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Assessment of Reflectivity on Bird Strike for Sydney Olympic Park Site 2 Mixed Use Development

Dear Graham,

Cumberland Ecology has been engaged to prepare an assessment of the potential impacts of reflectivity on bird strike for a proposed development at Site 2 Australia Avenue, located to the south of the intersection between Australia Avenue and Murray Rose Avenue in Sydney Olympic Park NSW (hereafter referred to as the 'project').

This letter includes the following:

- **Appendix A:** Reflectivity and bird strike assessment; and
- **Appendix B:** Threatened and migratory bird likelihood of occurrence table.

Please do not hesitate to contact myself, or Vanessa Orsborn, at our Sydney office on (02) 9868 1933 if you have any questions.

Yours sincerely,

Heather Gosper
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APPENDIX A :
Reflectivity and Bird Strike Assessment

A.1. Introduction

Cumberland Ecology has been engaged by the Ecove Group (the 'client') to provide an assessment of the impacts of reflectivity on bird strike for a proposed mixed use development application (DA) at Site 2 Australia Avenue, located to the south of the intersection between Australia Avenue and Murray Rose Avenue in Sydney Olympic Park NSW (hereafter referred to as the 'project'). The project will involve the construction of two high-rise buildings and ancillary development.

The land area covered by the proposed development (Lot 71 DP 1134933), is hereafter referred to as the 'subject site' and additional areas of vegetation surrounding the subject site have been considered as part of the 'study area' (see **Figure 1**).

Cumberland Ecology has previously prepared an ecological assessment and Biodiversity Development Assessment Report (BDAR) Waiver (our ref. 18113 Let3) and sun-shading assessment (our ref. 18113 Let4) for the project.

Following the DA exhibition period, the following commentary was received:

"SOPA notes that the current assessment does not consider the potential impacts of building reflectivity to avian fauna, which may be impacted by the development. There are several species of native birds recorded as being within the town centre, including Black-shouldered Kite, Peregrine Falcon, Tawny Frogmouth, Magpies as well as many species of parrots and small birds".

The client has received two bird-safe building guidelines from the Sydney Olympic Park Authority (SOPA) for consideration that recommend glazing reflectivity of less than 15% and requested further information regarding the impact of building reflectivity on birds and the proposed mitigation measures for the project.

The assessment of building reflectivity on bird strike based on the current development plan is provided below.

A.2. Methodology

A.2.1. Desktop Assessment

A review of existing data for the project area was conducted, including revision of the previously prepared Cumberland Ecology BDAR Waiver and sunshading assessment, and the architectural, solar reflectivity and development layout plans provided by the client. Additionally, the following two bird-safe building guidelines provided by SOPA were reviewed:

- Draft Bird-Safe Design Guidelines (City of Ottawa 2020); and
- Bird-friendly Best Practices: Glass (City of Toronto 2016).

A database analysis was also conducted for the locality (within 5km of the subject site) using the NSW BioNet Wildlife Atlas to identify any threatened species and native avian species that have the potential to be present or regularly pass through the subject site.

A.3. Results

A.3.1. Building Design and Reflectivity Information

Untreated glass in buildings is responsible for most bird collisions. Birds will strike transparent panes of glass in buildings because they do not perceive it as being present and attempt to fly through the glass to reach the sky or habitat that is either visible through the glass or that is reflected in the glass surfaces (City of Toronto 2016). While high-rise buildings have been shown to account for less than 1% of building-related bird strikes, they tend to have higher per-structure strike rates than other houses or low-rise buildings (City of Ottawa 2020).

Glazing is noted as the most critical factor in bird-safe design in the Draft Bird-Safe Design Guidelines (City of Ottawa 2020), that states there are two primary factors leading to bird strike, transparency and reflectivity.

Transparency can be reduced through reducing the amount of glass on the exterior of a building, covering glass surfaces uniformly with objects or patterns separated by no more than 10 cm, using translucent or opaque glass, and introducing facades and external building features such as awnings and shutters and sunshades (City of Toronto 2016).

Reflectivity can be reduced by using a low reflectance glass of less than 15% reflectance. Glass with a reflective or low-emissivity coating that has an outside reflectance of greater than 15% should be used in combination with other strategies such as visual markers (City of Toronto 2016).

The guidelines Bird-friendly Best Practices: Glass (City of Toronto 2016) recommends the following strategies to reduce the risk of bird-strike for buildings:

"a) Avoid monolithic, undistinguished expanses of glazing.

b) Incorporate visual interest or differentiation of material, texture, colour, opacity, or other features to fragment reflections.

c) Where glazing is used, bird-safe glass or glass with integrated protection measures is preferred. Treatments should be applied to a minimum of 90% of the glass within the first 16 metres of height as measured from the finished grade, or to the height of the adjacent mature tree canopy, whichever is greater.

d) Where green roofs, rooftop gardens or terraces are included in a design, any adjacent glazing should also be treated to a height of 4 m from the surface of the roof or terrace or the height of the adjacent mature vegetation, whichever is greater."

A.3.2. Bird Species Occurrence

A.3.2.1. Threatened Bird Species

A total of 56 threatened and migratory bird species have been recorded as occurring within the locality, comprising 34 species listed as threatened under the NSW *Biodiversity Conservation Act 2016* (BC Act) or Commonwealth *Environment and Protection Biodiversity Conservation Act 1999* (EPBC Act) and 22 species listed

only as migratory under the EPBC Act. Of the 34 species listed as threatened, 11 are also listed as migratory for a total of 33 migratory species.

Of these species, and as identified in the BDAR Waiver for the project (ref. 18113 Let3), the following bird species have been assessed as having the potential to occur within the subject site:

- Eastern Osprey (*Pandion cristatus*);
- Little Lorikeet (*Glossopsitta pusilla*);
- Powerful Owl (*Ninox strenua*);
- Swift Parrot (*Lathamus discolor*); and
- White-bellied Sea-Eagle (*Haliaeetus leucogaster*).

A large number of threatened and migratory waders are also known from the locality, and extensive habitat is present in proximate areas, including Badu Wetlands approximately 277m to the east of the subject site. However, no habitat is present for these species on the subject site.

A Likelihood of Occurrence Assessment for threatened and migratory species recorded from the locality is provided in **Appendix B**.

A.3.2.2. Non-threatened Bird Species

A number of native bird species have been noted as occurring within the area by SOPA, including the Black-shouldered Kite (*Elanus axillaris*), Peregrine Falcon (*Falco peregrinus*), Tawny Frogmouth (*Podargus strigoides*), Australian Magpie (*Cracticus tibicen*) and other parrots and small birds.

Additional species likely to be present include urban-adapted native species such as the Magpie-lark (*Grallina cyanoleuca*), Rainbow Lorikeet (*Trichoglossus moluccanus*), Noisy Miner (*Manorina melanocephala*), and exotic species such as the Spotted Dove (*Streptopelia chinensis*) and Common Myna (*Acridotheres tristis*).

A.4. Impact Assessment

A.4.1. Bird Strike on Buildings

Direct impacts of the project include the construction of the commercial buildings and associated landscaping and will result in the removal of approximately 0.34 ha of urban native and exotic vegetation which has previously been planted in garden beds or as rows of street trees (ref. 18113 Let3). This vegetation provides little habitat for birds as it is in a highly urbanised setting and it is unlikely that many species have come to rely on these habitats or frequent the subject site regularly as part of their foraging routine; thus the number of birds within the area is already reduced.

Nevertheless, the risk of window strike hazard is likely to increase for resident and migrant birds as the construction of new buildings will contain some expanses of glass. As any factor that increases the density of birds near windows is known to increase strike rate (Klem Jr. 1990, Klem Jr. 1990), there is the possibility that the staged building construction will exacerbate strike risk impacts as the few resident birds using the subject

site as part of their regular flight path will adapt to the first building and then later collide with subsequent buildings as they are erected. This is highly unlikely however, as birds are likely to be scared off by the working on site and are more likely to adapt to avoiding the area completely.

There are numerous migratory and wading species inhabiting the Badu Wetlands to the east and these species may fly over the developed areas within the subject site on occasion and thus experience an increased risk of bird strike; however, it is more likely these species would travel north and south to areas of further wetlands and waterways rather than to the west over the already developed areas of Sydney Olympic Park and the subject site.

The majority of the species utilising the subject site would be non-threatened and exotic urban-adapted species that are familiar with the inhabiting areas around buildings and development, as the subject site currently exists as a carpark and there is little incentive for species to forage in or inhabit this environment. Of the five threatened bird species considered as having the potential to occur within the subject site, none are considered likely to utilise the subject site as part of a regular foraging area or be at a significantly increased risk of bird-strike by the project.

Birds strikes with windows in the long-term are likely to increase, however these are not predicted to be significant and specific mitigation measures have been incorporated into the design to reduce these impacts.

A.5. Mitigation Measures

A.5.1. Building Design

A solar light reflectivity study was prepared for the project (Windtech Consultants 2021) to assess measures for the project to avoid any adverse glare to motorists and pedestrians and to comply with the relevant planning control requirements. The following limitations to the maximum normal specular reflectance of visible light of the external façade that were identified to be incorporated into the building design include:

- *The inclusion of the proposed powdercoated sun-shade and louver elements along the façade of Building 2A as indicated in the architectural drawings;*
- *The proposed louver elements and loading dock roller door along the podium of Building 2A are to have a painted or powdercoated surface finish;*
- *The inclusion of the proposed powdercoated sun-shade elements along the façade of Building 2B as indicated in the architectural drawings;*
- *The inclusion of the proposed louver elements and non-glazed signage along the façade of the Pavilion as indicated in the architectural drawings; and*
- *All other glazing (windows and balustrades) should have a maximum normal specular reflectance of visible light of 20%.*

These design elements also act to reduce the likelihood of bird strike by reducing the following:

- reducing the reflectance level of the glass used to 20% (within 5% of the recommended 15%);

- by reducing the overall surface area of reflective glass surfaces through incorporation of powdercoated sun-shade elements; and
- by reducing large expanses of undifferentiated glass through incorporation of louvres and sun-shade elements in the façade at each level to act as visual differentiation.

Further, the development has been situated in an area already surrounded by several high-rise buildings that would reduce the possibility that bird species utilise this area as part of a regular flight path.

A selection of the architectural drawings showing the proposed facades for the two towers are provided in **Figures** at the end of this letter.

A.6. Conclusion and Recommendations

The proposed development for Site 2A, Australia Avenue will involve the construction of two high-rise towers that have the potential to increase the risk of bird-strike in the long-term.

Bird-safety guidelines were reviewed alongside the architectural plans for the project and a solar light reflectivity study, which indicate that a suite of mitigation measures have been incorporated into the building design to reduce overall reflectance and thereby the risk of bird-strike is also subsequently reduced.

While the project will result in a slight increase in bird-strike risk in the long-term, the subject site exists in a highly developed area that is likely only frequented by hardy non-threatened and exotic urban-adapted species. No significant impact to any threatened, migratory or native bird species is considered likely to result from the proposed project.

A.7. References

City of Ottawa (2020). Draft Bird-Safe Design Guidelines. Ottawa, Canada.

City of Toronto (2016). Bird-friendly Best Practices: Glass. Toronto, Canada.

Klem Jr., D. (1990). "Bird injuries, cause of death, and recuperation from collisions with windows." Journal of Field Ornithology **61**(1): 115-119.

Klem Jr., D. (1990). "Collisions between birds and windows: Mortality and prevention." Journal of Field Ornithology **61**(1): 120-128.

Windtech Consultants (2021). Solar Light Reflectivity Study: 2A & 2B Australia Avenue, Sydney Olympic Park.

APPENDIX B :

Threatened and Migratory Bird Likelihood of Occurrence Assessment

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Table 1 Threatened and migratory bird likelihood of occurrence assessment

Common Name	Scientific Name	BC Act	EPBC Act	No. of Records	Habitat Requirements	Likelihood on the subject site
Australasian Bittern	*Botaurus poiciloptilus*	E	E	13	Favours permanent freshwater wetlands with tall, dense vegetation, particularly bulrushes (Typha spp.) and spikerushes (Eleocharis spp.).	Unlikely, no suitable habitat on the subject site. The species is likely to frequent the wetland habitats of the Sydney Olympic Park site.
Australian Painted Snipe	*Rostratula australis*	E	E	10	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	Unlikely, no suitable habitat on the subject site. The species is likely to frequent the wetland habitats of the Sydney Olympic Park site.
Barking Owl	*Ninox connivens*	V		1	Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. Requires very large permanent territories in most habitats due to sparse prey densities. Monogamous pairs hunt over as much as 6000 hectares, with 2000 hectares being more typical in NSW habitats.	Unlikely. No suitable habitat

Common Name	Scientific Name	BC Act	EPBC Act	No. of Records	Habitat Requirements	Likelihood on the subject site
Bar-tailed Godwit	*Limosa lapponica*		C,J,K	1736	A variety of coastal habitats including large intertidal sandflats, estuaries and coastal lagoons.	Unlikely, no suitable habitat on the subject site. The species is likely to frequent the wetland habitats of the Sydney Olympic Park site.
Black Bittern	*Ixobrychus flavicollis*	V		5	Inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Where permanent water is present, the species may occur in flooded grassland, forest, woodland, rainforest and mangroves.	Unlikely, no suitable habitat on the subject site. The species is likely to frequent the wetland habitats of the Sydney Olympic Park site.
Black Falcon	*Falco subniger*	V		2	Predominantly located in inland Australia where it is found along tree-lined watercourses and in isolated woodlands, mainly in arid and semi-arid areas.	Unlikely. No suitable habitat
Black-tailed Godwit	*Limosa limosa*	V	C,J,K	19	Usually found in sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats.	Unlikely, no suitable habitat on the subject site. The species is likely to frequent the wetland habitats of the Sydney Olympic Park site.

Common Name	Scientific Name	BC Act	EPBC Act	No. of Records	Habitat Requirements	Likelihood on the subject site
Broad-billed Sandpiper	*Limicola falcinellus*	V	C,J,K	1	Sheltered coastal areas including sandflats and mudflats, lagoons and saltmarshes. May occasionally be found in freshwater lagoons. Roosts on banks and beaches.	Unlikely, no suitable habitat on the subject site. The species is likely to frequent the wetland habitats of the Sydney Olympic Park site.
Caspian Tern	*Hydroprogne caspia*		C,J	90	Mostly in sheltered coastal embayments, especially those with sandy or muddy margins.	Unlikely, no suitable habitat on the subject site. The species is likely to frequent the wetland habitats of the Sydney Olympic Park site.
Common Greenshank	*Tringa nebularia*		C,J,K	339	A wide variety of inland wetlands and sheltered coastal habitats of varying salinity.	Unlikely, no suitable habitat on the subject site. The species is likely to frequent the wetland habitats of the Sydney Olympic Park site.
Common Sandpiper	*Actitis hypoleucos*		C,J,K	158	A wide range of coastal and sometimes inland wetlands.	Unlikely, no suitable habitat on the subject site. The species is likely to frequent the wetland habitats of the Sydney Olympic Park site.

Common Name	Scientific Name	BC Act	EPBC Act	No. of Records	Habitat Requirements	Likelihood on the subject site
Common Tern	*Sterna hirundo*		C,J,K	52	All marine zones, particularly near-coastal and sheltered waters	Unlikely, no suitable habitat on the subject site. The species is likely to frequent the wetland habitats of the Sydney Olympic Park site.
Crested Tern	*Thalasseus bergii*		J	71	A coastal species that breeds in colonies on small offshore islands. Most frequently seen along beaches and coastal estuaries.	Unlikely. No suitable habitat
Curlew Sandpiper	*Calidris ferruginea*	E	CE,C,J,K	694	Generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts.	Unlikely, no suitable habitat on the subject site. The species is likely to frequent the wetland habitats of the Sydney Olympic Park site.
Dusky Woodswallow	*Artamus cyanopterus*	V		34	Prefers dry, open eucalypt forests and woodlands, can also be found in shrublands or around farmland.	Unlikely. No suitable habitat
Eastern Curlew	*Numenius madagascariensis*		CE,C,J,K	41	Sheltered coasts with large intertidal mudflats or sandflats.	Unlikely, no suitable habitat on the subject site. The species is likely to frequent the wetland habitats of the Sydney Olympic Park site.

Common Name	Scientific Name	BC Act	EPBC Act	No. of Records	Habitat Requirements	Likelihood on the subject site
Eastern Grass Owl	*Tyto longimembris*	V		2	Tall grass habitats in swampy, grassy plains and floodplains. Breeds exclusively on the ground.	Unlikely. No suitable habitat
Eastern Osprey	*Pandion cristatus*	V		11	Coastal habitats of open water, especially mouths of large rivers, lagoons and lakes.	Possible, although unlikely to frequently visit the marginal habitats of the subject site. Could occasionally occur as part of a large area covered by migratory route.
Flame Robin	*Petroica phoenicea*	V		2	Breeds in upland tall, moist, eucalypt forests and woodlands, often on ridges and slopes. Groundlayer of breeding habitat is dominated by native grasses. It occasionally occurs in herbfields, heathlands, shrublands, and sedgelands at high altitudes. In winter the species migrates to drier, more open habitats in the lowlands. The species forages from low perches, pouncing on small invertebrates on the ground or off logs, and other coarse woody material.	Unlikely. No suitable woodland habitat

Common Name	Scientific Name	BC Act	EPBC Act	No. of Records	Habitat Requirements	Likelihood on the subject site
Fork-tailed Swift	*Apus pacificus*		C,J,K	2	Forages aerially over a variety of habitats usually over coastal and mountain areas with a preference for wooded areas.	Unlikely. No suitable habitat.
Freckled Duck	*Stictonetta naevosa*	V		2	Prefer permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. During drier times they move from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds.	Unlikely. No suitable habitat.
Great Knot	*Calidris tenuirostris*	V	CE,C,J,K	1	Coastal areas, including sheltered inlets, bays, lagoons and estuaries with intertidal mudflats	Unlikely, no suitable habitat on the subject site. The species is likely to frequent the wetland habitats of the Sydney Olympic Park site.

Common Name	Scientific Name	BC Act	EPBC Act	No. of Records	Habitat Requirements	Likelihood on the subject site
Greater Sand-plover	*Charadrius leschenaultii*	V	V,C,J,K	1	Greater Sand Plovers breed in central Asia, Mongolia, southern Siberia, north-western China, south-eastern Kazakhstan, the Aral Sea, the Caspian Sea, and south to Afghanistan. During the non-breeding season, the species is recorded in many coastal areas of Australia, inhabiting littoral and estuarine habitats where they mainly occur on sheltered sandy, shelly or muddy beaches with large intertidal mudflats or sandbanks, as well as sandy estuarine lagoons.	Unlikely. No suitable habitat.
Grey Plover	*Pluvialis squatarola*		C,J,K	3	This species breeds in the northern hemisphere and is a non-breeding visitor to Australia, where it occurs predominantly along the coasts and with other wader bird species.	Unlikely. No suitable habitat.
Grey-tailed Tattler	*Tringa brevipes*		C,J,K	5	Sheltered coasts with reefs and rock platforms or with intertidal mudflats.	Unlikely, no suitable habitat on the subject site. The species is likely to frequent the wetland habitats of the Sydney Olympic Park site.

Common Name	Scientific Name	BC Act	EPBC Act	No. of Records	Habitat Requirements	Likelihood on the subject site
Gull-billed Tern	*Gelochelidon nilotica*		C	15	Occurs at freshwater swamps, brackish and salt lakes, beaches and estuarine mudflats, floodwaters, sewage farms, irrigated croplands and grasslands.	Unlikely, no suitable habitat on the subject site. The species is likely to frequent the wetland habitats of the Sydney Olympic Park site.
Latham's Snipe	*Gallinago hardwickii*		J,K	1880	Freshwater wetlands on or near the coast, generally among dense cover.	Unlikely, no suitable habitat on the subject site. The species is likely to frequent the wetland habitats of the Sydney Olympic Park site.
Little Eagle	*Hieraaetus morphnoides*	V		16	Occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used.	Unlikely. No suitable habitat

Common Name	Scientific Name	BC Act	EPBC Act	No. of Records	Habitat Requirements	Likelihood on the subject site
Little Lorikeet	*Glossopsitta pusilla*	V		5	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophoras, Melaleucas and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Also utilises isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees. Roosts in treetops, often distant from feeding areas. Nests in proximity to feeding areas if possible, most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts.	Possible, although unlikely to frequently visit the marginal habitats of the subject site. Could occasionally occur as part of a large foraging area
Little Tern	*Sternula albifrons*	E	C,J,K	7	Almost exclusively coastal, preferring sheltered environments; however may occur several kilometres from the sea in harbours, inlets and rivers.	Unlikely, no suitable habitat on the subject site. The species may utilise the wetland habitats of the Sydney Olympic Park site as secondary habitat.

Common Name	Scientific Name	BC Act	EPBC Act	No. of Records	Habitat Requirements	Likelihood on the subject site
Marsh Sandpiper	*Tringa stagnatilis*		C,J,K	74	Permanent or ephemeral wetlands of varying salinity.	Unlikely, no suitable habitat on the subject site. The species is likely to frequent the wetland habitats of the Sydney Olympic Park site.
Masked Owl	*Tyto novaehollandiae*	V		1	Lives in dry eucalypt forests and woodlands from sea level to 1100 m. It is a forest owl, but often hunts along the edges of forests, including roadsides.	Unlikely. No suitable habitat.
Pacific Golden Plover	*Pluvialis fulva*		C,J,K	639	Coastal habitats such as beaches, mudflats and sandflats.	Unlikely, no suitable habitat on the subject site. The species is likely to frequent the wetland habitats of the Sydney Olympic Park site.
Pectoral Sandpiper	*Calidris melanotos*		J,K	73	Shallow fresh to saline lagoons usually in coastal areas.	Unlikely, no suitable habitat on the subject site. The species is likely to frequent the wetland habitats of the Sydney Olympic Park site.

Common Name	Scientific Name	BC Act	EPBC Act	No. of Records	Habitat Requirements	Likelihood on the subject site
Pied Oystercatcher	*Haematopus longirostris*	E		8	Favours intertidal flats of inlets and bays, open beaches and sandbanks. Forages on exposed sand, mud and rock at low tide, for molluscs, worms, crabs and small fish.	Unlikely. No suitable habitat
Powerful Owl	*Ninox strenua*	V		55	A variety of forest types including woodland, open sclerophyll forest, tall open wet forest, rainforest and occasionally fragmented areas. Territories may be as large as 1450 ha and nesting occurs in large tree hollows of old, mature trees.	Possible, although unlikely to frequently visit the marginal habitats of the subject site for foraging. No nesting or roosting habitat is present. Could occasionally occur as part of a large foraging area
Red Knot	*Calidris canutus*		E,C,J,K	29	Intertidal mudflats, sandflats and sandy beaches of sheltered coasts.	Unlikely, no suitable habitat on the subject site. The species is likely to frequent the wetland habitats of the Sydney Olympic Park site.

Common Name	Scientific Name	BC Act	EPBC Act	No. of Records	Habitat Requirements	Likelihood on the subject site
Red-necked Stint	*Calidris ruficollis*		C,J,K	89	Coastal areas, including sheltered inlets, bays, lagoons and estuaries with intertidal mudflats	Unlikely, no suitable habitat on the subject site. The species is likely to frequent the wetland habitats of the Sydney Olympic Park site.
Regent Honeyeater	*Anthochaera phrygia*	E	CE	5	Occurs in dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Forages mainly on nectar from a small number of high volume nectar-producing species such as the Mugga Ironbark, Yellow Box, White Box and Swamp Mahogany.	Unlikely. No suitable habitat.
Ruddy Turnstone	*Arenaria interpres*		C,J,K	14	Coastal regions with exposed rock coastlines or coral reefs.	Unlikely. No suitable habitat
Ruff	*Philomachus pugnax*		C,J,K	5	A wading bird that breeds in northern Eurasia and visits Australia as part of it's non-breeding range.	Unlikely. No suitable habitat
Sanderling	*Calidris alba*	V	C,J,K	1	Breeds in Siberia and visits Australia as part of it's non-breeding habitat, where they often occur on exposed sandy beaches that are subject to the ocean's swell.	Unlikely. No suitable habitat

Common Name	Scientific Name	BC Act	EPBC Act	No. of Records	Habitat Requirements	Likelihood on the subject site
Scarlet Robin	*Petroica boodang*	V		3	Occurs singly or in pairs in dry eucalypt forests and woodlands with an abundance of fallen timber and logs. It can occasionally be found in wetlands and swamps.	Unlikely. No suitable woodland habitat
Sharp-tailed Sandpiper	*Calidris acuminata*		C,J,K	1485	Prefers muddy edges of shallow fresh or brackish wetlands.	Unlikely, no suitable habitat on the subject site. The species is likely to frequent the wetland habitats of the Sydney Olympic Park site.
Spotted Harrier	*Circus assimilis*	V		12	Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands.	Unlikely. No suitable habitat
Swift Parrot	*Lathamus discolor*	E	CE	11	Migratory, forage on winter-flowering eucalypts and/or lerp-infested trees.	Possible, although unlikely to frequently visit the marginal habitats of the subject site. Could occasionally

Common Name	Scientific Name	BC Act	EPBC Act	No. of Records	Habitat Requirements	Likelihood on the subject site
						occur as part of a large foraging area
Terek Sandpiper	*Xenus cinereus*	V	C,J,K	1	Favours mudbanks and sandbanks located near mangroves, but may also be observed on rocky pools and reefs, and occasionally up to 10 km inland around brackish pools.	Unlikely, no suitable habitat on the subject site. The species is likely to frequent the wetland habitats of the Sydney Olympic Park site.
Turquoise Parrot	*Neophema pulchella*	V		2	Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland.	Unlikely. No suitable habitat
Whimbrel	*Numenius phaeopus*		C,J,K	2	Brreds in Alaska and Siberia and migrates to Australia in summer where they feed in intertidal mudflats.	Unlikely. No suitable habitat
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	V		739	Coastal habitats and terrestrial wetlands, characterises by the presence of large areas of open water.	Possible, although unlikely to frequently visit the marginal habitats of the subject site. Could occasionally occur as part of a large

Common Name	Scientific Name	BC Act	EPBC Act	No. of Records	Habitat Requirements	Likelihood on the subject site
						area covered by migratory route.
White-fronted Chat	*Epthianura albifrons*	V		439	Usually found foraging on bare or grassy ground in wetland areas, singly or in pairs.	Unlikely, no suitable habitat on the subject site. The species is likely to frequent the wetland habitats of the Sydney Olympic Park site.
White-fronted Chat population in the Sydney Metropolitan Catchment Management Area	*Epthianura albifrons*	E		439	Regularly observed in the saltmarsh of Newington Nature Reserve (with occasional sightings from other parts of Sydney Olympic Park and in grassland on the northern bank of the Parramatta River). Current estimates suggest this population consists of 8 individuals.	Unlikely, no suitable habitat on the subject site. The species is likely to frequent the wetland habitats of the Sydney Olympic Park site.
White-throated Needletail	*Hirundapus caudacutus*		V,C,J,K	44	Almost exclusively aerial; can occur over most habitats.	Unlikely. This species is exclusively aerial, and hence would not utilise the habitats present on the subject site.

Common Name	Scientific Name	BC Act	EPBC Act	No. of Records	Habitat Requirements	Likelihood on the subject site
White-winged Black Tern	*Chlidonias leucopterus*		C,J,K	1	Species breeds in northern Europe and Asia and migrates to Australia where it inhabits coastal wetlands.	Unlikely, no suitable habitat on the subject site. The species is likely to frequent the wetland habitats of the Sydney Olympic Park site.
Wood Sandpiper	*Tringa glareola*		C,J,K	3	A migratory shorebird that inhabits shallow, freshwater wetlands in Australia.	Unlikely, no suitable habitat on the subject site. The species is likely to frequent the wetland habitats of the Sydney Olympic Park site.
Yellow Wagtail	*Motacilla flava*		C,J,K	3	Migrates from the northern hempisphere and is usually found around wetlands and estuaries when sighted in Australia.	Unlikely. No suitable habitat

Key: V = Vulnerable, E = Endangered, CE = Critically Endangered, C/J/K = Protected under International migratory species agreements with China, Japan and Korea

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FIGURES

Figure 1. Location of the subject site and study area

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SOP 2A + 2B

SYDNEY OLYMPIC PARK

AUSTRALIA AVE, SYDNEY OLYMPIC PARK NSW 2127

DEVELOPMENT APPLICATION

19/11/2021

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ARCHITECTURAL SET

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DEVELOPMENT APPLICATION LEGEND

- ALLOCATED SOPA/ PUBLIC CAR PARKING WITHIN BASEMENT
- FIT-OUT WALLS. (NOTE 2)
- INTERTENANCY WALLS. (NOTE 3)

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DRAWING
PHOTOMONTAGE SHEET 03 - GROUND PLANE

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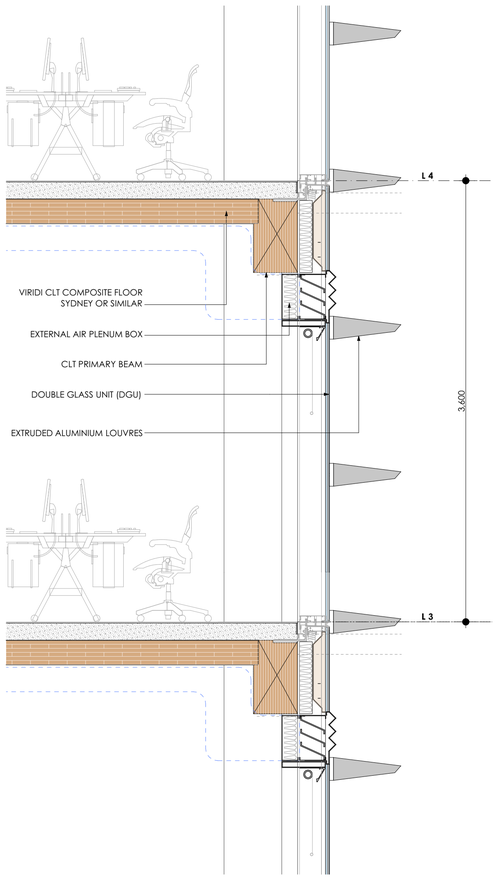
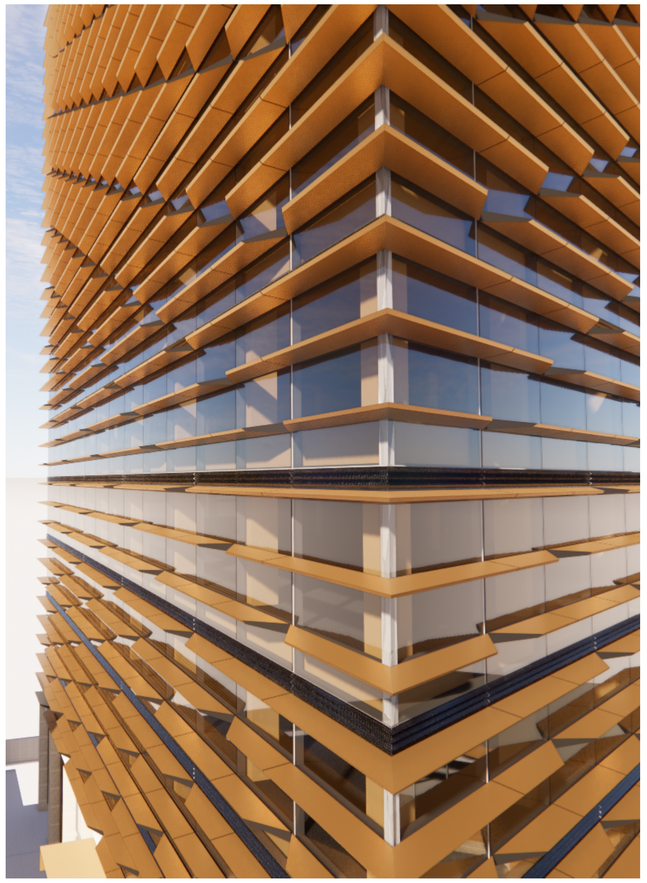


02 FACADE SECTION DETAIL
SCALE - 1:25

03 FACADE ELEVATION DETAIL
SCALE -



04 FACADE PERSPECTIVE DETAIL
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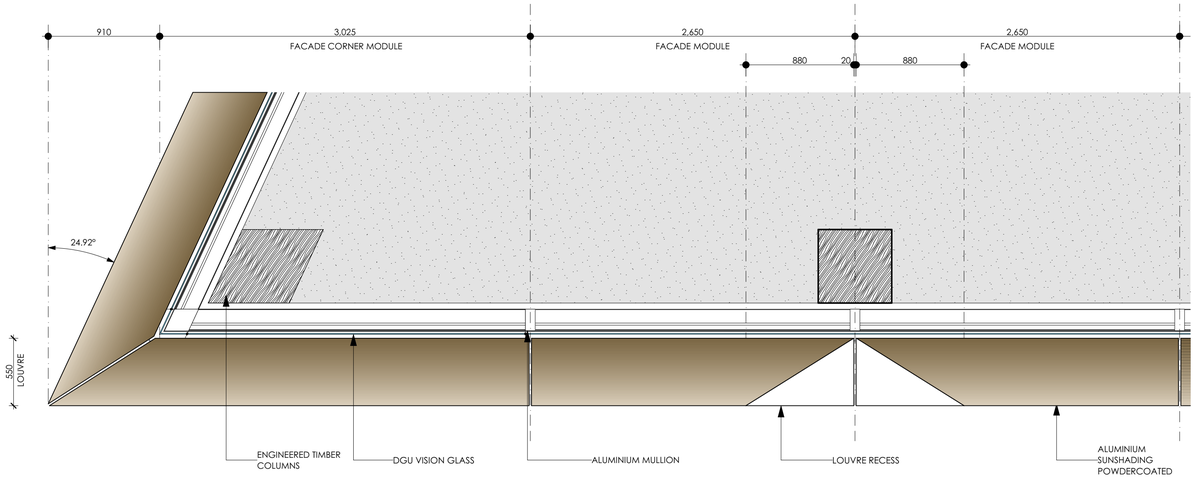

01 FACADE PLAN DETAIL
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