

Off Airport Wildlife Hazards Managing Aviation Risk and Enhancing Biodiversity: Can it Be Done?

North American Aviation Wildlife Management Conference
August 2025

Phil Shaw

Off-airport Wildlife Regulation and Guidance

Doc 9981

PROCEDURES FOR AIR NAVIGATION SERVICES

Aerodromes

Third Edition, 2020

6.3.5.2 Aerodrome operators 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 corridors. The appropriate radius (i.e. aerodrome vicinity) in this context should be 13 km around the aerodrome reference point. However, the radius may be extended or reduced, based on a wildlife evaluation of the aerodrome vicinity.

This edition supersedes, on 5 November 2020, all previous editions of Doc 9981.

Off-airport Wildlife Regulation and Guidance

LAND USE ON AND AROUND AERODROMES

- 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.

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INTERNATIONAL CIVIL AVIATION ORGANIZATION

Off-airport Wildlife Regulation and Guidance

Doc 9981

PROCEDURES FOR AIR NAVIGATION SERVICES

Aerodromes

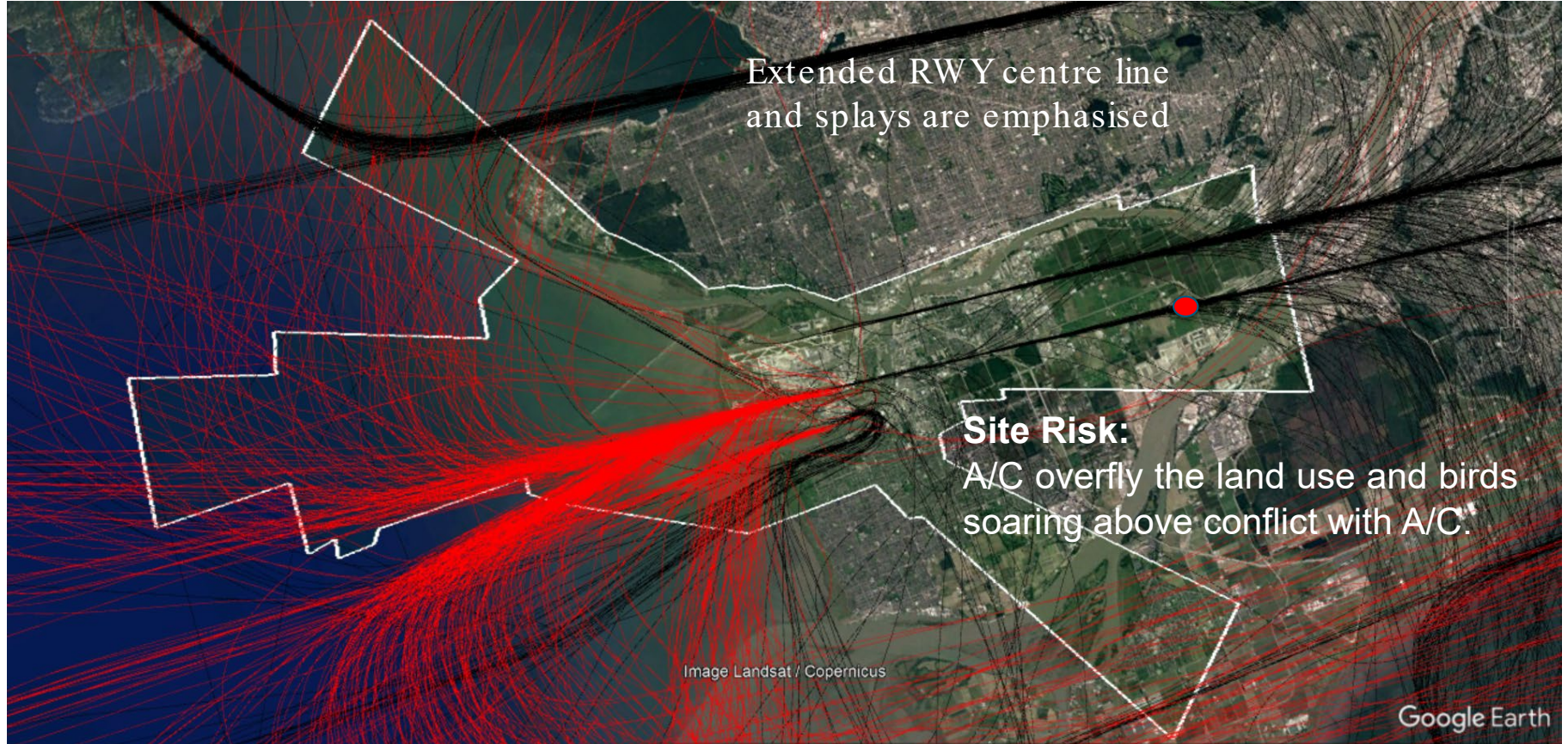
Third Edition, 2020

6.3.5.2 Aerodrome operators 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 corridors**. The appropriate radius (i.e. aerodrome vicinity) in this context **should be 13 km** around the **aerodrome reference point**. However, the radius may be extended or reduced, based on a wildlife evaluation of the aerodrome vicinity.

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Off-airport Wildlife Regulation and Guidance

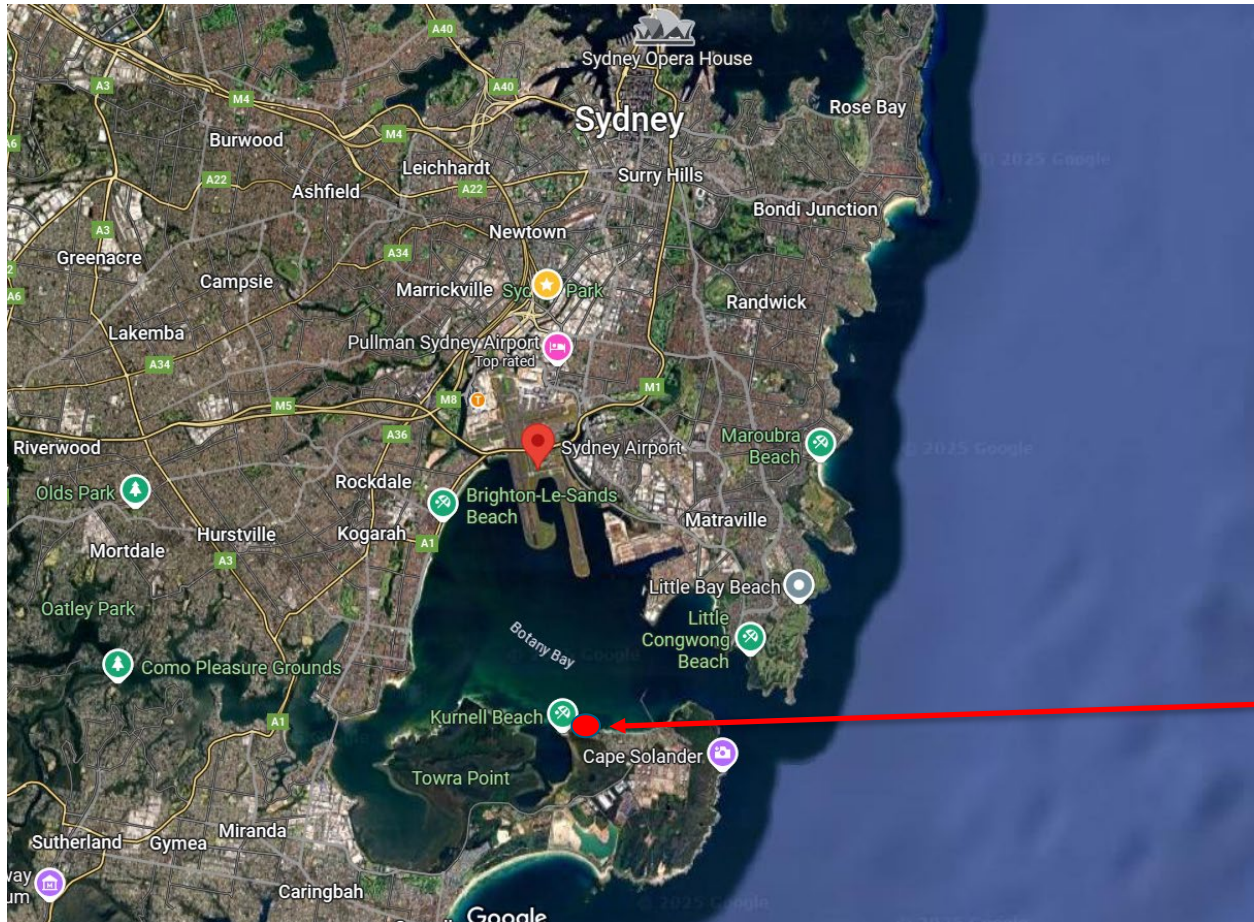
Vancouver AZR – Canada Regs



Off-airport Wildlife Case Study: Sydney



Off-airport Wildlife Case Study: Sydney



Flying-fox camp
(*Pteropus*)

Off-airport Wildlife Case Study: Sydney



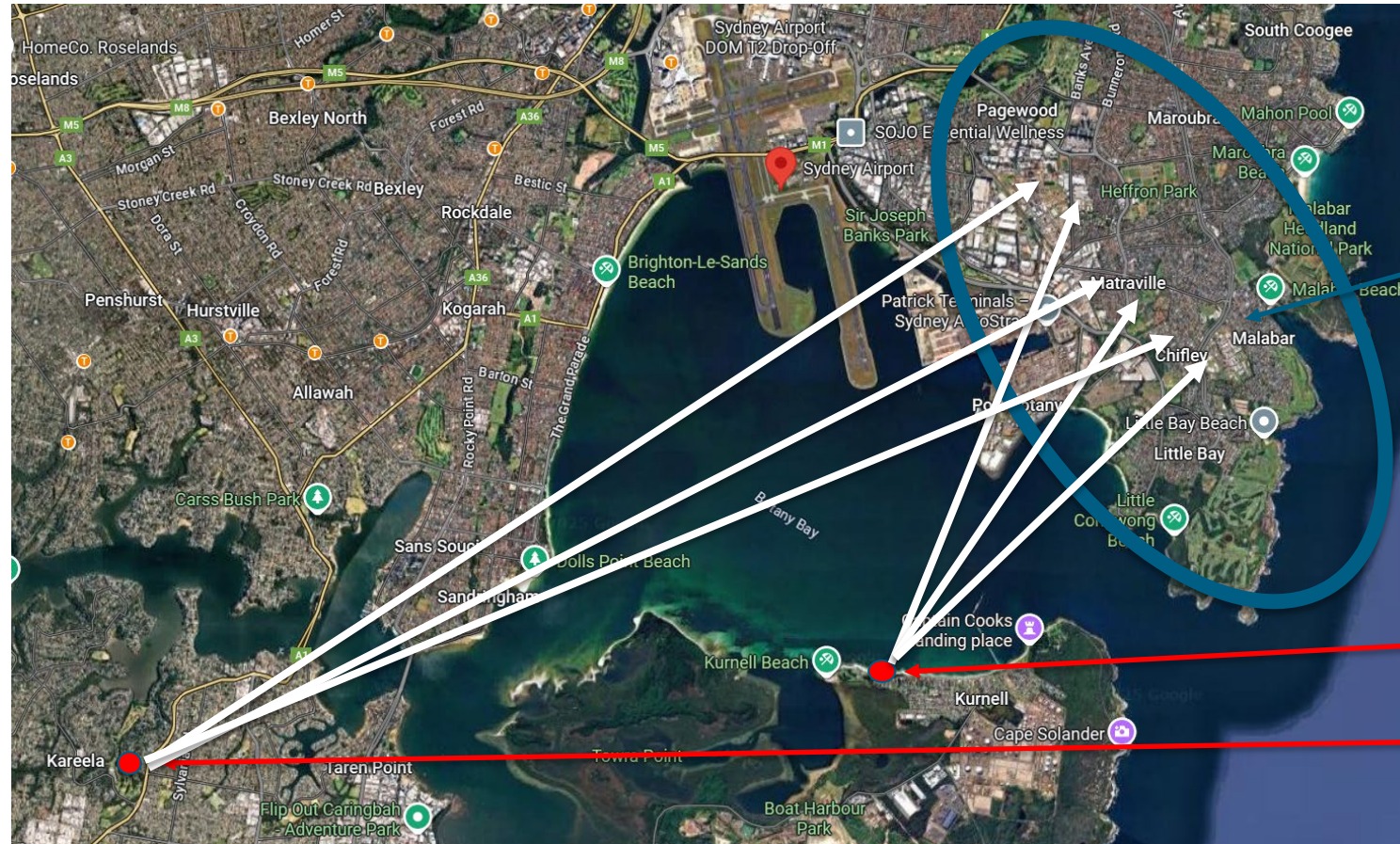
Flying-fox

- Most frequently struck species group in Australia
- Nocturnal – flyout on dusk in numbers up to 100's of thousands
- Sometimes from off-airport camps to off-airport foraging sites through aircraft flight paths





Off-airport Wildlife Case Study: Sydney



Feeding area:
March to May.
Melaleuca and
Eucalyptus in
flower

3.7km from RWY

11.7km from RWY

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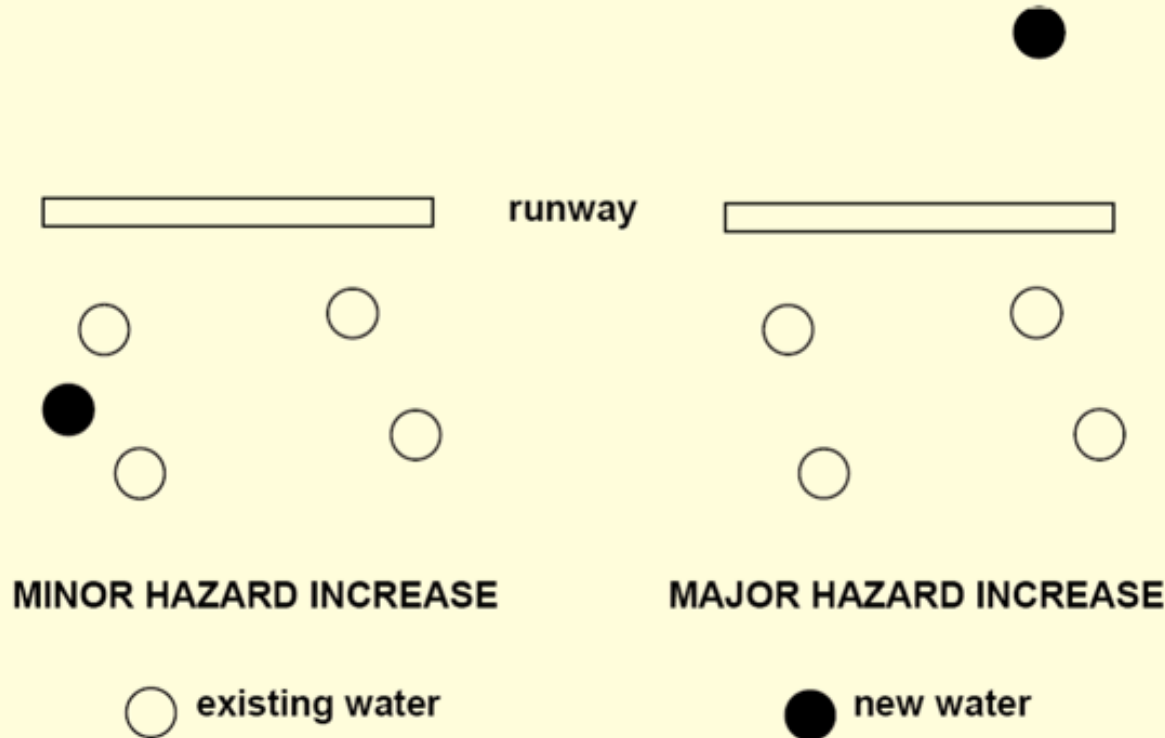
GEOMETRY MATTERS!
**Where are complimentary habitats
in relation to A/C flight paths?**

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Off-airport Wildlife Regulation and Guidance

UK CAA CAP 680

Flight Path Risk: Birds/bats traverse A/C flight paths to and from the land use.



The Overabundant Aussie White Ibis



70% of the population obtaining most of their food from landfills

Spill Over Risk: Significant population growth of species receiving abundant food from land use results in 'spill over' onto areas around or on the airport.

Off-airport Wildlife

Land Use Contribution to Aviation Risk



1. **Site Risk:** A/C overfly the land use and birds soaring above can conflict with A/C.
2. **Flight Path Risk:** Birds/bats traverse A/C flight paths to and from the land use.
3. **Spill Over Risk:** Significant population growth of species receiving abundant food from land use results in 'spill over' onto areas around or on the airport.

Off-airport Wildlife Regulation and Guidance

Doc 9981

PROCEDURES FOR AIR NAVIGATION SERVICES

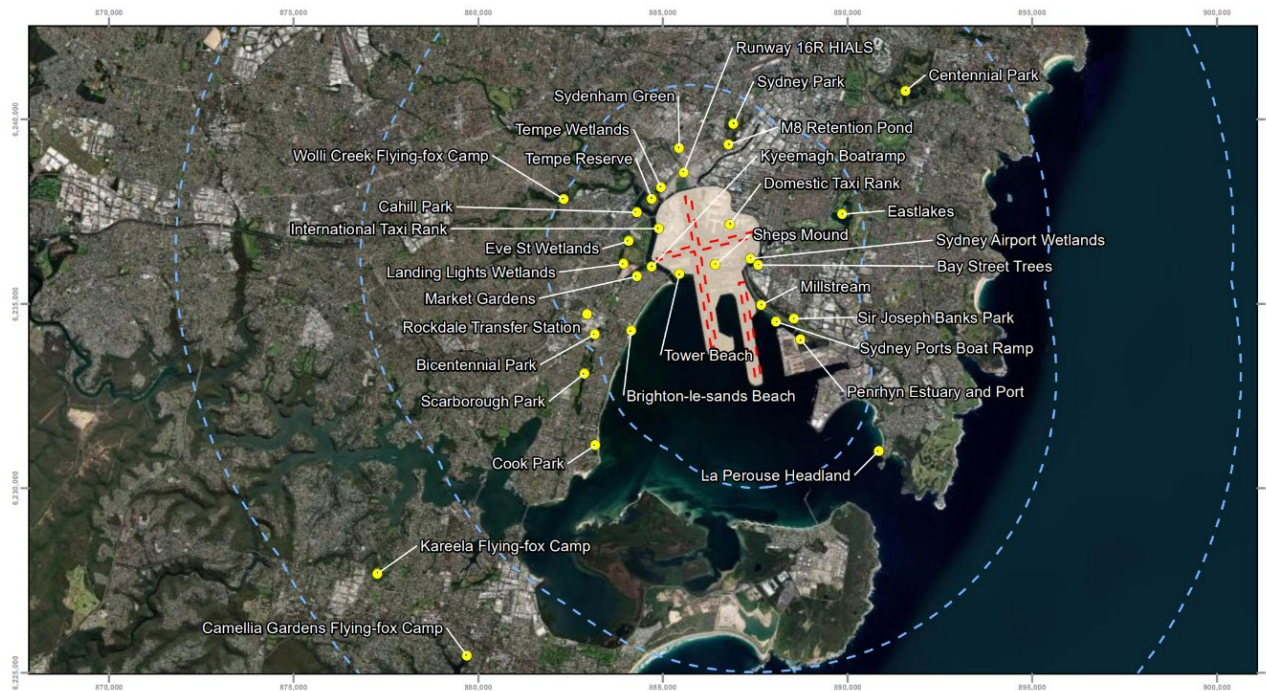
Aerodromes

Third Edition, 2020

6.3.7.1 Effective wildlife hazard management requires communication, cooperation and coordination with all relevant stakeholders. Aerodrome operators should identify which stakeholders on and off the aerodrome should be involved and consulted. Such stakeholders may include transportation officials (including government), aerodrome staff, the ATS unit, aircraft operator representatives (including pilots), nature conservation organizations (government and non-government), local municipalities/cities, and organizations responsible for land management and local planning and development approvals in the vicinity of the aerodrome.

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Off-airport Wildlife Regulation and Guidance Australia - NASF

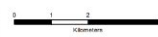
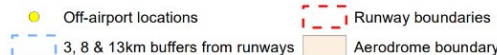


National Airports Safeguarding Framework (NASF):

- Zones: 3, 8, 13km from Aerodrome Reference Point (ARP)
- We use RWYs to buffer zones
- More restrictive the closer you get to the runway.

Figure D1: Off-airport locations in the vicinity of Sydney Airport

Sydney Airport Corporation Limited
Wildlife Management Program



Land use types	Likely attractants ▲ natural elements ■ structural elements ● waste and food	Wildlife attraction risk	Actions for existing development and land uses in wildlife management areas			Actions for new and changed development and land uses in wildlife management areas		
			0-3 km (Area A)	3-8 km (Area B)	8-13 km (Area C)	0-3 km (Area A)	3-8 km (Area B)	8-13 km (Area C)

Land use types	Likely attractants ▲ natural elements ■ structural elements ● waste and food			Wildlife attraction risk	Actions for existing development and land uses in wildlife management areas			Actions for new and changed development and land uses in wildlife management areas		
					0-3 km (Area A)	3-8 km (Area B)	8-13 km (Area C)	0-3 km (Area A)	3-8 km (Area B)	8-13 km (Area C)
Agriculture										
Turf farm, piggery, abattoir, aquaculture	▲	■	●	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Fruit tree farm/orchard	▲	■	●	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Fish processing/packing plant	▲	■	●	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Farm (cattle, dairy, poultry, crops)	▲	■	●	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Horticulture, viticulture, market farms/gardens	▲	■	●	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/conservation area - wetland, waterways	▲			High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Wildlife/conservation area - dryland	▲			Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Recreation										
Significant open water (ancillary to development)	▲			High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Showground	▲	■	●	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Significant landscaped space (ancillary to development)	▲			Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Golf course	▲	■	●	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Park, playground	▲		●	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Picnic areas, camping ground	▲		●	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Racetrack, horse riding school	▲	■	●	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Sports facility (tennis, bowls, football fields)	▲	■	●	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Commercial										
Food processing or storage facility		■	●	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
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
Warehouse (food storage)		■	●	Low	Monitor	Monitor	No Action	Monitor	Monitor	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
Hotel/motel		■	●	Very Low	Monitor	No Action	No Action	Monitor	No Action	No Action
Office building		■	●	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
Warehouse (non-food storage)		■	●	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
Water infrastructure (drains, channels, basins)	▲			High	Mitigate	Mitigate	Monitor	Mitigate	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

Off-airport Land Use Embedment In Planning Schemes – Queensland, Australia

Wildlife hazards	
Where involving development and activities on land within a wildlife hazard buffer zone:	
<p>Outcome 4 Development and associated activities do not attract wildlife or increase wildlife hazards within the wildlife hazard buffer zone.</p> <p><small>Note – If a proposed development may increase the risk of wildlife strike, it must be referred to the airport operator for assessment. Defence or joint-user airfields will require referral to the Department of Defence.</small></p>	<p>Where involving development and activities on land within the 3km wildlife hazard buffer zone:</p>
	<p>Measure 4.1 Development and associated activities do not involve the following high risk land uses:</p> <ul style="list-style-type: none"> (a) Rural activities such as cropping (e.g. turf farm, fruit tree farm), intensive animal industry (e.g. piggery), aquaculture (e.g. fish hatchery) (b) Green space activities such as environment facility (e.g. wetland) and major sport, recreation and entertainment facility (e.g. showground) (c) Industry activities such as low, medium or high impact industry (e.g. food processing plant, fish processing / packing plant) (d) Public infrastructure such as utility installation (e.g. food/organic waste facility, putrescible waste facility (e.g. a landfill or transfer station).
	<p>Measure 4.2 Development and associated activities involving the following moderate risk land uses that may attract or support wildlife such as birds and bats include measures to reduce the potential to attract wildlife in consultation with the airport operator and qualified bird and wildlife management experts:</p> <ul style="list-style-type: none"> (a) Rural activities such as animal husbandry (e.g. cattle/dairy farm), intensive animal industry (e.g. poultry farm) (b) Green space activities such as park, outdoor sport and recreation, and entertainment facility (other than showground) (c) Public infrastructure such as utility installation (e.g. non-putrescible waste facility (e.g. landfill or transfer station), sewerage or waste water treatment facility.

Off-airport Land Use Embedment In Planning Schemes – Queensland, Australia

Where involving development and activities on land within the 8km and 13km wildlife hazard buffer zone:

Measure 4.3

Development and associated activities involving the following high and moderate risk land uses that may attract or support wildlife such as birds and bats include measures to reduce the potential to attract wildlife in consultation with the airport operator and qualified bird and wildlife management experts:

- (a) Rural activities such as:
 - (i) cropping (e.g. turf farm, fruit tree farm)
 - (ii) intensive animal industry (e.g. piggery or poultry farm)
 - (iii) aquaculture (e.g. fish hatchery)
 - (iv) animal husbandry (e.g. cattle/dairy farm)
- (b) Green space activities such as:
 - (i) environment facility (e.g. wetland)
 - (ii) major sport, recreation and entertainment facility (e.g. showground)
 - (iii) park
 - (iv) outdoor sport and recreation
 - (v) entertainment facility
- (c) Industry activities such as low, medium or high impact industry (e.g. food processing plant, fish processing / packing plant)
- (d) Public infrastructure such as a utility installation involving a:
 - (i) food/organic waste facility
 - (ii) non-putrescible waste facility or putrescible waste facility (e.g. a landfill or transfer station)
 - (iii) sewerage or waste water treatment facility.

Off-airport Land Use Embedment In Planning Schemes – Cairns, Queensland Australia

Wildlife hazards

PO7

Development does not attract wildlife or increase wildlife hazards within a wildlife hazard buffer zone as identified on the Airport environs overlay map – Wildlife hazard buffer zone contained in Schedule 2.

AO7.1

Development located within the 3km Wildlife hazard buffer zone as identified on the Airport environs overlay map – Wildlife hazard buffer zone contained in Schedule 2, does not involve uses listed in column 1 of Table 8.2.2.3.d.

AO7.2

Development located within the 3km Wildlife hazard buffer zone as identified on the Airport environs overlay map – Wildlife hazard buffer zone contained in Schedule 2, involving a use listed in column 2 of Table 8.2.2.3.d, includes measures to reduce the potential to attract wildlife.

AO7.3

Development located within the 8km Wildlife hazard buffer zone as identified on the Airport environs overlay map – Wildlife hazard buffer zone contained in Schedule 2, involving a use listed in column 1 or column 2 of Table 8.2.2.3.d includes measures to reduce the potential to attract wildlife.

AO7.4

Development located within the 13km Wildlife hazard buffer zone shown on the Airport environs overlay map – Wildlife hazard buffer zone contained in Schedule 2, involving a use listed in column 1 or column 2 of Table 8.2.2.3.d does not increase the potential to attract wildlife.

Off-airport Land Use Embedment In Planning Schemes – Cairns, Australia

Table 8.2.2.3.d — Land uses associated with increases in wildlife strikes and hazards

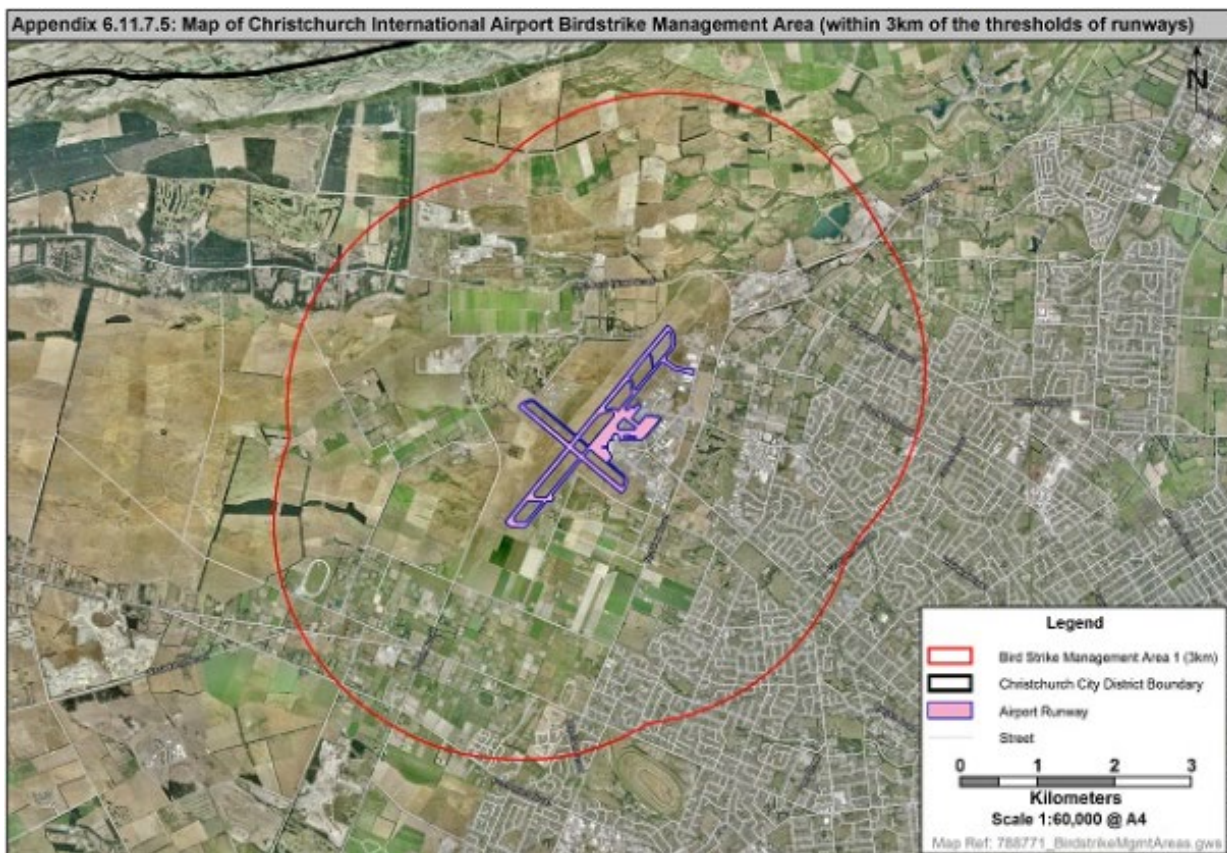
Column 1 High Risk	Column 2 Moderate Risk
<ul style="list-style-type: none"> • Aquaculture (fish processing/packing plant); • Conservation estate (e.g. wetland); • Cropping (turf farm, fruit tree farm); • High-impact industry (food processing plant); • Intensive animal industry (piggery); • Low impact industry (food processing plant); • Major sport, recreation and entertainment facility (showground); • Medium-impact industry (food processing plant); • Sport and recreation activities; • Utility installation (Food / organic waste facility, Putrescible waste facility (e.g. landfill, transfer station). 	<ul style="list-style-type: none"> • Animal husbandry (cattle/dairy farm); • Environment facility • Intensive animal industry (poultry farm); • Major sport, recreation and entertainment facility (all other); • Outdoor sport and recreation activities; • Park; • Utility installation (Sewage/wastewater treatment facility, Non-putrescible waste facility e.g. landfill, transfer station).

Off-airport Land Use Embedment In Planning Schemes – Cairns, Australia

Table 8.2.2.3.d — Land uses associated with increases in wildlife strikes and hazards

Column 1 High Risk	Column 2 Moderate Risk
<ul style="list-style-type: none"> • Aquaculture (fish processing/packing plant); • Conservation estate (e.g. wetland); • Cropping (turf farm, fruit tree farm); • High-impact industry (food processing plant); • Intensive animal industry (piggery); • Low impact industry (food processing plant); • Major sport, recreation and entertainment facility (showground); • Medium-impact industry (food processing plant); • Sport and recreation activities; • Utility installation (Food / organic waste facility, Putrescible waste facility (e.g. landfill, transfer station). 	<ul style="list-style-type: none"> • Animal husbandry (cattle/dairy farm); • Environment facility • Intensive animal industry (poultry farm); • Major sport, recreation and entertainment facility (all other); • Outdoor sport and recreation activities; • Park; • Utility installation (Sewage/wastewater treatment facility, Non-putrescible waste facility e.g. landfill, transfer station).

Off-airport Land Use Embedment In Planning Schemes – Christchurch, New Zealand



6.7.4 Rules - Christchurch International Airport

6.7.4.3 Activity status tables - Birdstrike Management Areas

6.7.4.3.1 Permitted activities

- a. In the Birdstrike Management Area (within 3 km of the thresholds of the runways at Christchurch International Airport) as shown in [Appendix 6.11.7.5](#), the activities listed below are permitted activities if they meet the activity specific standards set out in the following table.
- b. Activities may be controlled, restricted discretionary, discretionary, non-complying or prohibited as specified in Rules [6.7.4.3.2](#), [6.7.4.3.3](#), [6.7.4.3.4](#), [6.7.4.3.5](#), and [6.7.4.3.6](#).

Activity		Activity specific standards
P1	Any activity not specifically provided for as a permitted, controlled, restricted discretionary or discretionary activity in Rules 6.7.4.3.1 - 6.7.4.3.6 .	Nil
P2	Fish processing or packing plants, abattoirs or freezing works.	<ul style="list-style-type: none">a. Storage, processing and disposal of all organic material takes place within enclosed buildings.b. There is no disposal of effluent onto land associated with the plant or works.

P3	<p>Creation of a new:</p> <ul style="list-style-type: none"> a. stormwater basin; or b. <u>water body</u> (including wastewater oxidation pond) which exceeds 500m² in area. <p>Except that This rule does not apply to any area of a <u>water body</u> covered by an aviary/s.</p>	<ul style="list-style-type: none"> a. The combined area of all stormwater basins and/or <u>water bodies</u>, that are wholly or partly within 0.5km of the proposed <u>water body</u> or stormwater basin's edge, shall not exceed 1000m². b. Any stormwater basin has been designed by a suitably qualified person, with experience in stormwater management systems, to the following standards: <ul style="list-style-type: none"> i. Stormwater infiltration basins shall be designed to fully drain within 48 hours of the cessation of a 2% AEP storm event; ii. Sufficient rapid soakage overflow capacity shall be provided to minimise any ponding of stormwater outside the infiltration area(s); and iii. Plant species used shall be limited to those listed in Appendix 6.11.9. c. Any <u>water body</u> has been designed by a suitably qualified person, with experience in stormwater management systems, to the following standards: <ul style="list-style-type: none"> i. Side slopes shall be at least as steep as 1H:4V except for: <ul style="list-style-type: none"> A. any side slope treated with rock armouring; or B. any area required for vehicle access, provided that such access has a gradient of at least 8H:1V; ii. No permanent island features shall be included, that could provide perching sites for birds; and iii. Plant species used shall be limited to those listed in Appendix 6.11.9.
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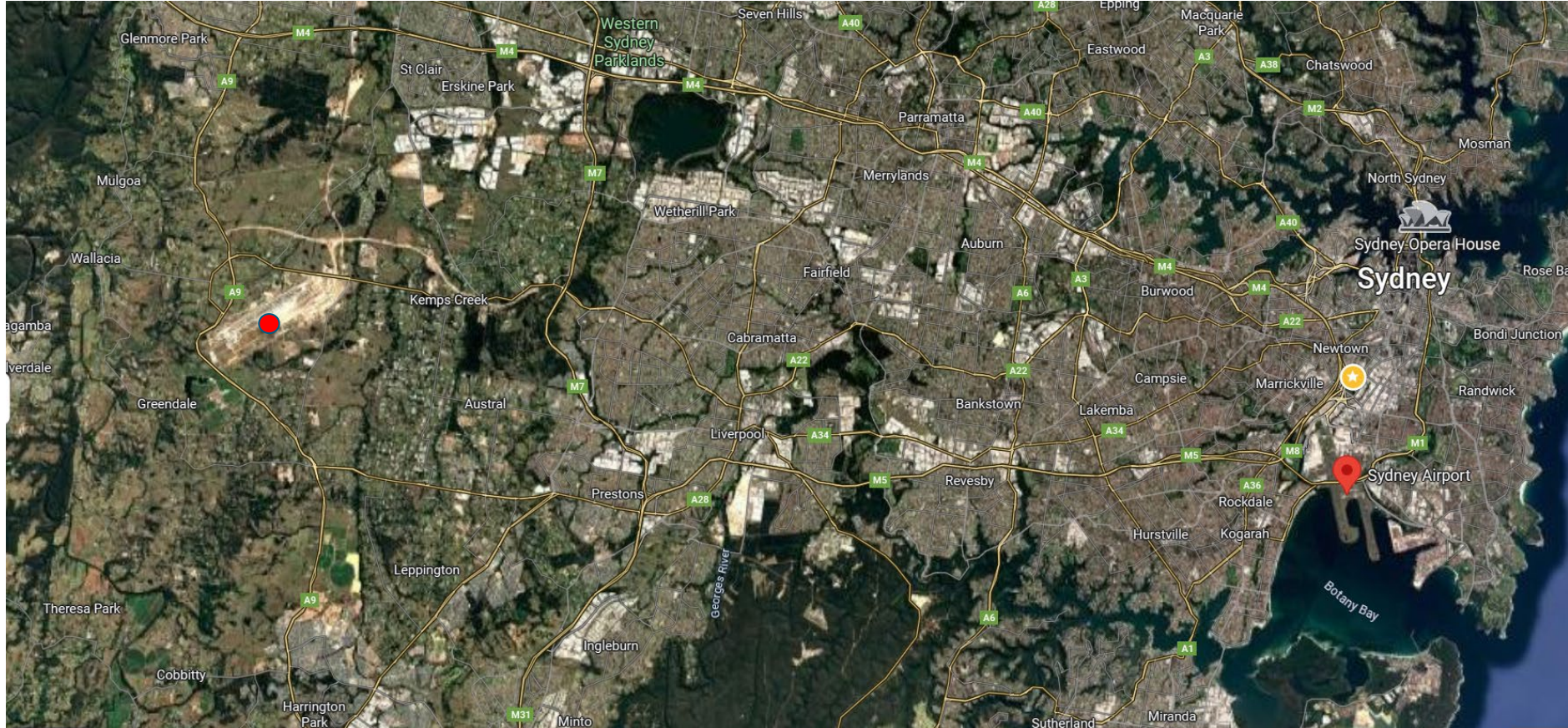
6.7.4.3.2 Controlled activities

- a. In the Birdstrike Management Area (within 3 km of the thresholds of the runways at Christchurch International Airport) as shown in [Appendix 6.11.7.5](#), the activities listed below are controlled activities.

Activity		The matters over which Council reserves its control:
C1	<p>a. Any activity listed in Rule 6.7.4.3.1 P2 that does not meet one or more of the activity specific standards.</p> <p>b. Applications must be accompanied by a birdstrike risk assessment from a qualified and experienced ornithologist, and that assessment must include recommendations for appropriate conditions for mitigation of birdstrike risk.</p>	<p>a. Mitigation of birdstrike risk, including by design measures and operation or management procedures.</p>

Off-airport Land Use – Finding the Balance

Western Sydney, Australia



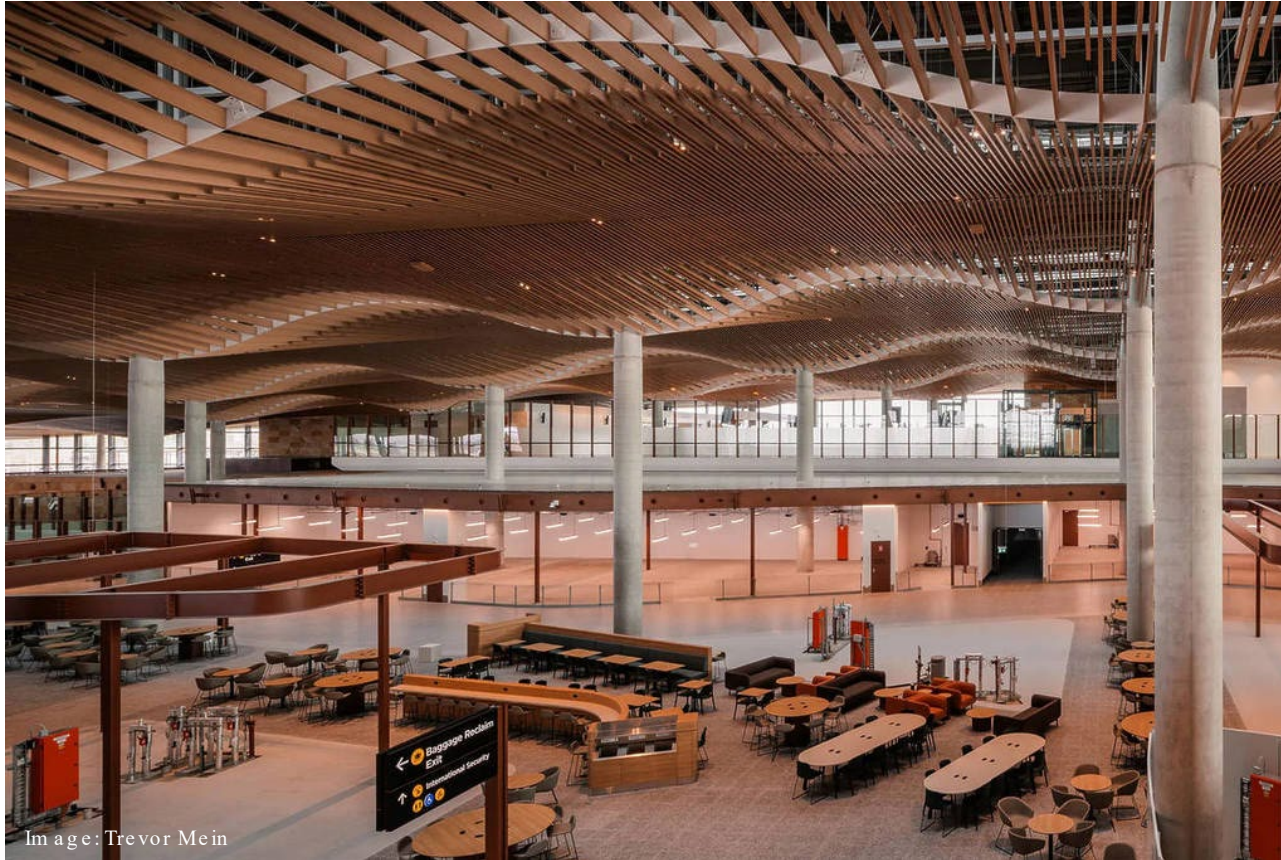
Off-airport Land Use – Finding the Balance

Western Sydney, Australia



1st of 2 RWYs ready
for operation 2026

Off-airport Land Use – Finding the Balance Western Sydney, Australia



Do you think the architect had been to PDX?

Off-airport Land Use – Finding the Balance

Western Sydney, Australia



Off-airport Land Use – Finding the Balance

Western Sydney, Australia



New City as well as new airport:

- Transition from rural to urban, industrial, commercial
- Wetland/waterway enhancement desired
- 40% tree cover

Pink: Existing farm dams

Green: Stormwater scheme waterbodies

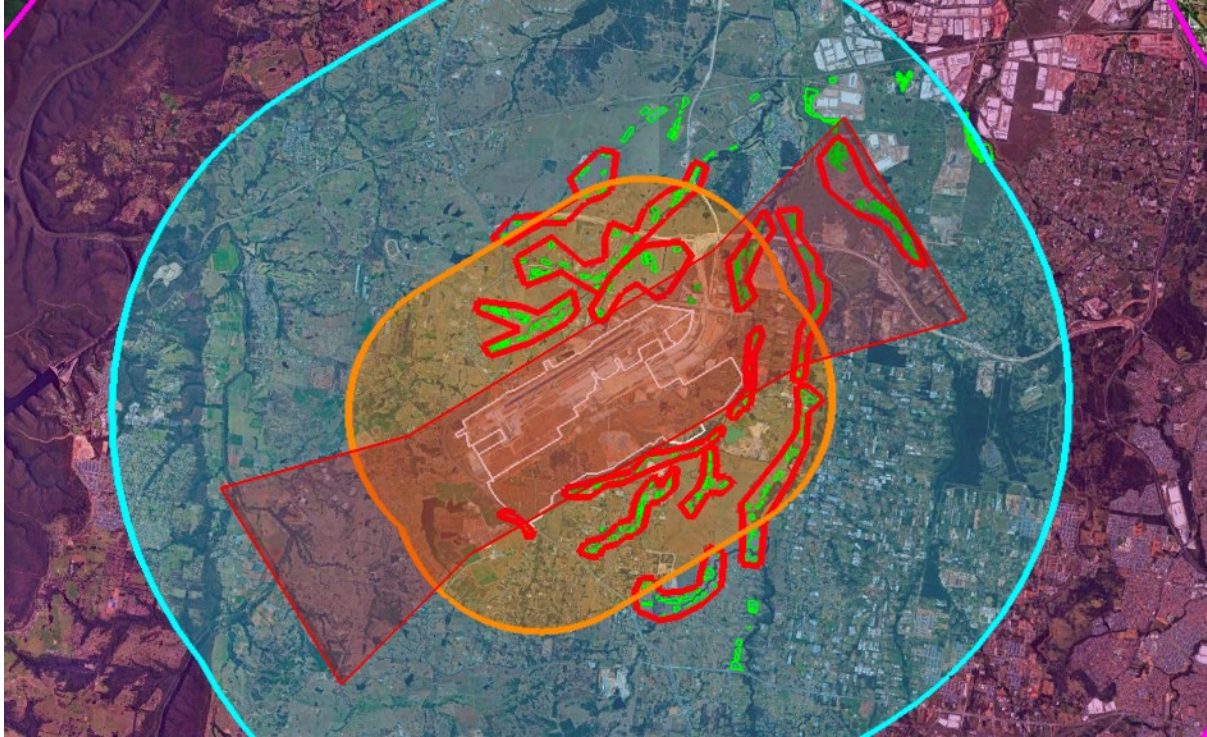
Off-airport Land Use – Finding the Balance

Western Sydney, Australia



Off-airport Land Use – Finding the Balance

Western Sydney, Australia



Hierarchy of Risk Reduction

1. Eliminate (red)
2. Underground (red)
3. Net (red)
4. Amend designs (undesignated)

Landscapes to avoid Eucalypts and Melaleuca (especially in clumps)

Off-airport Land Use – Finding the Balance

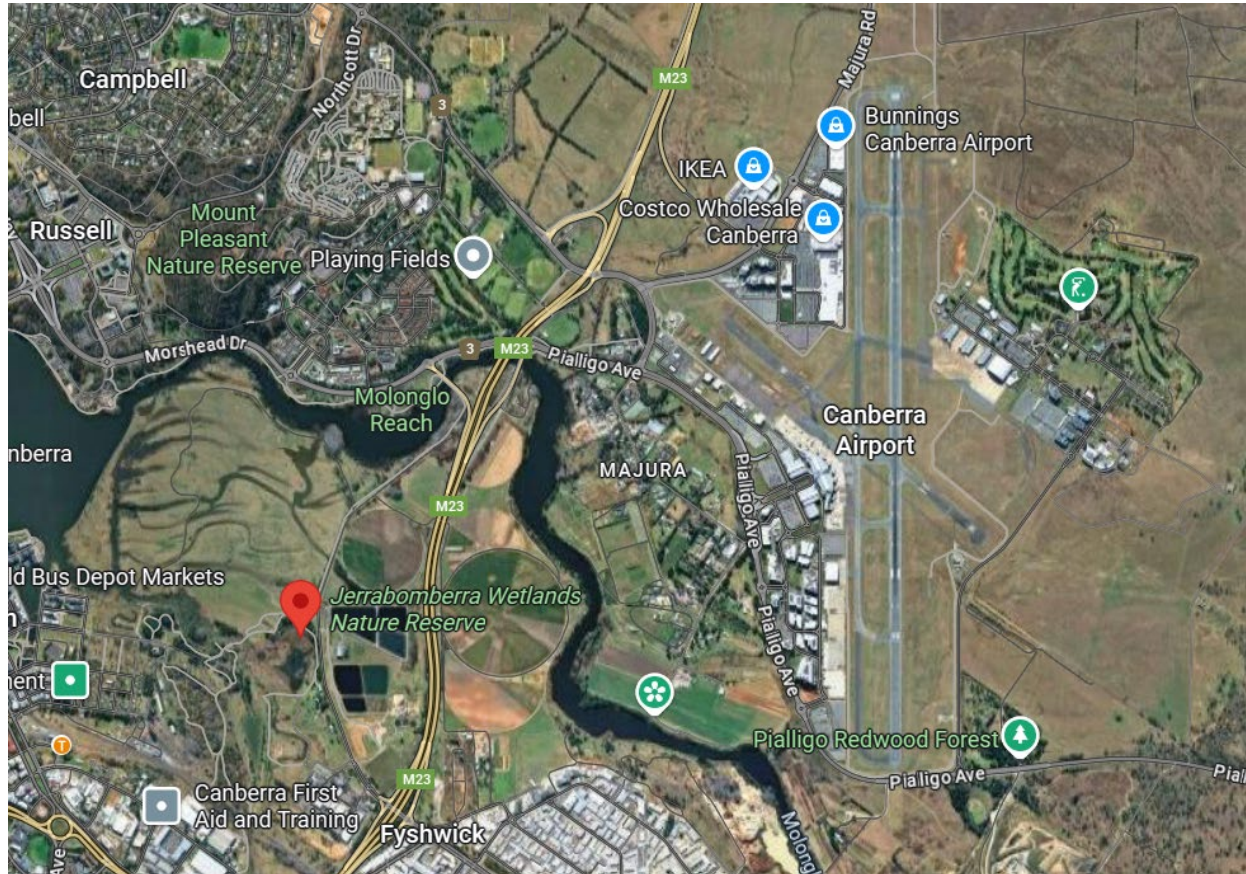
Canberra, Australia

Australia's Capital City

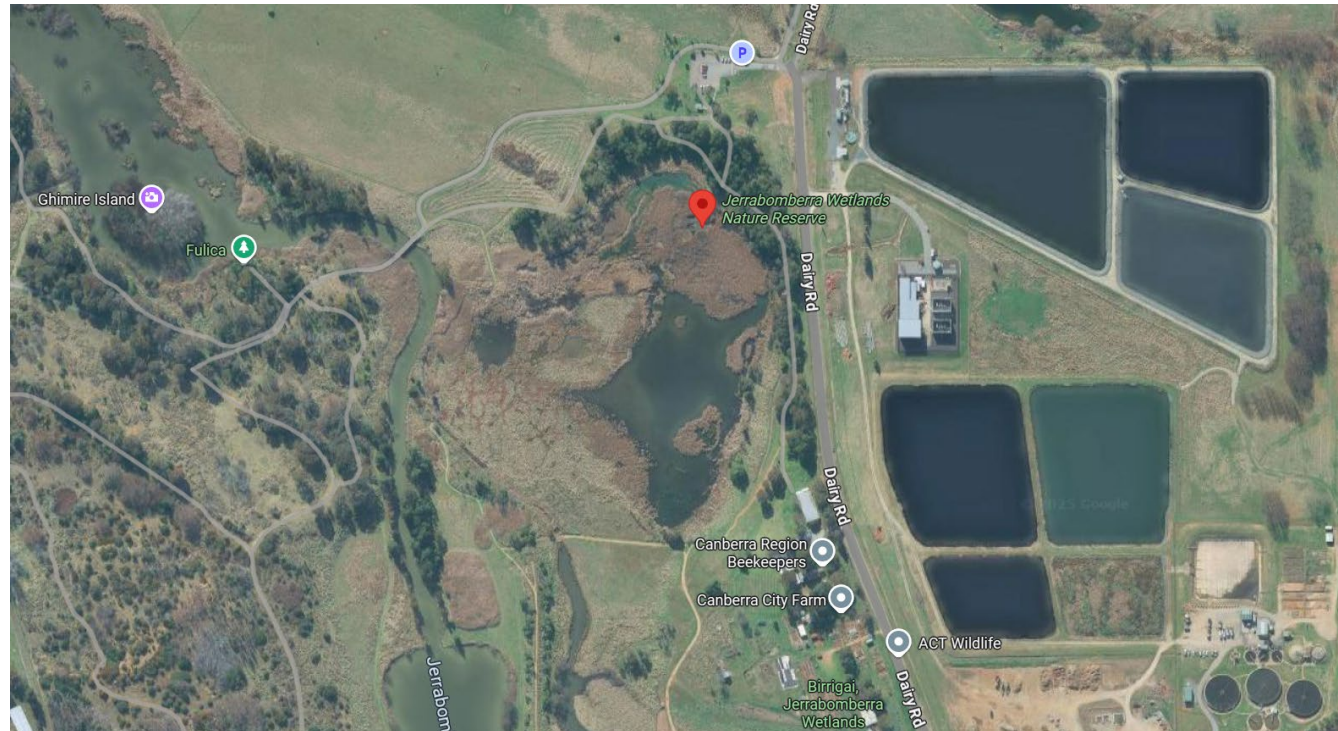


Off-airport Land Use – Finding the Balance Canberra, Australia

Jerrabomberra Wetland Enhancement



Off-airport Land Use – Finding the Balance Canberra, Australia



Principle:
No net increase in risk

Reduce wetland habitat
and suitability for
large/flocking birds

Improve terrestrial habitat
for passerines and other
smaller birds

Off-airport Land Use – Finding the Balance

Wetlands - remove islands and refuges



Off-airport Land Use – Finding the Balance

Wetlands - remove islands and refuges



Off-airport Land Use – Finding the Balance

Wetlands - remove perching opportunities



Off-airport Land Use – Finding the Balance

Wetlands – shaping banks, vegetating



- Simple shape with steep or vertical sides
 - Reducing shoreline variation and potential roosting opportunities.
- Deep water (>1m).
- No islands or floating structures.
- Reduced access to open water (thick vegetation).

Off-airport Land Use – Finding the Balance

Wetlands – waste and feeding



Off-airport Land Use – Finding the Balance

Wetlands – landscaping

- Can be attractive to birds and flying-foxes.
- Attractants: food, perches, nesting, roosting, shelter.
- Need to consider:
 - Plant species and types
 - Watering regimes
 - Grassed areas (extent, seed mix, application)
- Landscaping around sites should be the minimum required to soften the impact of physical structures.
- Large flowering gums and *Melaleuca* sp. are known to attract flying-foxes.



Questions?



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