

Peer Review of Biodiversity Impact Assessment at 6 McDonald Road, Queenscliff, Victoria

Final Report

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1 Introduction

Ecology and Heritage Partners Pty Ltd were engaged by the Borough of Queenscliffe to conduct a peer review of a Biodiversity Impact Assessment (Nature Advisory 2022) concerning potential impacts to native fauna associated with the proposed helicopter flight movements using a take-off and landing location at 6 McDonald Road, Queenscliff, Victoria.

It is understood that the proposed helicopter use would involve the personal use of the aircraft by the resident of the property for a maximum of 6 - 8 flights per month. Each flight will comprise a take-off 'movement' and landing 'movement', which will result in a total maximum of 12 - 16 movements per month. As the region is located in close proximity to an internationally recognised Ramsar wetland (Swan Bay), there are community concerns that the helicopter flights will have a negative impact on local native fauna due to factors such as noise, collision risks, and interference to foraging or breeding behaviour. Of particular concern are the potential impacts to nationally protected migratory bird species that may be present in the area.

The purpose of this assessment is to review the Biodiversity Impact Assessment report prepared by Nature Advisory (2022) and determine any likely impacts to native fauna listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act) as a result of the proposed helicopter movements. The potential impacts to migratory bird species will be examined, with a focus on those listed under the EPBC Act as Migratory/ Marine species.

2 Objectives

The key objectives of this peer review and assessment are to:

- Review the Biodiversity Impact Assessment prepared by Nature Advisory (2022) and determine whether the environmental analysis adequately addresses the potential impacts of the helicopter movements to native fauna, particularly to migratory bird species;
- Review current research and available literature regarding the impacts of helicopters to fauna; and,
- Determine whether the proposed helicopter flight paths, frequency of flights or timing of the flights during the year needs to be altered with consideration to mitigating impacts to fauna species.

3 Study Area

The helicopter take-off and landing site is proposed to be located within the property boundaries of Queenscliff, Victoria, approximately 57 kilometres south-west of Melbourne's CBD (Figure 1). The property covers an area of approximately 3.6 hectares and is bound by low-density private residential properties to the north, east and west, and the Lakers Cutting waterbody to the south, which connects to the larger waterbody of Swan Bay. Swan Bay is relatively sheltered from wave activity and tides from the larger Port Phillip Bay due to the presence of an island group that includes Swan Island.

A five-kilometre radius was applied around the helicopter landing site (Coordinates: latitude 38° 15' 50" S, longitude 144° 37' 40" E) as a buffer to capture the likely impact area for wildlife during helicopter take-off and landing movements. The five-kilometre buffer area will be hereafter referred to as the 'study area' (Figure 1).

The property at 6 McDonald Road, Queenscliff, is currently used as a private residential property with one dwelling and associated infrastructure. It is generally flat, with no ridges or crests within or immediately adjacent to the site. It is located adjacent to the Lakers Cutting waterbody, with the proposed helicopter take-off and landing location approximately 80 - 90 metres north-east of the water's edge. The internationally recognised Swan Bay Ramsar wetland is located to the north and east of the site (Figure 1). An extension to the Swan Bay Ramsar wetland has been proposed to include the Lakers Cutting waterbody (Borough of Queenscliffe 2022), however this decision appears to have not been finalised yet.

According to the Victorian Department of Energy, Environment and Climate Action's (DEECA's) Naturekit Map (DEECA 2023a), the study area occurs within the Otway Plain Bioregion. It is located within the jurisdiction of the Corangamite Catchment Management Authority (CMA) and the Borough of Queenscliffe municipality.

3.1 Proposed Helicopter Use

As outlined in the Borough of Queenscliffe Agenda for the Ordinary Meeting of Council (14 December 2022) and in the most recent Planning Permit Application (2022/044), the proponent applied to undertake a maximum of eight flights per month (consisting of 16 movements, with each take-off and landing defined as a movement) (Borough of Queenscliffe 2022). Based on the recommendation of officers from the Borough of Queenscliffe Council from this meeting (14 August 2022), this is to be reduced to six flights per month (12 movements total) and must occur between the hours of 07:00 – 19:00. The helicopter model must be consistent with the model outlined in the Planning Permit (Enstrom 280 FX), and take-offs and landings must occur to and from a westerly direction to avoid the high-value sensitive Ramsar wetland of Swan Bay to the north and east.

The helicopter take-off and landing location is proposed to occur approximately 80 - 90 metres from the water's edge (38° 15' 50" S; 144° 37' 40" E). The helicopter is expected to ascend to an elevation of approximately 1000 feet (305 metres) within 1.5 minutes. Based on the information provided in the Planning Permit application, it has been suggested that the proposed helicopter model ascends at a rate of 700 feet (213 metres) per minute and descends at a rate of 500 feet (150 metres) per minute (Borough of Queenscliff 2022).

No flights may occur directly over Swan Island given that it is currently used as a national defence facility and has an associated no-fly zone. Given that Swan Island contains mudflats and other suitable habitat for many

shorebird species, this also ensures that helicopters cannot fly too close to any flocks roosting or foraging in these sensitive areas.

The original flight paths proposed by the client are outlined in Plate 1.

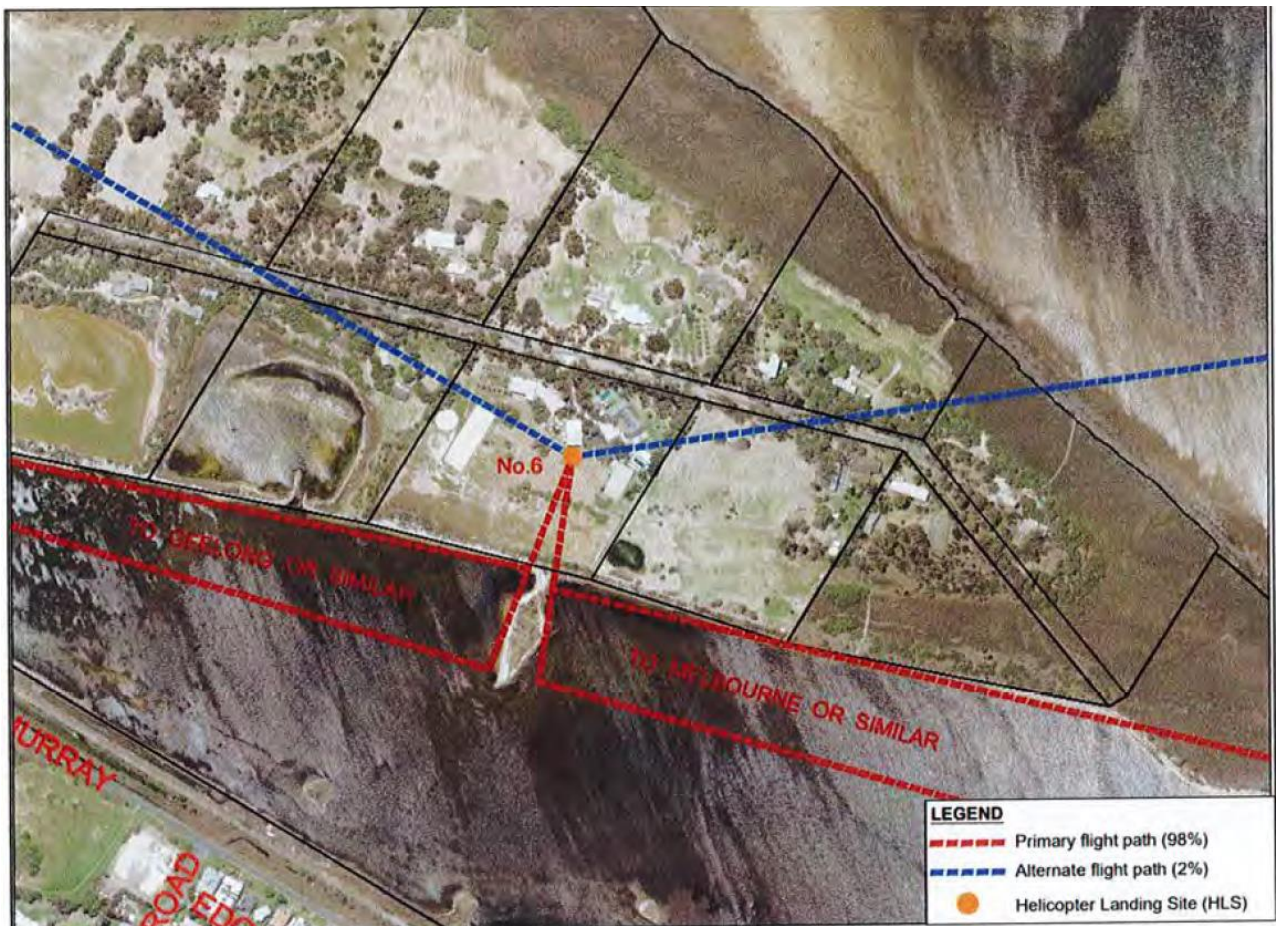


Plate 1: Original flight paths proposed by the client as outlined in the Planning Permit application.

4 Methods

4.1 Desktop Assessment

Relevant literature, online-resources and databases were reviewed to provide an assessment of flora and fauna values associated with the study area. The following information sources were reviewed:

- The DEECA NatureKit Map (DEECA 2023a) and Native Vegetation Information Management (NVIM) Tool (DEECA 2023b) for:
 - Modelled data for location risk, native vegetation patches, scattered trees and habitat for rare or threatened species; and,
 - The extent of historic and current Ecological Vegetation Classes (EVCs).

- EVC benchmarks (DEECA 2023c) for descriptions of EVCs within the relevant bioregion;
- The Victorian Biodiversity Atlas (VBA) for previously documented flora and fauna records within the project locality (DEECA 2022);
- The Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) Protected Matters Search Tool (PMST) for matters of National Environmental Significance (NES) protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (DCCEEW 2023);
- Online databases such as eBird (eBird 2023), Atlas of Living Australia (ALA 2023) and iNaturalist Australia (iNaturalist 2023);
- Relevant listings under the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act), including the latest Threatened (DEECA 2022d) and Protected (DELWP 2019) Lists;
- The online VicPlan Map (DTP 2023) to ascertain current zoning and environmental overlays in the study area;
- Aerial photography of the study area; and,
- Previous documents relevant to the study area; including;
 - *6 McDonald Road, Queenscliff: Biodiversity Impact Assessment* (Nature Advisory 2022);
 - Agenda for the Ordinary Meeting of Council. 14 December 2022 (Borough of Queenscliffe 2022);
 - *Assessment of Helicopter Noise: 6 McDonald Road, Queenscliff* (Clarity Acoustics 2022);
 - Air Services Visual Terminal Chart showing flight over Swan Island 24 Hr. Restricted.
- The RFI from DEECA also requested that two additional reports be examined as part of the peer review process. These were:
 - *Aircraft and human activity at Melaleuca and the Orange-bellied Parrot* (Neophema chrysogaster) (Ecology Australia 2000).

While a copy of this report was obtained, it is noted that the report focused on the effects of fixed-wing aircrafts (particularly Cessna models), with only three helicopter flights documented in 1999/2000 when the assessment was completed.

- *Aircraft and human activity at Melaleuca and the Orange-bellied Parrot* (Neophema chrysogaster): *the effects of helicopters* (Ecology Australia 2001).

Despite extensive efforts to source this document from the original provider and the client, we were not able to obtain authority from the original client to have the documents released. As such, this paper has been excluded from the peer review.

4.2 Assessment Qualifications and Limitations

Information used to inform the desktop assessment was collated from the most recent information available from relevant online resources at the time of the assessment. It should be noted that online resources do not

provide a comprehensive record of all flora and fauna values and are often a reflection of sampling effort rather than actual presence or absence of any particular species.

As this is a desktop-based assessment, ground-truthing of the information detailed in the report has not been undertaken. A field assessment would be required to confirm the presence of habitat for significant fauna species, which was not included in the scope of this assessment. Nevertheless, information obtained from relevant desktop sources is considered adequate to provide an initial assessment of the likely helicopter impacts relating to native fauna within the study area.

5 Results

5.1 Desktop Assessment

5.1.1 Modelled Habitat

The habitat within the broader vicinity of the helicopter landing and take-off point consists of the shallow estuarine waters and intertidal wetlands of Swan Bay to the north, south-east and east of the study area. Meanwhile, inland wetlands, lakes, agricultural land, and the township of Point Lonsdale occur to the west and south-west.

Waterbodies

The closest waterbody to the helicopter landing point is Lakers Cutting (located approximately 80-90 metres to the south), which is a former shell-grit extraction area consisting of a steep-sided deep waterbody that lacks extensive intertidal habitat (Nature Advisory 2022). Migratory shorebirds or other waterbirds are therefore infrequently observed in this area (Figure 2), as it provides little roosting, foraging or nesting habitat.

The current extent of the Swan Bay Ramsar wetland site is located to the north and east of the helicopter landing point. The southern part of Swan Bay contains the nearest intertidal foraging areas for waterbirds and migratory shorebirds, with the closest sections of suitable foraging habitat located 350 metres to the north of the helicopter landing point and 600 metres to the east (Nature Advisory 2022; Figure 1). However, migratory shorebirds and waterbirds are more commonly observed in the extensive intertidal mudflats along the western shore of Swan Island, located approximately 3.5 - 5.5 kilometres north-east of the helicopter landing point (Nature Advisory 2022). Other large waterbird species (e.g. spoonbills, ibis, herons and egrets) have been regularly sighted near Tip Island, located approximately 900 metres to the east, particularly between January and June after breeding when other inland wetland areas are dry. The species frequently use the area as a high tide roosting site (Nature Advisory 2022).

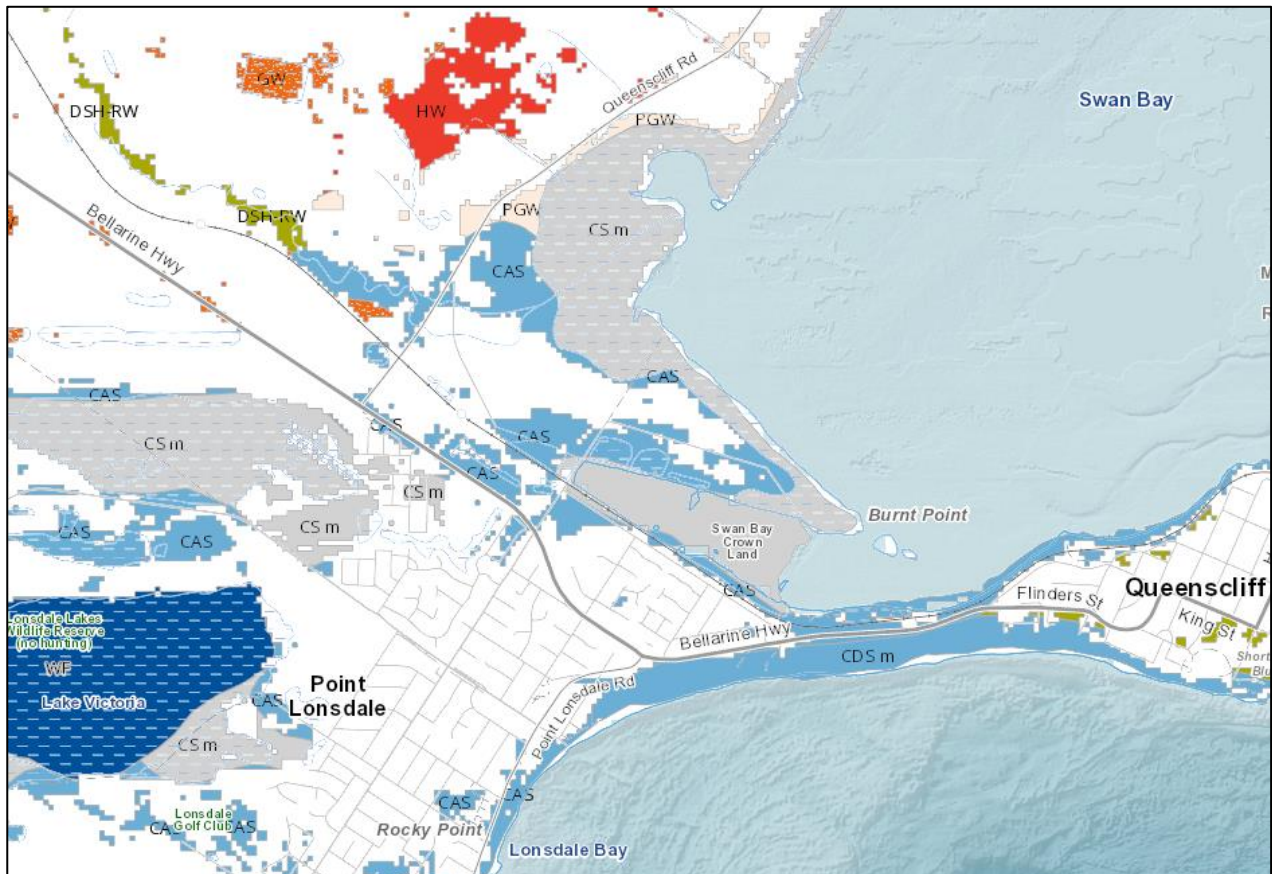
Lake Victoria, located approximately 2-4 kilometres to the west, and the eastern shore of Swan Island (3.5 - 5.5 kilometres east) are often used as a supplementary foraging and high tide roosting areas by migratory shorebirds.

Native Vegetation

Modelled extant (2005) native vegetation, according to the NatureKit Map (DEECA 2023a), includes eight different Ecological Vegetation Classes (EVCs) in the vicinity of the study area (Plate 2). The proposed helicopter take-off and landing location occurs near a large patch of Coastal Alkaline Scrub (CAS) EVC 858,

which is the dominant EVC along much of the coastal areas. This coastal shrub vegetation may provide habitat for a range of fauna, including the nationally listed Orange-bellied Parrot *Neophema chrysogaster* and Blue-winged Parrot *Neophema chrysostoma*.

Plate 2: Modelled extant (2005) native vegetation within the impact area of the helicopter take-off and landing point at 6 McDonald Road, Queenscliff (DEECA 2023a).



CAS = Coastal Alkaline Scrub EVC 858; CS m = Coastal Saltmarsh/Mangrove Shrubland mosaic EVC 302; CD S m = Coastal Dune Scrub/Coastal Dune Grassland Mosaic EVC 1; PGW = Plains Grassy Woodland EVC 55; HW = Heathy Woodland EVC 48; GW = Grassy Woodland EVC 175; DSH-RW = Damp Sands Herb-rich Woodland EVC 3; WF = Wetland Formation EVC 74.

5.1.2 Significant Fauna

Since the Biodiversity Impact Assessment by Nature Advisory (2022) was undertaken, there have been several fauna species either newly listed or with a reviewed and upgraded listing status under the EPBC Act. The recently added or upgraded species that have been recorded near the impact area, or that have modelled habitat occurring in the area, include: Blue-winged Parrot (Vulnerable; effective 31 March 2023), Southern Whiteface *Aphelocephala leucopsis* (Vulnerable; effective 31 March 2023), Diamond Firetail *Stagonopleura guttata* (Vulnerable; effective 31 March 2023), Brown Treecreeper (south-eastern) *Climacteris picumnus victoriae* (Vulnerable; effective 31 March 2023), Hooded Robin *Melanodryas cucullata cucullate* (Endangered; effective 31 March 2023), and Swamp Skink *Lissolepis coventryi* (Vulnerable; effective 25 March 2023).

An up-to-date review of data from the VBA, using the most recent available records and data for these recently listed species, contains records of 35 nationally significant (listed under the 'EPBC Act') and 48 state significant

(listed under the 'FFG Act') fauna species previously recorded within 10 kilometres of the proposed helicopter take-off and landing location (DELWP 2023a) (Figure 2). The PMST nominated an additional 37 nationally significant species which have not been previously recorded but have the potential to occur in the locality (DCCEEW 2023) (Figure 2; Appendix 1).

Of these species, there is suitable habitat within the impact area for several EPBC Act or FFG Act listed fauna (Appendix 1), of which many are bird species that are outlined in more detail in Table 1. Some species that are only listed as 'Marine' and/or 'Migratory' (and not listed as threatened) under the EPBC Act have also been included in Table 1 (e.g. Sharp-tailed Sandpiper *Calidris acuminata*, Red-necked Stint *Calidris ruficollis*, Double-banded Plover *Charadrius bicinctus*).

As previously stated by Nature Advisory (2022), no marine or aquatic species, including freshwater fish, whales, sharks, dolphins, turtles, and pelagic seabirds (e.g. petrels, prions, most albatross), were considered likely to occur within the impact area due to the waters in the Swan Bay and Lakers Cutting area being shallow estuarine waters or inland coastal areas that provide minimal (if any) suitable habitat for these species.

Species that are not listed under the EPBC Act or FFG Act have not been included below (Table 1 and Appendix 1). However, it is expected that a range of common large waterbirds, such as ibis, herons, spoonbills, ducks, swans, and gulls would also inhabit the area.

Table 1. Key significant fauna species with potential to occur near the proposed helicopter landing area.

Species	Habitat Requirements	Timing
NATIONAL SIGNIFICANCE (EPBC Act) – Listed Threatened Species		
Bar-tailed Godwit <i>Limosa lapponica</i>	Non-breeding migrant arriving in south-eastern Australia from September. Found mainly in coastal habitats such as tidal flats and estuaries with shallow waters.	October - February
Blue-winged Parrot <i>Neophema chrysostoma</i>	Found feeding on the ground or in low, open vegetation such as grasslands, saltmarsh and pastures. In winter (after breeding) they can disperse up to 100 kilometres inland to semi-arid areas supporting chenopod shrubland and sparse grassland. Partly migratory, with some of the Tasmanian populations migrating to the mainland after breeding (leaving Tasmania in March/ April and returning in August - October).	All year
Curlew Sandpiper <i>Calidris ferruginea</i>	Non-breeding migrant arriving in south-east Australia in September. Found in tidal flat systems or brackish and freshwater wetlands in shallow waters.	October - March
Eastern Curlew <i>Numenius madagascariensis</i>	Non-breeding migrant arriving in Australia from August. Found mainly in coastal habitats such as tidal flats and estuaries with shallow waters.	October - February
Fairy Tern <i>Sternula nereis</i>	Found foraging over shallow coastal or sheltered inshore waters.	All year
Great Knot <i>Calidris tenuirostris</i>	Non-breeding migrant arriving in south-east Australia from October. Often found in large flocks, restricted to large intertidal flats foraging along tidal edges.	October - March
Hooded Plover <i>Thinornis cucullatus</i>	Nests on beaches during breeding season from August to January, otherwise found at beaches or coastal wetlands. Can be found inland foraging at salt lakes.	All year

Species	Habitat Requirements	Timing
Orange-bellied Parrot <i>Neophema chrysogaster</i>	Non-breeding migrant from Tasmania, arriving in Victoria typically from March and returning by early November. Found foraging in saltmarsh in low shrubs or on ground, or in dunes or weedy pasture within five kilometres of the coast.	March - October
Red Knot <i>Calidris canutus</i>	Non-breeding migrant arriving in south-eastern Australia from late September. Found predominately in tidal flats or sandy beaches in sheltered coasts.	October - March
NATIONAL SIGNIFICANCE (EBPC Act) – MIGRATORY and MARINE only		
Caspian Tern <i>Hydroprogne caspia</i>	Coastal species but can also be found on inland fresh and salt lakes.	All year
Common Greenshank <i>Tringa nebularia</i>	Non-breeding migrant arriving in Australia in August. Found in a variety of coastal and freshwater habitats with open mudflats or shallow waters.	October - March
Double-banded Plover <i>Charadrius bicinctus</i>	Non-breeding migrant from New Zealand, occurs in south-eastern Australia in autumn and spring. Found on a variety of coastal and freshwater habitats including open mudflats, exposed reefs, salt marshes or salt lakes. Also may frequent fields with cropped grass.	April - July
Grey Plover <i>Pluvialis squatarola</i>	Non-breeding migrant arriving in southern Australia from September. Restricted to coastal areas in large intertidal flats.	September - April
Grey-tailed Tattler <i>Tringa brevipes</i>	Non-breeding migrant arriving in south-eastern Australia from September. Occurs in coastal areas, largely in tidal flats or along rocky shorelines.	All year
Little Tern <i>Sternula albifrons</i>	Coastal species found along shallow coastal waters, as well as estuaries, lagoons and river channels.	All year
Pacific Golden Plover <i>Pluvialis fulva</i>	Non-breeding migrant arriving in south-eastern Australia from September. Inhabits coastal habitats, occasionally inland wetlands.	October - February
Red-necked Stint <i>Calidris ruficollis</i>	Non-breeding migrant arriving in Australia in September. Found predominately in tidal flats or wetland habitats (freshwater or brackish inland, ocean beaches) in shallow waters.	October - February
Ruddy Turnstone <i>Arenaria interpres</i>	Non-breeding migrant arriving in Australia from September. Found mostly in coastal areas with exposed rock or coral reefs, platforms or shelves, shallow tidal pools, or sandy beaches.	October - February
Sharp-tailed Sandpiper <i>Calidris acuminata</i>	Non-breeding migrant arriving in Australia from September. Found in a variety of coastal and freshwater habitats, inland wetlands and tidal flats with shallow waters.	November - February
Whimbrel <i>Numenius minutus</i>	Non-breeding migrant arriving in south-eastern Australia from September. Found in a variety of coastal and freshwater habitats, inland wetlands and tidal flats with shallow waters.	October - February
NATIONAL SIGNIFICANCE (EBPC Act) – MARINE only		
White-bellied Sea-Eagle <i>Haliaeetus leucogaster</i>	Inhabit coastal areas and waterways.	All year (breeding June to January)
STATE SIGNIFICANCE (FFG Act)		
Australasian Shoveler <i>Spatula rhynchotis</i>	Inhabits freshwater lakes and swamps.	All year

Species	Habitat Requirements	Timing
Blue-billed Duck <i>Oxyura australis</i>	Inhabits freshwater lakes and swamps.	All year
Eastern Great Egret <i>Ardea alba modesta</i>	Found in shallow water including wetlands, dams or damp grasslands.	All year
Hardhead <i>Aythya australis</i>	Inhabits freshwater lakes and swamps.	All year
Lewin’s Rail <i>Lewinia pectoralis</i>	Found in dense vegetation of coastal or near coastal wetlands.	All year
Little Egret <i>Egretta garzetta</i>	Found in shallow water including wetlands, dams or damp grasslands.	All year
Musk Duck <i>Biziura lobata</i>	Inhabits freshwater lakes and swamps.	All year

5.1.3 Local Planning Scheme

The study area is located within the Borough of Queenscliffe. As outlined by Nature Advisory (2022) in more detail, the following zoning and overlays apply to the property at 6 McDonald Road, Queenscliff. However, due to no development being proposed, no requirements under these zones or overlays for a permit are triggered (DTP 2023):

- Rural Conservation Zone (RCZ);
- Environmental Significance Overlay – Schedule 1 (ESO1) Coastal and Foreshore Areas;
- Environmental Significance Overlay – Schedule 2 (ESO2) Swan Bay and Martine and Terrestrial Habitats; and
- Significant Landscape Overlay – Schedule 1 (SLO1) Swan Bay Landscape Area.

6 Review of Relevant Literature

The Biodiversity Impact Assessment prepared by Nature Advisory (2022) summarises the known impacts of helicopters on wildlife based on available research and literature.

The report highlights the sensitivity and responses to helicopter disturbance across a range of fauna species, including birds, large mammals and marine species. It concludes that impacts will vary greatly between species in terms of the scale of their response, level of habituation, and distances at which they will display escape behaviours. The key finding was that aircraft flown below 500 metres in elevation are considered to cause greater disturbance than those flown at higher elevations and are particularly likely to cause adverse reactions if flown at elevations less than 150 metres of the ground or roosting sites (Drewitt 1999). Helicopters were also considered to cause greater disturbance compared to fixed-wing aircrafts and may be detected by fauna from distances of 500 - 1250 metres away depending on the species (Nature Advisory 2022; Anderson 2007).

Further information or considerations that have been addressed below to supplement the findings outlined by Nature Advisory (2022) include:

- Impacts of helicopters specifically to migratory shorebirds (including cumulative effects of increased energy expenditure due to disturbance);
- Acceptable flight elevations and distances of birds from take-off or landing points;
- Bird strike risk with aircraft;
- Impacts to the EPBC Act listed Critically Endangered Orange-bellied Parrot; and,
- Impacts to the EPBC Act Marine listed White-bellied Sea-eagle.

Note: There are fewer recent studies available on the impact of helicopters to birds compared to past decades, likely due to the rising popularity of Unmanned Aerial Vehicles (UAVs or 'drones') as a replacement for helicopters in bird population surveys, and the subsequent shift to understand the impacts of drones to birds.

6.1.1 *Migratory Shorebirds*

Many migratory shorebird species (e.g. curlews, sandpipers, stints) complete their breeding season in the northern hemisphere before undertaking an annual migration south to spend their non-breeding period in the southern hemisphere. In Victoria, most migratory shorebirds arrive in early spring and depart back to their breeding grounds in the northern hemisphere in late summer or early autumn. They typically spend their non-breeding season foraging in shallow intertidal mudflats during low tide and move to higher ground to roost at high tide (GBRMPA 1997).

Once completing their migration from the northern hemisphere, many migratory shorebirds will expend additional energy to moult their breeding plumage and flight feathers (Miller 1994; DES 2020). If they are exposed to high levels of disturbance during this time, the excess energy is expended in escape or stress behaviours instead of foraging, and this may cause cumulative impacts to their energy stores and affect their ability to complete their return migration (Miller 1994; Rogers *et al.* 2006). In the long-term, it may also cause the birds to abandon these high-disturbance areas as roosting sites (Rogers *et al.* 2006), reducing the amount of suitable habitat available in the area and risking population decline for the species.

A study by Miller (1994) used computer-simulated models to examine the disturbance of helicopters on a moulting population of waterfowl (Pacific Black Brant *Branta bernicla*), testing different flight path routes, altitudes, helicopter models, and frequency of flights to determine their effect on the waterfowl's body condition. Helicopter elevation and the frequency of flights were found to strongly influence disturbance to birds and subsequently reduce their fitness, with flight routes in closer proximity to the birds also demonstrating a greater level of disturbance.

However, helicopter flights were simulated to be between 10 - 50 flight movements *per day* to simulate moderate-high air traffic routes. Infrequent flights (i.e. 10 flight movements per day) at altitudes greater than 460 metres with a smaller helicopter model (comparable to the proposed helicopter model at the study area) had a minimal level of disturbance and as such, would not be expected to greatly impact their cumulative energy stores. The proposed helicopter movements at 6 McDonald Road are far fewer in comparison (12 flight movements maximum *per month*) and will use a relatively small helicopter model (Enstrom 280FX). Flight paths are also prohibited to fly over the mudflats near Swan Island due to the military no-fly zone, and if all

flights are redirected to the west to avoid the Swan Bay Ramsar wetland, there will be no flight paths directly passing over any sensitive foraging and roosting areas.

Therefore, it is expected that the proposed low frequency and diverted helicopter flight paths using a small helicopter model would have a largely negligible impact to migratory shorebirds around Queenscliff in terms of cumulative impacts to body condition, particularly if flown at higher altitudes (i.e. > 450 metres). This should avoid impacts to body condition and subsequent return migration, and is not expected to discourage the shorebirds from returning to the site in subsequent years for use as a foraging and roosting habitat. Another Ramsar wetland (Avalon Wetland) is situated in close proximity to Avalon airport which is subject to substantially higher levels of aircraft traffic, and thus suggests that any deleterious impacts of aircraft movements on avifauna species can be mitigated.

6.1.2 *Suitable Helicopter Flight Elevations and Distances*

Flight Distance

As the proposed helicopter flight movements will be relatively infrequent, it is unlikely that any birds in the area will become habituated to the disturbance, and instead may display flight or escape behaviours. The distance at which a bird may move away from a disturbance can be referred to as the Flight Initiation Distance (FID). FID can greatly vary between species, for example, roosting Eurasian Curlew were found to have a substantially lower FID than oystercatchers and godwits when approached by helicopters (Smit and Visser 1993). Similar patterns of reactivity have also been documented in comparable species when approached by drones: Eastern Curlews were the most likely to take flight, whereas Pied Oystercatchers and Bar-tailed Godwits were comparatively unreactive (Wilson *et al.* 2022).

Roosting shorebirds gathered in large flocks appear to be more susceptible and readily disturbed compared to solitary or scattered individuals, likely due to a greater number of individuals remaining vigilant to threats, where if one individual exhibits alarm behaviours it will cause neighbouring individuals to respond in the same manner (Rogers *et al.* 2005). For example, in a study of drone impacts on shorebirds at Moreton Bay, it was found that mixed-species flocks often responded according to the most sensitive or reactive individual which would in turn create a 'domino effect', leading to widespread escape responses in mixed-species flock (Wilson *et al.* 2022).

Based on available online databases, the nearest large flocks of roosting migratory shorebirds are often located along the western shore of Swan Island (3.5 - 5.5 kilometres to the east), while the nearest waterbody of Lakers Cutting more commonly contains records of solitary or small groups of shorebirds, or flyover observations (Figure 2). Occasional roosts of large waterbirds (e.g. ibis, herons, egrets) occur approximately 900 metres to the east at Tip Point (Nature Advisory 2022). Regardless of the variation in FID across different species, it is likely that the distance between the proposed helicopter take-off/ landing point and these known key roosting and foraging locations (900 metres for Tip Point; 3.5 - 5.5 kilometres for Swan Island) are large enough to avoid triggering any significant escape or flight behaviours (noting that the upper limit at which species detected a helicopter was 1250 metres; Anderson 2007). While some individuals may initially detect the disturbance, it is considered more likely that they will return to foraging or roosting several minutes after the helicopter has left rather than abandoning the area completely. Furthermore, if flight paths can be redirected to the west to avoid approaching the roosting flocks of shorebirds near Swan Island, this is expected to minimise the risk of flight initiation or escape behaviours.

Flight Elevation

One study in Switzerland that assessed the effects of aircraft disturbance on waterbirds found that the minimum helicopter flight altitude that did not cause perceptible changes in bird behaviour was 450 metres (Komenda-Zehnder *et al.* 2003). The same height was recommended for helicopter flights over the Keurbooms and Bitou Rivers (with the former being a site of high conservation significance; Froneman 2006) and is also consistent with Miller (1994; see Section 6.1.1.). Where possible, it is recommended that the helicopter flight height is > 450 metres (i.e. approximately 1500 feet) in order to minimise potential disturbance to shorebirds/waterbirds in the area.

6.1.3 Bird Strike Risk

There is a paucity of academic literature assessing the bird strike risk of helicopter flights, with studies generally concerned with the risk to human life rather than the conservation impact of any collisions. It is understood that the greatest risk of collisions occurs when the aircraft is flying at a lower altitude (Froneman 2006). In Australia, there were 4691 bird strikes reported to the Australian Transport Safety Bureau (ATSB) between 2019-2023, of which 116 involved a helicopter (i.e. 2.5% of all reports; ATSB 2023). Helicopter flights thus account for a very small proportion of bird strikes with aircrafts, and as a result, bird mortalities associated with helicopter collisions are not considered to pose a significant concern from a conservation perspective (Komenda-Zehnder *et al.* 2003).

It is considered that the bird strike risk is sufficiently mitigated by the current proposal by avoiding flights over sensitive areas that are likely to support larger flocks of shorebirds and/ or waterbirds (e.g. Swan Bay).

6.1.4 Orange-bellied Parrot

Orange-bellied Parrot (OBP) is one of only two migratory parrot species found in Australia, spending the summer months (December - February) breeding in south-west Tasmania and migrating across the Bass Strait to Victoria to spend the colder months on the mainland (March – October) (Menkhorst *et al.* 2017). The species is currently listed as Critically Endangered under the EPBC Act, with likely less than 100 individuals estimated to remain in the wild based on the most recent count of 77 wild OBP returning to Melaleuca, Tasmania, for the 2022 breeding season (DNRET 2023).

When in Victoria, OBP prefer to inhabit saltmarsh, dunes or weedy pasture within five kilometres the coast (Menkhorst *et al.* 2017). Based on modelled native vegetation and past records, suitable habitat for OBP can be found along the coast in the Swan Bay area (e.g. coastal saltmarsh; Plate 2; Figure 2), with several sightings of the species occurring around Swan Bay or on Swan Island over the past decades (Figure 2). More recently, two sightings of OBP have been reported on the Swan Island Golf Course as recently as 2020 (according to an objector to the application – however, these sightings have not been reported or confirmed in the VBA).

Case Study: Impact of Human and Aircraft Activity on OBP at Melaleuca, south-west Tasmania

The potential impacts of human and aircraft activity were examined at the primary breeding ground for OBP in Melaleuca, south-west Tasmania, in January 2000 (Ecology Australia 2000). The study aimed to establish the tolerance levels of OBP to a variety of human and aircraft stimuli, develop a survey methodology for monitoring the long-term impacts to OBP, and to recommend any mitigation measures to minimise the impacts of human and aircraft activity to OBPs (Ecology Australia 2000).

Historic aircraft activity was estimated from flight logbooks and discussions with the three relevant aircraft charter companies (Par Avion, Tasair, and Helicopter Resources) that operate flights to Melaleuca, to obtain data on the number and frequency of aircraft visitation, seasonal trends, aircraft types, and entry/ exit flight paths. Historic data on human activity was estimated from visitor logbook numbers (provided by Parks and Wildlife Service Tasmania) and by approximating the number of day visitors based on aircraft flight records and likely passenger carrying capacity, to gain an estimated total number of visitors from the previous year (1999). Current human and aircraft activity were recorded during a one-week field assessment to document ambient and disturbance conditions to OBP at their nesting sites and feeding table.

As a baseline, the standard level of vigilance of OBP was noted during the absence of aircraft and human activity.

- The impact of helicopters on OBP could only be assessed from one brief incidental helicopter flight into Melaleuca, as the helicopters were not available during the time of the field assessment due to fire operations. Noise levels during the approach, landing, take-off and departure were recorded.
 - No OBP (or any other bird species) were present at the assessment site while the helicopter was taking off, however one OBP returned to feeding three minutes after the disturbance.
 - One OBP flew into its nest box once the helicopter was starting up and emerged four minutes after the departure of the aircraft.

The authors suggest that noise and visual impacts associated with helicopters are likely greater than fixed-wing aircrafts, and habituation to the disturbance less likely, due to the volume and frequency of the noise, different size and shape of the aircraft, and lack of regular flight paths. Suggested mitigation measures include altering flight paths to reduce noise and visual disturbance at important sites.

It is considered that potential disturbance to OBP is relatively low in the context of the current proposal due to the low frequency of flights and avoidance of areas supporting suitable habitat (e.g. Swan Bay and Swan Island). The case study also provided preliminary evidence that OBP returned to baseline behaviour shortly after helicopter departure (i.e. 3-4 minutes, although the number of observations was very limited).

6.1.5 *White-bellied Sea-eagle*

White-bellied Sea-eagles *Haliaeetus leucogaster* are a protected 'Marine' species under the EPBC Act and have a high likelihood of occurring within the helicopter impact area due to extensive suitable habitat and recent records in the local vicinity.

Aside from habitat loss due to clearing for agriculture and development, human disturbance to nesting pairs is one of the greatest threats to White-bellied Sea-eagle (Dennis *et al.* 2011a). The species is particularly sensitive during the early and mid stages of their nesting period (i.e. courting/ nest lining, egg incubation, young nestlings) and are known to abandon their nests and young if exposed to substantial disturbance. The species typically lay eggs from June to early September in southern Australia (Dennis *et al.* 2011b). The general period of greatest sensitivity to disturbance extends from mid-May (when courtship is underway) to mid-September (when nestlings are present) (Dennis *et al.* 2011b).

Breeding failure was reported for a nesting pair of White-bellied Sea-eagles on a remote island on the Great Barrier Reef, Queensland, following frequent helicopter movements flying closely (~100 metres) over the nest

over a period of three days (Stokes 1996). The pair were found to abandon their nest while the helicopter was in operation, and did not return for several hours, which likely caused the eggs to fail to hatch. Habituation to the regular helicopter flights was considered unlikely to occur as to the helicopter presented a repeated, intense exposure to strong stimuli (i.e. loud noise and wind) (Stokes 1996). It was recommended that any future helicopter movements near the island occur at times that would cause the least disruption to the breeding pair to minimise risk of nesting failure (i.e. in the non-breeding season or when the fledglings are older) (Stokes 1996).

While there are many recent records of White-bellied Sea-eagle around the Swan Bay area based on observations reported on a range of online databases (VBA, ALA, iNaturalist, eBird), there are no available recent records of nesting pairs reported within the vicinity of the helicopter impact area (i.e. most observations reported on eBird comment on a flyover sighting of an adult or juvenile rather than a nest / nesting pair). While this does not conclude that there are no nesting pairs in the area, White-bellied Sea-eagles often re-use nests from earlier years over subsequent nesting seasons, which may suggest that there are no established long-term nesting locations or pairs known to that particular area. The species is also known to build their nests away from built up areas, often in high trees. For instance, in the Western Port area, one study found that the great majority of pairs built nests in tall trees (i.e. six out of seven pairs) (O'Brien and Lacy 2016). However, in coastal areas in South Australia, nesting tends to occur along cliffs, shallow cave overhangs, rock outcrops, or occasionally on isolated coastal trees or mangroves (Dennis and Detmar 2017). Due to the nature of coastal environments (i.e. predominantly open or supporting low-lying vegetation), these individuals/ pairs are more exposed and thus typically more susceptible to anthropogenic disturbances (Dennis and Detmar 2017).

To take a precautionary approach, it is recommended that if there are known nesting pairs of White-bellied Sea-eagle near the helicopter impact area, and particularly if any active nests are present, the helicopter should be diverted around the nest location, or avoided if this is not possible. The South Australian Recovery Plan for Eastern Osprey and White-bellied Sea Eagle (DEW 2022) recommends a 'refuge buffer zone' of two kilometres from the nest site (in coastal areas) where anthropogenic activities are restricted, based on the recommendations of Dennis *et al.* (2011a).

7 Conclusion

We support the original recommendations by Nature Advisory (2022):

- Helicopter flights should avoid going over the sensitive Ramsar wetlands of Swan Bay to the north and east of the study area. Flights are instead to be redirected to the west away from shorebird roosting/ foraging habitats; and,
- No flights will occur over Swan Island due to existing flight regulations (i.e. military no-fly zone), which will ensure that disturbance to migratory shorebirds is mitigated.

In addition:

- Given the low frequency of flights, and that the take-off/ landing location is sufficiently far from key roosting/ foraging sites, it is expected that migratory shorebirds will not be subject to significant disturbance. The proposed helicopter flights are considered unlikely to impact their energy reserves and ability to make their return migration to the northern hemisphere.

- Higher flight altitudes are likely to result in a lower impact to bird species present in the area. Previous recommendations for minimum helicopter flight heights over wetland sites have recommended an altitude of > 450 metres (Miller 1994; Froneman 2003; Komenda-Zehnder *et al.* 2003). The Bird Strike Risk is considered low, particularly given that no flights will be made over roosting habitat that supports larger flocks of birds.
- There is no available literature to our knowledge concerning FIDs for Orange-bellied Parrot. It is considered that the risk to the species has been mitigated as much as possible by avoiding sensitive foraging areas and flying at an appropriate altitude (i.e. > 450 metres).
- If there are any known nesting pairs of White-bellied Sea-eagle in the locality, it is advised that a two kilometre buffer (no fly zone) is applied to the nest site (if known) during the most sensitive periods of the breeding season (mid-May to mid-September).

It is our understanding that the client has undertaken a self-assessment and concluded that a referral under the EPBC Act is not likely to be required, which was confirmed by The Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW). However, given no referral or formal response under the EPBC Act has been made by the client to determine whether the proposed action is a controlled action under the Act, the proponent will be responsible if any significant impacts are identified in the future.

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Appendix 1 Significant Fauna Species

Significant fauna within 10 kilometres of the study area is provided in the Table A1.1.3 at the end of this section, with Tables A1.1.1 and A1.1.2 below providing the background context for the values in Table 1.1.3.

Table A1.1.1 Conservation status of each species for each Act/policy. The values in this table correspond to Columns 5 to 8 in Table A1.1.3.

EPBC (<i>Environment Protection and Biodiversity Conservation Act 1999</i>):				FFG (<i>Flora and Fauna Guarantee Act 1988</i>):			
EX	Extinct	VU	Vulnerable	ex	Extinct	vu	Vulnerable
CR	Critically endangered	CD	Conservation Dependent	cr	Critically endangered	cd	Conservation Dependent
EN	Endangered	#	Listed on the Protected Matter Search Tool	en	Endangered		

Table A1.1.2 Likelihood of occurrence rankings: Habitat characteristics assessment of significant fauna species previously recorded within 10 kilometres of the study area, or that may potentially occur within the study area to determine their likelihood of occurrence. The values in this table correspond to Column 7 in Table A1.1.3.

1	High Likelihood	<ul style="list-style-type: none"> Known resident in the study area based on site observations, database records, or expert advice; and/or, Recent records (i.e. within five years) of the species in the local area (DELWP 2022a); and/or, The study area contains the species' preferred habitat.
2	Moderate Likelihood	<ul style="list-style-type: none"> The species is likely to visit the study area regularly (i.e. at least seasonally); and/or, Previous records of the species in the local area (DELWP 2022a); and/or, The study area contains some characteristics of the species' preferred habitat.
3	Low Likelihood	<ul style="list-style-type: none"> The species is likely to visit the study area occasionally or opportunistically whilst en route to more suitable sites; and/or, There are only limited or historical records of the species in the local area (i.e. more than 20 years old); and/or, The study area contains few or no characteristics of the species' preferred habitat.
4	Unlikely	<ul style="list-style-type: none"> No previous records of the species in the local area; and/or, The species may fly over the study area when moving between areas of more suitable habitat; and/or, Out of the species' range; and/or, No suitable habitat present.

Table A1.1.3. Significant fauna within 10 kilometres of the study area.

Common Name	Scientific Name	Last documented record	Total # of documented records	EPBC Act	FFG Act	Likely occurrence in study area	Rationale for likelihood of occurrence
NATIONAL SIGNIFICANCE							
Antipodean Albatross	<i>Diomedea antipodensis</i> #	-	-	VU; Migratory; Marine	-	4	Pelagic species, unlikely to occur near shore within impact area.
Australasian Bittern	<i>Botaurus poiciloptilus</i>	2015	3	EN	cr	4	Limited suitable habitat (freshwater wetlands) near study area.
Australian Grayling	<i>Prototroctes maraena</i> #	-	-	VU	en	4	No suitable habitat.
Australian Painted Snipe	<i>Rostratula australis</i> #	-	-	EN; Marine	cr	4	Limited suitable habitat (freshwater wetlands) near study area.
Bar-tailed Godwit	<i>Limosa lapponica</i>	2019	106	VU; Migratory; Marine	vu	2	Suitable habitat, recent records.
Black-browed Albatross	<i>Thalassarche melanophris</i>	2019	172	VU; Migratory; Marine	-	3	Pelagic species. Commonly observed from land over inshore waters. Recent records.
Blue Petrel	<i>Halobaena caerulea</i>	2014	3	VU; Marine	-	4	Pelagic species, unlikely to occur near shore within impact area.
Blue Warehou	<i>Seriola brama</i> #	-	-	CD	cd	4	No suitable habitat.
Blue Whale	<i>Balaenoptera musculus</i>	2005	1	EN; Migratory; Marine	en	4	No suitable habitat.
Blue-winged Parrot	<i>Neophema chrysostoma</i>	2017	172	VU; Marine	-	2	Suitable habitat, recent records.
Brown Treecreeper (south-eastern)	<i>Climacteris picumnus victoriae</i> #	-	-	VU	-	4	No suitable habitat.
Buller's Albatross	<i>Thalassarche bulleri</i> #	-	-	VU; Migratory; Marine	en	4	Pelagic species, unlikely to occur near shore within impact area.
Campbell Albatross	<i>Thalassarche impavida</i> #	-	-	VU; Migratory; Marine	-	4	Pelagic species, unlikely to occur near shore within impact area.

Common Name	Scientific Name	Last documented record	Total # of documented records	EPBC Act	FFG Act	Likely occurrence in study area	Rationale for likelihood of occurrence
Curlew Sandpiper	<i>Calidris ferruginea</i>	2019	371	CR; Migratory; Marine	cr	2	Suitable habitat, recent records.
Diamond Firetail	<i>Stagonopleura guttata #</i>	-	-	VU	vu	4	No suitable habitat.
Eastern Barred Bandicoot	<i>Perameles gunnii</i>	1981	2	EN	en	4	Considered extinct in the wild on Australian mainland.
Eastern Curlew	<i>Numenius madagascariensis</i>	2019	145	CR; Migratory; Marine	cr	2	Suitable habitat, recent records.
Eastern Dwarf Galaxias	<i>Galaxiella pusilla #</i>	-	-	VU	en	4	No suitable habitat.
Fairy Prion (southern)	<i>Pachyptila turtur subantarctica #</i>	-	-	VU	-	4	Pelagic species, unlikely to occur near shore within impact area.
Fairy Tern	<i>Sternula nereis</i>	2019	241	VU	cr	2	Suitable habitat, recent records.
Fin Whale	<i>Balaenoptera physalus</i>	2017	1	VU; Migratory; Marine	-	4	No suitable habitat.
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	2017	9	EN	-	4	No suitable habitat.
Gould's Petrel	<i>Pterodroma leucoptera leucoptera #</i>	-	-	EN	-	4	Pelagic species, unlikely to occur near shore within impact area.
Great Knot	<i>Calidris tenuirostris</i>	2018	61	CR; Migratory; Marine	cr	2	Suitable habitat, recent records.
Greater Sand Plover	<i>Charadrius leschenaultii</i>	2011	21	VU; Migratory; Marine	vu	3	Suitable habitat, few recent records.
Green Turtle	<i>Chelonia mydas #</i>	-	-	VU; Migratory; Marine	-	4	No suitable habitat.
Grey Falcon	<i>Falco hypoleucos #</i>	-	-	VU	vu	4	No suitable habitat.

Common Name	Scientific Name	Last documented record	Total # of documented records	EPBC Act	FFG Act	Likely occurrence in study area	Rationale for likelihood of occurrence
Grey-headed Albatross	<i>Thalassarche chrysostoma</i>	1987	6	EN; Migratory; Marine	en	4	Pelagic species, unlikely to occur near shore within impact area.
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	2019	4	VU	vu	4	Some suitable habitat, few recent records.
Growling Grass Frog	<i>Litoria raniformis</i>	1961	3	VU	vu	4	No suitable habitat.
Hooded Plover	<i>Thinornis cucullatus</i>	2021	572	VU; Marine	vu	2	Some suitable habitat near beachy shorelines, recent records – but south of proposed flight paths.
Hooded Robin (south-eastern)	<i>Melanodryas cucullata cucullata</i> #	-	-	EN	-	4	No suitable habitat.
Indian Yellow-nosed Albatross	<i>Thalassarche carteri</i>	2019	18	VU; Migratory; Marine	en	4	Commonly observed from shore, however few recent records near impact area.
Leatherback Turtle	<i>Dermochelys coriacea</i> #	-	-	EN; Migratory; Marine	cr	4	No suitable habitat.
Lesser Sand Plover	<i>Charadrius mongolus</i>	2013	48	EN; Migratory; Marine	en	3	Some suitable habitat in area but no recent records.
Loggerhead Turtle	<i>Caretta caretta</i> #	-	-	EN; Migratory; Marine	-	4	No suitable habitat.
New Holland Mouse	<i>Pseudomys novaehollandiae</i> #	-	-	VU	en	4	No suitable habitat.
Northern Buller's Albatross	<i>Thalassarche bulleri platei</i> #	-	-	VU; Marine	-	4	Pelagic species, unlikely to occur near shore within impact area.
Northern Giant-Petrel	<i>Macronectes halli</i>	2014	9	VU; Migratory; Marine	en	4	Pelagic species, unlikely to occur near shore within impact area.
Northern Royal Albatross	<i>Diomedea sanfordi</i> #	-	-	EN; Migratory; Marine	-	4	Pelagic species, unlikely to occur near shore within impact area.
Nunivak Bar-tailed Godwit	<i>Limosa lapponica baueri</i> #	-	-	VU	-	4	No records.

Common Name	Scientific Name	Last documented record	Total # of documented records	EPBC Act	FFG Act	Likely occurrence in study area	Rationale for likelihood of occurrence
Orange-bellied Parrot	<i>Neophema chrysogaster</i>	2006	226	CR; Marine	cr	2	Some suitable habitat in area, recent records.
Painted Honeyeater	<i>Grantiella picta</i> #	-	-	VU	vu	4	No suitable habitat.
Plains-wanderer	<i>Pedionomus torquatus</i> #	-	-	CR	cr	4	No suitable habitat.
Red Knot	<i>Calidris canutus</i>	2019	100	EN; Migratory; Marine	en	2	Suitable habitat in area. Recent records.
Regent Honeyeater	<i>Anthochaera phrygia</i> #	-	-	CR	cr	4	No suitable habitat.
Salvin's Albatross	<i>Thalassarche salvini</i> #	-	-	VU; Migratory; Marine	-	4	Pelagic species, unlikely to occur near shore within impact area.
School Shark	<i>Galeorhinus galeus</i> #	-	-	CD	-	4	No suitable habitat.
Sei Whale	<i>Balaenoptera borealis</i> #	-	-	VU; Migratory; Marine	-	4	No suitable habitat.
Shy Albatross	<i>Thalassarche cauta</i>	2019	229	EN; Migratory; Marine	en	3	Commonly observed from shore, recent records in area.
Soft-plumaged Petrel	<i>Pterodroma mollis</i> #	-	-	VU; Marine	-	4	Pelagic species, unlikely to occur near shore within impact area.
Sooty Albatross	<i>Phoebastria fusca</i>	2014	5	VU; Migratory; Marine	cr	4	Pelagic species, unlikely to occur near shore within impact area.
Southern Bluefin Tuna	<i>Thunnus maccoyii</i>	1990	1	CD	cd	4	No suitable habitat.
Southern Brown Bandicoot	<i>Isodon obesulus obesulus</i>	1973	3	EN	en	4	No suitable habitat.
Southern Elephant Seal	<i>Mirounga leonina</i>	2005	2	VU	-	4	No suitable habitat.
Southern Giant-Petrel	<i>Macronectes giganteus</i>	2018	24	EN; Migratory; Marine	en	4	Pelagic species, unlikely to occur near shore within impact area.

Common Name	Scientific Name	Last documented record	Total # of documented records	EPBC Act	FFG Act	Likely occurrence in study area	Rationale for likelihood of occurrence
Southern Right Whale	<i>Eubalaena australis</i>	2019	32	EN; Migratory; Marine	en	4	No suitable habitat.
Southern Royal Albatross	<i>Diomedea epomophora</i> #	-	-	VU; Migratory; Marine	cr	4	Pelagic species, unlikely to occur near shore within impact area.
Southern Whiteface	<i>Aphelocephala leucopsis</i> #	-	-	VU	-	4	No suitable habitat.
Spot-tailed Quoll	<i>Dasyurus maculatus maculatus</i> (SE mainland population) #	-	-	EN	-	4	No suitable habitat.
Striped Legless Lizard	<i>Delma impar</i> #	-	-	VU	en	4	No suitable habitat.
Subantarctic Fur Seal	<i>Arctophoca tropicalis</i>	2015	2	EN	-	4	No suitable habitat.
Swamp Antechinus (mainland)	<i>Antechinus minimus maritimus</i> #	-	-	VU	vu	4	No suitable habitat.
Swamp Skink	<i>Lissolepis coventryi</i>	1989	2	EN	en	4	No suitable habitat.
Swift Parrot	<i>Lathamus discolor</i>	2019	83	CR; Marine	cr	3	Limited suitable habitat.
Wandering Albatross	<i>Diomedea exulans</i>	1984	21	VU; Migratory; Marine	cr	4	Pelagic species, uncommon near shore within impact area.
White Shark	<i>Carcharodon carcharias</i> #	-	-	VU; Migratory	en	4	No suitable habitat.
White-bellied Storm-Petrel (Tasman Sea)	<i>Fregetta grallaria grallaria</i> #	-	-	VU	-	4	Pelagic species, unlikely to occur near shore within impact area.
White-capped Albatross	<i>Thalassarche steadi</i> #	-	-	VU; Migratory; Marine	-	4	Pelagic species, unlikely to occur near shore within impact area.
White-throated Needletail	<i>Hirundapus caudacutus</i>	2019	43	VU; Migratory; Marine	vu	3	Migrant arriving in Summer (Dec-Apr). Few recent records.
Yarra Pygmy Perch	<i>Nannoperca obscura</i> #	-	-	VU	vu	4	No suitable habitat.

Common Name	Scientific Name	Last documented record	Total # of documented records	EPBC Act	FFG Act	Likely occurrence in study area	Rationale for likelihood of occurrence
Yellow-bellied Glider (south-eastern)	<i>Petaurus australis australis</i> #	-	-	VU	-	4	No suitable habitat.
STATE SIGNIFICANCE							
Australasian Shoveler	<i>Spatula rhynchotis</i>	2019	127	-	vu	2	Some suitable habitat (inland freshwater lakes/wetlands, Swan Bay intertidal area). Recent records.
Australian Gull-billed Tern	<i>Gelochelidon macrotarsa</i>	1982	10	-	en	3	Some suitable habitat, no recent records.
Australian Little Bittern	<i>Ixobrychus dubius</i>	2013	1	-	en	4	Limited suitable habitat (freshwater wetlands) near study area, no recent records.
Black Falcon	<i>Falco subniger</i>	2018	21	-	cr	3	Limited suitable habitat, infrequent recent records.
Black-tailed Godwit	<i>Limosa limosa</i>	2006	31	Migratory; Marine	cr	4	Limited suitable habitat (shallow wetlands), no recent records.
Blue-billed Duck	<i>Oxyura australis</i>	2018	69	-	vu	2	Some suitable habitat (inland freshwater lakes/wetlands, Swan Bay intertidal area). Recent records.
Brolga	<i>Antigone rubicunda</i>	1998	1	-	en	4	Limited suitable habitat (freshwater wetlands), no recent records.
Brown Toadlet	<i>Pseudophryne bibronii</i>	2000	1	-	en	4	No suitable habitat.
Brush-tailed Phascogale	<i>Phascogale tapoatafa</i>	1963	5	-	vu	4	No suitable habitat.
Burrnan Dolphin	<i>Tursiops australis</i>	2015	20	-	cr	4	No suitable habitat.
Bush Stone-curlew	<i>Burhinus grallarius</i>	1992	3	-	cr	4	No suitable habitat. Outside known current distribution.
Caspian Tern	<i>Hydroprogne caspia</i>	2019	507	Migratory; Marine	vu	2	Suitable habitat and recent local records.
Chestnut-rumped Heathwren	<i>Calamanthus pyrrhopygius</i>	1981	10	-	vu	4	No suitable habitat.
Chiton 5254	<i>Bassethullia glypta</i>	1989	2	-	cr	4	No suitable habitat.

Common Name	Scientific Name	Last documented record	Total # of documented records	EPBC Act	FFG Act	Likely occurrence in study area	Rationale for likelihood of occurrence
Common Greenshank	<i>Tringa nebularia</i>	2019	369	Migratory; Marine	en	2	Suitable habitat in area. Recent records.
Common Sandpiper	<i>Actitis hypoleucos</i>	2014	37	Migratory; Marine	vu	3	Some suitable habitat, no recent records.
Eastern Great Egret	<i>Ardea alba modesta</i>	2018	4	-	vu	2	Suitable habitat in area. Recent records.
Fiery Jewel Butterfly	<i>Hypochrysops ignitus ignitus</i>	1955	89	-	en	4	No suitable habitat.
Freckled Duck	<i>Stictonetta naevosa</i>	2019	242	-	en	3	Some suitable habitat in area (inland freshwater lakes/wetlands, Swan Bay intertidal area). Few recent records.
Ghost Shrimp	<i>Pseudocalliax tooradin</i>	1982	2	-	en	4	No suitable habitat.
Glossy Grass Skink	<i>Pseudemoia rawlinsoni</i>	2007	3	-	en	4	No suitable habitat.
Grey Goshawk	<i>Accipiter novaehollandiae</i>	2018	47	-	en	3	Some suitable habitat, few recent records.
Grey Plover	<i>Pluvialis squatarola</i>	2019	71	Migratory; Marine	vu	2	Suitable habitat in area. Recent records.
Grey-crowned Babbler	<i>Pomatostomus temporalis</i>	1891	1	-	vu	4	Outside current known range.
Grey-tailed Tattler	<i>Tringa brevipes</i>	2019	47	Migratory; Marine	cr	2	Some suitable habitat, few recent records.
Hardhead	<i>Aythya australis</i>	2020	352	-	vu	2	Some suitable habitat (inland freshwater lakes/wetlands, Swan Bay intertidal area). Recent records.
Lewin's Rail	<i>Lewinia pectoralis</i>	2018	11	-	vu	2	Some suitable habitat (coastal wetlands). Recent records.
Little Eagle	<i>Hieraaetus morphnoides</i>	2016	94	-	vu	3	Some suitable habitat, few recent records.
Little Egret	<i>Egretta garzetta</i>	2020	642	-	en	2	Some suitable habitat (inland freshwater lakes/wetlands, Swan Bay intertidal area). Recent records.
Little Tern	<i>Sternula albifrons</i>	2019	91	Migratory; Marine	cr	2	Suitable habitat in area. Recent records.

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Long-nosed Fur Seal	<i>Arctophoca forsteri</i>	2020	3	Marine	vu	4	No suitable habitat.
Magpie Goose	<i>Anseranas semipalmata</i>	2016	1	-	vu	3	Some suitable habitat, few recent records.
Marsh Sandpiper	<i>Tringa stagnatilis</i>	2018	24	Migratory; Marine	en	3	Some suitable habitat, few recent records.
Masked Owl	<i>Tyto novaehollandiae</i>	1979	1	-	cr	4	No suitable habitat.
Musk Duck	<i>Biziura lobata</i>	2019	154	-	vu	3	Some suitable habitat (inland freshwater lakes/wetlands, Swan Bay intertidal area). Few recent records.
Pacific Golden Plover	<i>Pluvialis fulva</i>	2019	72	Migratory; Marine	vu	2	Suitable habitat, few recent records.
Plumed Egret	<i>Ardea intermedia plumifera</i>	2001	3	-	cr	4	Limited suitable habitat, no recent records.
Ruddy Turnstone	<i>Arenaria interpres</i>	2019	123	Migratory; Marine	en	2	Suitable habitat, few recent records.
Small Ant Blue Butterfly	<i>Acrodipsas myrmecophila</i>	1974	172	-	en	4	No suitable habitat.
Southern Humpback Whale	<i>Megaptera novaeangliae australis</i>	2019	15	-	cr	4	No suitable habitat.
Square-tailed Kite	<i>Lophoictinia isura</i>	2019	1	-	vu	3	Limited suitable habitat, few recent records.
Terek Sandpiper	<i>Xenus cinereus</i>	1987	1	Migratory; Marine	en	4	Limited suitable habitat, no recent records.
Whimbrel	<i>Numenius phaeopus</i>	2001	27	Migratory; Marine	en	2	Some suitable habitat, recent records (eBird).
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	2019	80	Marine	en	2	Suitable habitat, recent records.
White-faced Storm-Petrel	<i>Pelagodroma marina</i>	2018	20	-	en	4	No suitable habitat.
White-footed Dunnart	<i>Sminthopsis leucopus</i>	2014	7	-	vu	4	No suitable habitat.
Wood Sandpiper	<i>Tringa glareola</i>	1979	1	-	en	3	Some suitable habitat, no recent records.

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Yellow Sedge-skipper Butterfly	<i>Hesperilla flavescens</i>	1988	1	-	en	4	No suitable habitat.

Data Sources: Victorian Biodiversity Atlas (DELWP 2022a); Protected Matters Search Tool (DCCEEW 2023).