounded by man-made walking tracks	Pacific Black Duck	Wildlife sanctuary / conservation area - wetland	High	Mitigate	Annually (Avisure)
Smithfield Transfer Station 	7.5	Transfer station surrounded by suburbs and grassland	Australian White Ibis Bush Stone-curlew Feral Pigeon Masked Lapwing Pacific Black Duck	Putrescible waste facility – transfer station	High	Mitigate	Annually (Avisure)

Feature	Distance[18] (km)	Description	High/Moderate Species	NASF Type	NASF Risk	NASF Action	Monitoring Action
≥ 3km and ≤ 8km							
Portsmith Transfer Station 	7.8	Transfer station surrounded by suburbs and a compost facility	Bush Stone-curlew	Putrescible waste facility – transfer station	High	Mitigate	Quarterly (Avisure)
Suez Compost Facility 	7.9	Closed-in compost facility with a waterbody at the back. Surrounded by suburbs and a transfer station.	Australian White Ibis Feral Pigeon Masked Lapwing Pacific Black Duck	Food / organic waste facility	High	Mitigate	Quarterly (Avisure)

Feature	Distance[18] (km)	Description	High/Moderate Species	NASF Type	NASF Risk	NASF Action	Monitoring Action
≥ 8km and ≤ 13km							
Half Moon Golf Course 	8.4	Large man-made waterbody surrounded by vegetation and turf.	Bush Stone-curlew	Golf course	Moderate	Monitor	Annually (Avisure)
Southern Wastewater Treatment Plant 	8.5	Wastewater treatment plant surrounded by suburbs and vegetation.	Australian White Ibis Cattle Egret Masked Lapwing	Sewage/wastewater treatment facility	Moderate	Monitor	Quarterly (Avisure)
Edmonton Wastewater Treatment Plant 	12.7	Wastewater treatment plant surrounded by suburbs and vegetation.	Bush Stone-curlew Cattle Egret Masked Lapwing Pacific Black Duck	Sewage/wastewater treatment facility	Moderate	Monitor	Quarterly (Avisure)

Feature	Distance[18] (km)	Description	High/Moderate Species	NASF Type	NASF Risk	NASF Action	Monitoring Action
>13km							
Kewarra Beach Resort Flying-fox Camp 	13.3	Vegetation in the middle of a resort surrounded by water and suburbs.	Nil	Wildlife sanctuary / conservation area - wetland	High	Monitor	Annually (Avisure)

Appendix G: Research, Reviews, Trials, and Initiatives

This section outlines key research, trials, and initiatives undertaken at Cairns Airport.

Table G1. Research, trials, and initiatives undertaken at Cairns Airport, 2008-present.

Date	Research /Initiative	Description	Reference
May 2008	Cairns Airport Vegetation Management Strategy	Cairns Airport engaged Ecosure to perform a grass height trial between March 2007 and February 2008. Fourteen trial plots were established across the aerodrome and surveyed for bird activity and grass height. The trial recommended to maintain grass heights between 200-400mm including edges of airside drains, monitor grass species to establish flowering and seeding seasonality to identify seed head formation, and mow grass <200mm at the onset of the wet season to avoid very long grass growth.	Vegetation Management Strategy, Ecosure, May 2008
Oct 2009	Flying-fox Monitoring Program	Cairns Airport engaged Avisure and CSIRO Sustainable Ecosystems to monitor flying-fox population and transit data to help Cairns Airport manage the flying-fox strike risk. Avisure monitored flying-fox movements on- and in the vicinity of the aerodrome since March 2007 and CSIRO examined fruiting and flowering patterns of attractants, camp occupation, and fly-out patterns between October 2007 and June 2009. The report recommended that Cairns Airport continue to monitor local *Melaleuca sp.* populations, particularly between April and June, supplement Bird Watch Condition Reports with NOTAMs, remove known attractants from Cairns Airport land, encourage airlines to alter flight movements during high risk dusk periods, and implement a standard operating procedure for reviewing plan species lists proposed for any landscaping works.	Flying-fox Program Final Report, Avisure, October 2009

Date	Research /Initiative	Description	Reference
Oct 2018	Proposed Outdoor Sport and Entertainment Wildlife Hazard Assessment and Mitigation	Cairns Airport engaged Avisure to perform a wildlife hazard assessment of the Outdoor Sport and Recreation Facility at Machans Beach Road. The developer initiated construction works which attracted wildlife, posing a strike risk to Cairns Airport. The assessment recommended that the waterbody for the jet boat track be removed. If waterbodies were to remain on site, they be covered with netting or vegetation to restrict access.	Outdoor Sports and Recreation Facility Wildlife Hazard Assessment, Avisure, October 2018
Sep 2018	Development Application 8/30/265 Expert Review	Cairns Airport engaged Avisure to assist in responding to the development application for Reconfiguring A Lot (1 Lot into 2 Lots) and Material Change Of Use for Bulk Landscape Supplies, Garden Centre, Wholesale Nursery and Food and Drink Outlet.	Information for DA Response, Avisure, September 2018
Mar 2019	Wildlife Mitigation Plan 3L Machans Beach Road	Cairns Airport engaged Avisure to review the Application for Material Change of Use for Outdoor Sport and Entertainment, 3L Machans Beach Road, Machans Beach – Lot 3 on SP258914.	Adventure Park Wildlife Management Plan Expert Review, Avisure, March 2019
Jun 2022	Cairns Flying-fox Relocation Strike Risk Assessment	NRA Environmental Consultants engaged Avisure to perform a desktop risk assessment on relocating a Spectacled Flying-fox roost to an existing wetland conservation area located within 3km of the runway at Cairns Airport. The report found that the site was incompatible with state legislation, local government planning requirements, and recommended guidelines, and that the relocation should not proceed. For the project to proceed, it was recommended that Cairns Regional Council consider an acceptable alternative location, located at a greater distance from the airport.	Cairns Flying-fox Relocation Strike Risk Assessment, Avisure, June 2020

Revision History

Rev. No.	Rev. Date	Details	Prepared by	Reviewed by	Approved by
00	07/08/2023	Cairns Airport Wildlife Hazard Management Plan 2022/23 – DRAFT	Alexandra Stone Senior Wildlife Biologist	Kylie Patrick Principal Consultant	Kylie Patrick Principal Consultant
01	10/10/2023	Cairns Airport Wildlife Hazard Management Plan 2022/23 – FINAL	Alexandra Stone Senior Wildlife Biologist	Kylie Patrick Principal Consultant	Kylie Patrick Principal Consultant

Distribution List

Copy No.	Date	Format	Issued to	Name
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2	10/10/2023	E-copy	Cairns Airport Pty Ltd	Mark Musumeci
3	10/10/2023	E-copy	Cairns Airport Pty Ltd	Lucy Friend
5	10/10/2023	E-copy	Avisure	Administration

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