



succession
ecology

Adelaide Aquatic Centre

**Flora & Fauna
Environmental Report**



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1.0 INTRODUCTION

1.1 Background

The South Australian Government has made a commitment of approximately \$80 million to construct a new Adelaide Aquatic Centre in Pardipardinyilla/Denise Norton Park (Park 2), situated in the northern Park Lands (Figure 1). The Department for Infrastructure and Transport (DIT) are responsible for the design and construction and are seeking approval for a code amendment under section 73(2)(b)(ii) of the *Planning, Development and Infrastructure Act 2016* (the Act).

Pardipardinyilla is primarily a sporting and recreational landscape, with a range of facilities including tennis courts, ovals, playgrounds, picnic spaces and the Aquatic Centre, surrounded by a grove of planted vegetation. The Adelaide Park Lands Landscape Master Plan identifies this park as an Open Woodland/Sports Zone. Several plant species, which were part of the original planting plans from the 1800s, remain in the park, including Moreton Bay Figs (*Ficus macrocarpa*) and Aleppo Pines (*Pinus halepensis*). More recently, in the 60s-80s, native Australian species (though mostly not local to South Australia) were planted. These include *Eucalyptus* and *Acacia* species.

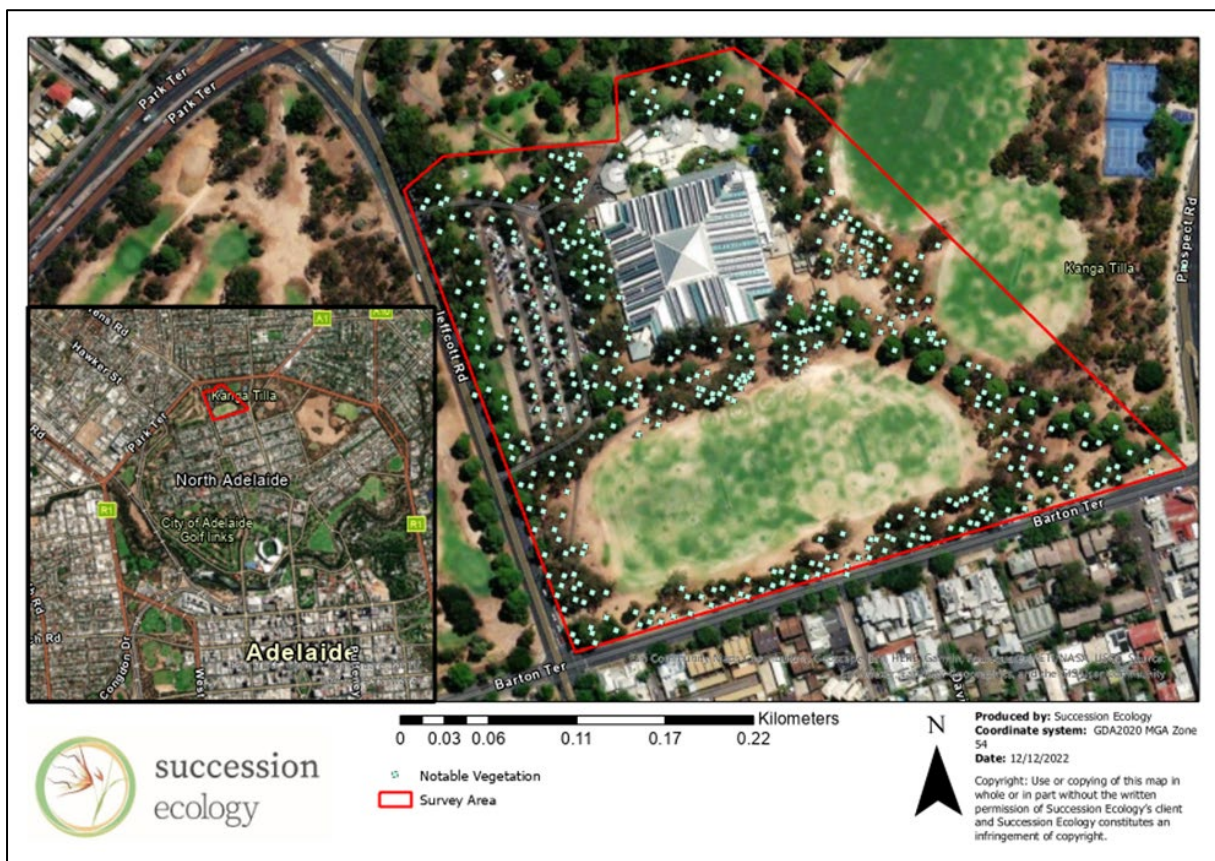


Figure 1: The survey area assessing Pardipardinyilla/Denise Norton Park, encapsulating the existing Adelaide Aquatic Centre and parkland infrastructure.



1.2 Site

Pardipardinyilla is 17.8 hectares in total. The development of the new Adelaide Aquatic centre will impact a portion of this area (less than 10 ha), in which environmental and heritage assessments have been performed to minimise impacts to the Parklands, addressing objectives in the development proposal. The site is located within the Flinders Lofty Block IBRA Region and the Green Adelaide Landscape Board. Relevant overlays include the Native Vegetation Overlay (*NV Act 1991*) and the Regulated and Significant Tree Overlay (*Planning, Development and Infrastructure [PDI] Act 2016*). Key vegetation has been identified and assessed by Arborman Tree Solutions, indicating 'Regulated trees' or 'Significant trees' that are protected under the Act that should be retained on site (Figure 2).

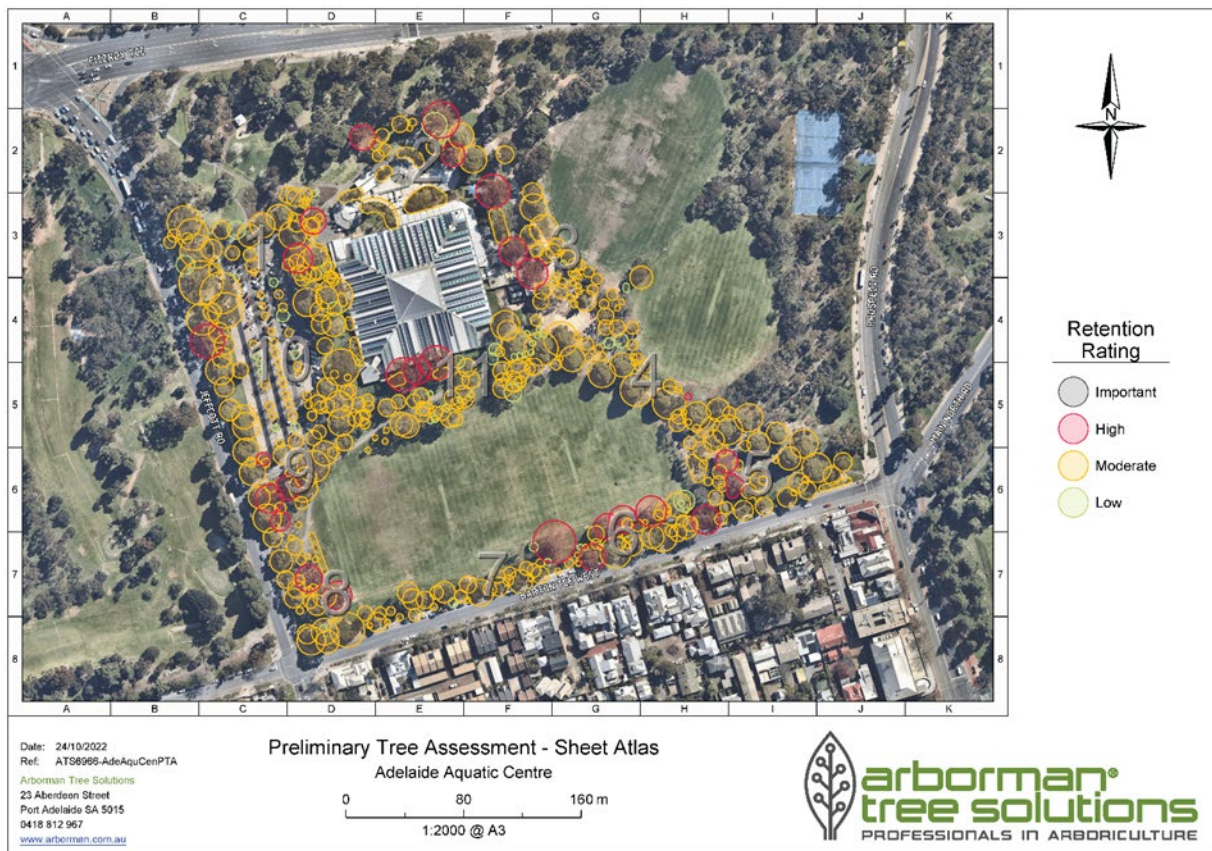


Figure 2: The Arborist assessment for the new Adelaide Aquatic Centre development identified vegetation worth retaining with amenity and environmental value. 27 trees were assessed as having a high retention rating, 381 with a moderate retention rating and 49 with a low retention rating.



2.0 METHODOLOGY

2.1 Desktop Assessment

A preliminary desktop assessment, in conjunction with the Environment and Heritage Impact Assessment Report (EHIA) developed by Enviro Collective, was conducted by Succession Ecology to identify threatened flora and fauna that may be impacted by the proposed works.

2.1.1 Preliminary mapping

Preliminary mapping of vegetation was included within the EHIA which determined the extent of remnant vegetation (protected under the *NVA 1991*), amenity plantings (under DIT VRP 2020) and presence of any declared plants (under the *Landscape South Australia (LSA) Act 2019*) or environmental weeds (DIT Environmental Weeds list 2017) in the sites proposed for works. An assessment of the trees at the site was also carried out by Arborman Tree Solutions prior to Succession Ecology carrying out a survey, where each tree within the site area was evaluated and mapped.

2.1.2 Database searches

Database searches were used to determine the range of threatened flora and fauna species and ecological communities, protected under the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* and *National Parks and Wildlife (NPW) Act 1972*, that are likely to occur within a 5 km radius of the site. The search tools used include:

- A Protected Matters Search to identify matters of national significance under the *EPBC Act 1999*, including threatened species and ecological communities.
- A Biological Database of South Australia (BDBSA) search using NatureMaps and Atlas of Living Australia (ALA) to determine flora species recorded within a 5 km radius of the site and species listed under the *NPW ACT 1972*.

2.2 Field Assessment

A field survey was conducted at 1602 Jeffcott Road, North Adelaide (Pardipardinyilla) to identify any environmental risks associated with the proposed works. The assessment addressed weeds (Declared and Environmental), fauna observed and the habitat value of the trees at the site. It was conducted on the 12th of December 2022 and covered an area of 10.1 ha.

2.2.1 Weeds

Declared and Environmental weeds described in the *LSA Act 2019, Landscape SA (General) Regulations 2020* and on the DIT Environmental Weeds List (2017) were surveyed. Recommendations for the safe management and removal of these will be provided based on the requirements defined by the Department of Primary Industries and Regions (PIRSA).

2.2.2 Fauna Observations

Any opportunistic fauna observations were noted during the survey. Additionally, signs of presence of fauna species (e.g., droppings, scratches) were also noted.



2.2.3 *Habitat Value Assessment*

Large trees, >2 m in circumference, were assessed for their habitat value. Additionally, trees that had fauna observed in them were evaluated independent of their size. The trees were assessed for fauna, evidence of fauna (e.g., droppings, scratches, nests) and habitat/foraging value (e.g., hollows, fruits, flowers).



3.0 RESULTS

3.1 Desktop Assessment

3.1.1 Threatened Ecological Communities

No threatened ecological communities were identified as being known to occur within a 5 km radius of the site.

3.1.2 Threatened Flora

A NatureMaps search identified four species threatened under the *NPW Act 1972* within a 5 km radius of the site (Table 1). No threatened species were identified in a Protected Matters search. The likelihood of use of the habitat in the Adelaide Aquatic Centre site is presented in Table 1 and assessed against the criteria in Table 2.

Table 1: A likelihood analysis of threatened flora protected under the EPBC Act 1999 and the NPW Act 1972. SOURCE: BDSA (1), ALA (2), NatureMaps (3), Observed (4), Protected Matters Search (5). NPW Act: Endangered (E), Vulnerable (V), Rare (R). EPBC Act: Extinct (EX), Critically Endangered (CR), Endangered (EN), Vulnerable (VU).

Species (common name)	NPW Act	EPBC Act	Data source	Date of last record	Species known habitat preferences	Likelihood of use for habitat – Comments (Table 2)
<i>Austrostipa gibbosa</i> (Swollen Spear-grass)	R		3	1997	Growing in rich loamy soil along creeks and seasonally wet areas in woodland and grassland (Seeds of SA, 2021).	Unlikely – the last record is from nearly 20 years ago and the habitat at the site is not suitable.
<i>Austrostipa multispiculis</i> (Many-flowered Spear-grass)	R		3	2008	Found in grasslands and eucalypt woodland (DEW, 2017).	Possible – habitat at the site is suitable.
<i>Rytidosperma tenuius</i> (Short-awn Wallaby-grass)	R		3	2008	Found in dry sclerophyll forest on sandy soils (National Herbarium of NSW, 2021).	Unlikely – the habitat present is not suitable.
<i>Crassula sieberiana</i> (Sieber's Crassula)	E		3	2008	Rock ledges and in crevices and on seasonally inundated ground (VicFlora, 2022).	Unlikely – habitat at the site is not suitable.



Table 2: Criteria for the likelihood of occurrence of species within the survey area.

Likelihood	Criteria
Highly Likely/Known	Recorded in the last 10 years, the species does not have highly specific niche requirements, the habitat is present and falls within the known range of the species distribution or; The species was recorded as part of field surveys.
Likely	Recorded within the previous 20 years, the area falls within the known distribution of the species and the area provides habitat or feeding resources for the species.
Possible	Recorded within the previous 20 years, the area falls inside the known distribution of the species, but the area provides limited habitat or feeding resources for the species. Recorded within 20 -40 years, survey effort is considered adequate, habitat and feeding resources present, and species of similar habitat needs have been recorded in the area.
Unlikely	Recorded within the previous 20 years, but the area provides no habitat or feeding resources for the species, including perching, roosting or nesting opportunities, corridor for movement or shelter. Recorded within 20 -40 years; however, suitable habitat does not occur, and species of similar habitat requirements have not been recorded in the area. No records despite adequate survey effort.

3.1.3 Threatened Fauna

A protected matters search identified five threatened fauna species, listed under the *EPBC Act 1999*, known to occur within 5 km of the site (Table 3). Eighteen species threatened under the *NPW Act 1972* were identified as occurring within a 5 km radius of the site. The likelihood of use of the habitat in the Adelaide Aquatic Centre site is presented in Table 3 and assessed against the criteria in Table 2.

Table 3: A likelihood analysis of threatened fauna protected under the *EPBC Act 1999* and the *NPW Act 1972*. SOURCE: BDSA (1), ALA (2), NatureMaps (3), Observed (4), Protected Matters Search (5). NPW Act: Endangered (E), Vulnerable (V), Rare (R). EPBC Act: Extinct (EX), Critically Endangered (CR), Endangered (EN), Vulnerable (VU).

Species (common name)	NPW Act	EPBC Act	Data source	Date of last record	Species known habitat preferences	Likelihood of use for habitat – Comments (Table 2)
AVES						
<i>Actitis hypoleucos</i> (Common Sandpiper)	R		3	2017	Found in coastal or inland wetlands, both saline or fresh. Found mainly on muddy edges or rocky shores. Breeds in the northern hemisphere (Birdlife Australia, 2021).	Unlikely – habitat present at the site is unsuitable.



Species (common name)	NPW Act	EPBC Act	Data source	Date of last record	Species known habitat preferences	Likelihood of use for habitat – Comments (Table 2)
<i>Anhinga novaehollandiae novaehollandiae</i> (Australasian Darter)	R		3	2013	Most often seen inland, around permanent and temporary water bodies. Prefer smooth, open waters for feeding, with tree trunks and branches for drying. Can be seen in calm seas near shore (Birdlife, 2022).	Possible – there is no freshwater present at the site. However, the Australasian Darter might inhabit the River Torrens, which is in close proximity to the site.
<i>Biziura lobata menziesi</i> (Musk Duck)	R		3	2013	Deep freshwater lagoons with dense reed beds (Australian Museum, 2021).	Possible - there is no freshwater present at the site. However, the Musk Duck might inhabit the River Torrens, which is near the site.
<i>Botaurus poiciloptilus</i> (Australasian Bittern)	E	EN	5	NA	Occupies swamps and wetlands usually associated with <i>Baumea</i> sp., <i>Ghania</i> sp. and <i>Typha</i> sp., and low shrubs such as <i>Melaleuca</i> sp. (DFCA, 2018).	Unlikely – suitable habitat is not present, and there is no freshwater, at the site.
<i>Cereopsis novaehollandiae novaehollandiae</i> (Cape Barren Goose)	R		3	2012	Found on offshore islands, usually granite, in areas of pasture, tussock grass or low heathy scrub (Australian Museum, 2022).	Unlikely – there is not suitable habitat present.
<i>Falco hypoleucos</i> (Grey Falcon)	R	VU	3	2004	Arid-zone open woodlands and open Acacia shrublands. Especially stony and sandy plains, hummock, and tussock grasslands, low shrublands and wooded watercourses (DEW, 2021).	Unlikely – there is no suitable habitat present.
<i>Falco peregrinus Macropus</i> (Peregrine Falcon)	R		3	2022	Use a broad range of habitats from rainforest to arid. Need abundant prey and secure nest sites (DEH, 2009).	Highly likely – they are a generalist species; and have been observed to breed within 5km of the site.
<i>Falco subniger</i> (Black Falcon)	R		3	2005	Nomadic, preferring sparse woodlands, scrubby grasslands, and farmlands (Birds SA, 2021).	Unlikely – there is no suitable foraging in proximity.
<i>Lophochroa leadbeateri leadbeateri</i> (Major Mitchell's Cockatoo)	R		1 & 3	2013	Wide range of inland habitats near water, feeds on melons and seeds of saltbush, wattles, and cypress pines. Requires hollows for nesting (DEW, 2021).	Unlikely – suitable plant species for foraging unavailable.



Species (common name)	NPW Act	EPBC Act	Data source	Date of last record	Species known habitat preferences	Likelihood of use for habitat – Comments (Table 2)
<i>Hieraetus morphnoides</i> (Little Eagle)	V		3	2002	Seen over woodland, forested land and open country. Avoids heavy forest (Birdlife Australia, 2021).	Unlikely – there is no suitable foraging in proximity.
<i>Zanda funerea whiteae</i> (Yellow-tailed Black Cockatoo)	V		3 & 4	2021	Inhabits a variety of habitats, favours eucalypt woodland and pine plantations (Birdlife Australia, 2021).	Highly likely – the tree species present at the site (pines) are likely to be used as a food source for the cockatoos.
<i>Zapornia tabuensis</i> (Spotless Crane)	R		3	1996	Inhabits wetlands where there is dense vegetation surrounding the water (eBird, 2021).	Unlikely – the habitat at this site is unsuitable.
MAMMALIA						
<i>Isoodon obesulus obesulus</i> (Southern Brown Bandicoot)	V	EN	5	NA	The southern brown bandicoot prefers dense vegetation, including wetland fringes and heathland. (Woinarski, 2014)	Unlikely – the habitat at the site is not suitable. However, there was a recent record (from 2008) just outside of the 5 km radius.
<i>Pteropus poliocephalus</i> (Grey-headed Flying-fox)	R	VU	3 & 5	2021	Typically roost in tall dense trees next to a water source. They will move up to 20km from their roost site to forage (DEW, 2020).	Highly likely – they have a large roost nearby (in the Botanic Park) and are likely to use the trees at this site to forage.
<i>Trichosurus vulpecula</i> (Common Brushtail Possum)	R		3	2022	Inhabits woodland, forests, heath, and urban areas using trees with hollows for nesting (Australian Museum, 2020).	Highly likely – there are large, old trees present at the site that the possums can nest in. Also, in very close proximity to urban areas where the possums tend to live and search for food.
REPTILIA						
<i>Egernia cunninghami</i> (Cunningham's Skink)	E		3	2007	Forests and Woodland with Rocky Outcrops (Australian Museum, 2021).	Unlikely – this site does not have suitable habitat.
<i>Emydura macquarii</i> (Macquarie River Turtle)	V		3	2017	Occurs throughout many of the rivers of the eastern half of Australia (Atlas of Living Australia, 2022).	Unlikely - this site does not have any freshwater bodies present. The turtle likely inhabits the nearby River Torrens.
<i>Eulamprus tympanum</i> (Southern Water Skink)	R		3	2017	Its habitat is in the vicinity of fresh water, usually near small creeks (Atlas of Living Australia, 2022).	Unlikely – this site is does not have any freshwater bodies present. The lizard may inhabit the nearby River Torrens.



3.2 Field Assessment

3.2.1 Flora

Within the site area, the arborist identified 457 trees and 31 different species (see Appendix A), only two of which are native to Adelaide. Succession Ecology assessed 172 of these trees for their habitat value during the survey.

Non-endemic trees such as Kurrajong (*Brachychiton populneus*), Norfolk Island Hibiscus (*Lagunaria patersonia*) and Moreton Bay Fig (*F. macrophylla*) accounted for the majority of flowering and fruiting plants within the project area (Table 4). Pinecones were observed on almost all individual trees within the *Pinus* genus. Both Moreton Bay Figs and Hills Weeping Figs (*Ficus microcarpa 'Hilli'*) were observed to accumulate significant amounts of leaf litter, providing habitat value for native fauna, including foraging birds, small reptiles, and invertebrates (Table 4). A total of 128 hollows were observed in trees on-site, with the majority occurring in River Red Gums (*Eucalyptus camaldulensis*) and Sugar Gums (*Eucalyptus cladocalyx*; Table 4). There were no Declared weeds observed at the site and only a small number of environmental weed species, Galenia (*Galenia pubescens*), Plantain Weed (*Plantago* sp.) and Sow-thistles (*Sonchus* spp.) were observed.

The Preliminary Tree Assessment (2022) conducted by Aborman Tree Solutions identified 25 Significant and 59 Regulated trees based on the criteria described within the *Planning, Development and Infrastructure Act 2016*. Of the 172 trees assessed by Succession Ecology, 19 and 52 (71 in total) were Significant and Regulated, respectively. Twenty-two of these trees were observed to have hollows (Table 5).



Table 4: Trees displaying important habitat features that can be utilised by fauna for food and shelter, including fruits, flowers, significant amount of leaf litter and hollows.

Species	Common Name	No. of Trees Fruiting	No. of Trees Flowering	No. of Trees with Significant Leaf Litter	No. of Hollows
<i>Brachychiton populneus</i>	Kurrajong	1	9	0	3
<i>Eucalyptus camaldulensis</i>	River Red Gum	1	1	0	56
<i>Eucalyptus cladocalyx</i>	Sugar Gum	1	1	0	51
<i>Eucalyptus intertexta</i>	Smooth Barked Coolibah	0	0	0	3
<i>Eucalyptus leucoxylon</i>	South Australian Blue Gum	1	0	1	4
<i>Eucalyptus salmonophloia</i>	Salmon Gum	0	0	0	3
<i>Eucalyptus steedmanii</i>	Steedman's Mallet	0	0	0	5
<i>Eucalyptus torquata</i>	Coral Gum	0	1	0	0
<i>Ficus macrophylla</i>	Moreton Bay Fig	5	1	4	0
<i>Ficus microcarpa</i> 'Hillii'	Hills Weeping Fig	0	0	2	2
<i>Lagunaria patersonia</i>	Norfolk Island Hibiscus	1	4	0	0
<i>Pinus canariensis</i>	Canary Island Pine	0	0	0	0
<i>Pinus halepensis</i>	Aleppo Pine	0	0	0	1
	TOTAL	10	17	7	128



Table 5: The legislative status of trees assessed by Succession Ecology and the count of those that bear hollows as an indicator of environmental value. A Tree ID number was provided by Succession Ecology for each tree surveyed. * NOTE: Legislative status of trees was drawn from the Preliminary Tree Assessment (2022).

Legislative status*	No. of trees	No. of hollow-bearing trees	Tree ID number
Significant	19	7	816, 925, 929, 930, 931, 954, 959
Regulated	52	15	795, 796, 823, 828, 832, 854, 860, 876, 882, 883, 894, 926, 932, 958, 961
Unregulated	99	14	809, 825, 831, 833, 844, 869, 893, 898, 905, 927, 928, 949, 952, 956
Exempt	2	1	820

3.2.2 Fauna

Three species that are threatened under the *NPW Act 1972* were either observed directly or had evidence of being present at the site: the Yellow-tailed Black Cockatoo (*Zanda funerea whiteae*), Grey-headed Flying-fox (*Trichosurus vulpecula*) and Common Brushtail Possum (*Pteropus poliocephalus*; Table 6). The Grey-headed Flying-fox is also considered Vulnerable under the *EPBC Act 1999*. No introduced species were observed.

Nine of the bird species were directly observed during the survey utilising, either perching or foraging, on trees (Figure 3). The other birds were observed within the site area, either flying over or on the oval. The two mammal species were not observed in the survey, however droppings and markings on trees suggested that these were being utilised by the species (Figure 4). No exotic fauna species were observed.

Table 6: Fauna observed, or evidence of their presence, at the site during the survey on 12th of December 2022.

Species	Common Name	Native	Observed	Evidence
BIRDS				
<i>Cacatua galerita</i>	Sulphur-crested Cockatoo	✓	✓	
<i>Cacatua sanguinea</i>	Little Corella	✓	✓	
<i>Eolophus roseicapilla</i>	Galah	✓	✓	
<i>Grallina cyanoleuca</i>	Magpie-lark	✓	✓	
<i>Gymnorhina tibicen</i>	Australian Magpie	✓	✓	
<i>Hirundo neoxena</i>	Welcome Swallow	✓	✓	
<i>Manorina melanocephala</i>	Noisy Miner	✓	✓	
<i>Ocyphaps lophotes</i>	Crested Pigeon	✓	✓	
<i>Pardalotus striatus</i>	Striated Pardalote	✓	✓	
<i>Threskiornis molucca</i>	Australian White Ibis	✓	✓	
<i>Trichoglossus moluccanus</i>	Rainbow Lorikeet	✓	✓	
<i>Platycercus eximius</i>	Eastern Rosella	✓	✓	
<i>Zanda funerea whiteae</i>	Yellow-tailed Black Cockatoo	✓	✓	
MAMMALS				
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	✓		✓
<i>Trichosurus vulpecula</i>	Common Brushtail Possum	✓		✓



Figure 3: A few of the bird species observed utilising the trees at the site. A. Rainbow Lorikeet; B. Noisy Miner; C. Australian Magpie; D. Galah.



Figure 4: Indicators of fauna observed on site which suggest their presence. A. Common Brushtail Possum scratches on *Eucalyptus* sp.; B. Grey-headed Flying-fox scat observed under a Moreton Bay Fig.

River Red Gums and Sugar Gums were observed over much of the site and were both assessed to be utilised the most by fauna (Table 7), primarily the Common Brushtail Possum. As such, indicators of Common Brushtail Possum presence occurred all over the site area (Figure 5). Indications of Grey-headed Flying-fox presence were observed in a number of trees along Barton Terrace, consistent with the presence of *Ficus* species on which the species feeds (Figure 5). The Aleppo Pines along the path leading from the corner of Barton Terrace and Prospect Road to the Aquatic Centre showed signs of being fed on by cockatoo species (Figure 6). However, all of the Aleppo Pines had a heavy loading of cones remaining on the tree suggesting they are not frequently utilised by cockatoos. There were also two trees, on the southern side of the site, that were observed to have birds nests within them (Figure 6).



Table 7: Tree species recorded on-site during the survey. A count of trees that were either being used, or had evidence of use, by fauna at the time of the survey. The origin of the tree species has been described as 'Indigenous' to the Adelaide region, and 'Native' or 'Exotic' to Australia.

Species	Common Name	Origin	No. of trees with evidence of fauna	No. of trees with fauna observed
<i>Brachychiton populneus</i>	Kurrajong	Native	4	4
<i>Casuarina cunninghamiana</i>	River She Oak	Native	1	0
<i>Corymbia maculata</i>	Spotted Gum	Native	0	1
<i>Eucalyptus camaldulensis</i>	River Red Gum	Indigenous	14	8
<i>Eucalyptus cladocalyx</i>	Sugar Gum	Native	14	5
<i>Eucalyptus intertexta</i>	Smooth Barked Coolibah	Native	0	0
<i>Eucalyptus leucoxylon</i>	South Australian Blue Gum	Indigenous	2	3
<i>Eucalyptus salmonophloia</i>	Salmon Gum	Native	3	2
<i>Eucalyptus sideroxylon</i>	Red Ironbark	Native	0	0
<i>Eucalyptus steedmanii</i>	Steedman's Mallet	Native	1	0
<i>Eucalyptus torquata</i>	Coral Gum	Native	0	1
<i>Ficus macrophylla</i>	Moreton Bay Fig	Native	8	2
<i>Ficus microcarpa 'Hillii'</i>	Hills Weeping Fig	Native	0	4
<i>Lagunaria patersonia</i>	Norfolk Island Hibiscus	Exotic	2	3
<i>Pinus canariensis</i>	Canary Island Pine	Exotic	4	0
<i>Pinus halepensis</i>	Aleppo Pine	Exotic	16	4
Total			69	37



Figure 5: Map showing tree locations where Grey-headed Flying Fox scat, Common Brushtail Possum scat and scratch markings were found during the survey.



Figure 6: Map showing indicators of avian fauna, such as bird nests and sites of cockatoo foraging indicated by dropped pinecones.



3.2.3 Current Potential Habitat within the Parklands

Within the northern section of the Adelaide Parklands there are a number of parks that have large areas of vegetation that can provide habitat for native fauna (Figure 7), which accounts for the majority of this area (approximately 86 ha). Currently, open areas and infrastructure within this section cover approximately 32.73 ha, which includes the current Adelaide Aquatic Centre and the associated carpark (approximately 2.5 ha of this). The area that will be affected by the construction of the new Aquatic Centre is approximately 4.36 ha.



Figure 7: Potential habitat for fauna in the northern section of the Adelaide Parklands, as indicated in green, which accounts for approximately 86.00 ha of the area. Open areas and infrastructure are indicated in purple (~32.73 ha), the current Adelaide Aquatic Centre is indicated in blue (~2.50 ha) and the affected area in which the new construction will occur is indicated in red (~4.36 ha).



4.0 DISCUSSION

4.1.1 Flora

Tree diversity within the project site was dominated by exotic or non-endemic native species planted for their amenity value with only two species, the River Red Gum and the South Australian Blue Gum (*Eucalyptus leucoxylon*), being indigenous to the Adelaide region. Both *Eucalypts* provide aesthetic benefits due to their tall, densely foliated habits and environmental advantages, with their structure offering hollows, nesting sites and floral resources for many native species. Irrespective of endemism, mature trees provide environmental value for a suite of native fauna. Aleppo Pines and Moreton Bay Figs, in particular, showed evidence of being utilised by native species including two threatened species: the Yellow-tailed Black Cockatoo and the Grey-headed Flying-fox. Arborman Tree Solutions assessed 84 trees on site as being either Significant or Regulated, and 71 of these were included in Succession Ecology's survey. Twenty-two of these trees had hollows that can be utilised by native fauna for shelter and/or nesting, highlighting their ecological value.

4.1.2 Fauna

The vegetation on site provides nesting, perching, and feeding opportunities for many native fauna species. Fifteen native fauna or indicators of their presence (e.g., scats and markings) were observed on-site during the survey. Of these 15 species, three are listed under the *NPW Act 1972* or *EPBC Act 1999*.

The presence of two mammal species, the Common Brushtail Possum and Grey-headed Flying-fox, was noted within the project area, indicated by either scat and/or markings on trees. The Grey-headed Flying-fox is listed as Vulnerable under the *EPBC Act 1999* and Rare under the *NPW Act 1972*, while the Common Brushtail Possum is listed as Rare under the South Australian *NPW Act 1972*. The presence of both these species on-site was expected, given their adaptability to urban/semi-urban settings. Common Brushtail Possums are well-adapted to inner city localities, especially within the Adelaide parklands, where they predominately use scattered *Eucalypts* for food and shelter. Multiple trees had scratch marks and/or scats, which indicates usage by the possums. A large colony of Grey-headed Flying-foxes live in close proximity to the Adelaide Aquatic Centre, within the Adelaide Botanic Park. This species forages on fruiting trees, and the presence of fig trees within the park provide them a food source. Bat scat was observed amongst the leaf litter under both of fig species on-site, indicating Grey-headed Flying-fox presence and usage of resources within the project area.

Two species of cockatoo, the Yellow-tailed Black Cockatoo, listed as Vulnerable under the *NPW Act 1972*, and the Sulphur-crested Cockatoo (*Cacatua galerita*), were recorded during the survey. These large birds have strong beaks which allow them to forage on pinecones. Multiple cone droppings were observed across the site, indicating that these birds use food resources on-site.

Other common urban bird species such as the Little Corella (*Cacatua sanguinea*), Rainbow Lorikeet (*Trichoglossus moluccanus*), Eastern Rosella (*Platycercus eximius*), Striated Pardalote (*Pardalotus striatus*) and Galah (*Eolophus roseicapilla*) were observed using large *Eucalypts* within the project site. These birds depend on flowering and fruiting trees for food, and hollows for shelter. Hollows in Australian open woodland landscapes take a very long time to form and provide shelter to a wide range of species, thereby making preservation of these structures crucial for native biodiversity. Australian White Ibis (*Threskiornis molucca*), Welcome Swallows (*Hirundo neoxena*), Australian Magpies (*Gymnorhina tibicen*), Noisy Miners (*Manorina melanocephala*) and Magpie-larks (*Grallina*



cyanoleuca) were also recorded within open areas such as ovals on site. These birds are generalists and opportunistic feeders, which allows them to adapt well to urban settings. Australian Magpies and Noisy Miners were frequently observed using exotic tree species for food and shelter on site. Although no introduced fauna species were identified during the survey, species such as European Starling (*Sturnus vulgaris*), House Sparrow (*Passer domesticus*), Rock Pigeon (*Columba livia*) and Common Blackbird (*Turdus merula*) might occur, given the type of amenity vegetation and urban nature of the site.

4.1.3 Effect of Construction

Within the northern side of the Adelaide Parklands there is currently approximately 86 ha of vegetated areas and approximately 32.73 ha of infrastructure or open space, including the current Adelaide Aquatic Centre and the associated carpark (Figure 7). An area of approximately 4.36 ha will be affected during construction, a large proportion of which is currently an open space (an oval) and the current Aquatic Centre carpark. As the mapping demonstrates, there will still be connectivity between these parks due to the vegetation that will remain on the northern edge of Pardipardinyilla (along Fitzroy Terrace), where there are a number of large *Eucalypt* trees. The area does not appear to be an important site to Yellow-tailed Black Cockatoos, given the large number of pines cones still present on the Aleppo Pines or to the Grey-headed Flying Fox considering there are only a few fruiting species they forage on (e.g., Moreton Bay Figs). While it does appear that the Common Brushtail Possum does frequently use the area that will be affected, there is a large portion of habitat still remaining within this area that will be available following construction of the new aquatic centre. Further, as part of the development plan, the existing Adelaide Aquatic Centre will be knocked down and the area will be revegetated, which will aid in offsetting habitat loss.



5.0 CONCLUSION AND RECOMMENDATIONS

The area that will be affected by the construction of the new Adelaide Aquatic Centre is relatively small in comparison to the other vegetated areas within the northern Adelaide Parklands, and much of this area is currently open space and infrastructure. There will be an impact on large *Eucalyptus* sp. and other non-native tree species (Aleppo Pines and Moreton Bay Figs) that at present provide habitat value for a number of native fauna species, including three fauna species that are threatened under the *NPW Act 1972*. However, there will still be a large number of trees still present within the rest of Pardipardinyilla and surrounding parks. It is believed that while there will be a small amount of habitat loss due to construction, the impacts of this on fauna species within the parklands will be very minimal.



6.0 REFERENCES

- Atlas of Living Australia. (2022). Species Profile: *Eulamprus tympanum*, Southern Water Skink.
- Australian Museum. (2021). Species Profile: *Biziura lobata*, Musk Duck.
- Australian Museum. (2022). Species Profile: *Cereopsis novaehollandiae*. Cape Barren Goose.
- Australian Museum. (2020). Species Profile: Common Brushtail Possum. Retrieved from Australian Museum.
- Australian Museum. (2021). Species Profile: *Egernia cunninghami*, Cunningham's skink.
- Australian Museum. (2022). Species Profile: *Hirundapus caudacutus*: White-throated Needletail.
- Birdlife Australia. (2021). Species Profile: *Actitis hypoleucos*, Common Sandpiper.
- Birdlife Australia. (2021). Species Profile: *Hieraaetus morphnoides*, Little Eagle.
- Birdlife Australia. (2021). Species profile: *Zanda funerea whiteae*, Yellow-tailed Black Cockatoo.
- Birds SA. (2021). Species Profile: *Falco subniger*, Black Falcon.
- DBCA. (2018). Australasian Bittern (*Botaurus poiciloptilus*) Western Australian Recovery Plan.
- DEH. (2009). Threatened Species Profile: *Falco Peregrinus*, Peregrine Falcon.
- DEW. (2021). Threatened Species Fact Sheet: *Falco hypoleucos*, Grey Falcon.
- DEW. (2021). Threatened Species Fact Sheet: *Lophochroa leadbeateri mollis*, Major Mitchell's Cockatoo.
- DEW. (2020). Threatened Species Profile: *Pteropus paliacephalus*, Grey-headed Flying-fox.
- DTI. (2022). PlanSA: Significant and Regulated Trees.
- eBird. (2021). Species Profile: *Zapornia tabuensis*, Spotless Crake.
- National Herbarium of NSW. (2021). Species Profile: *Rytidosperma tenuius*, Short-awn Wallaby Grass.
- Seeds of SA. (2021). Species Profile: *Austrostipa gibbosa*, Swollen Spear-grass.
- VicFlora. (2022). Species Profile: *Crassula sieberiana*, Sieber's Crassula.



7.0 APPENDIX A

Table 8: The tree species and their count at the project site, identified by Arborman Tree Solutions. The origin of the tree species has been described as 'Indigenous' to the Adelaide region, and 'Native' or 'Exotic' to Australia.

Species	Common Name	Origin	No. of Trees at Site
<i>Acacia pycnantha</i>	Golden Wattle	Native	3
<i>Agonis flexuosa</i>	Willow Myrtle	Native	1
<i>Brachychiton populneus</i>	Kurrajong	Native	15
<i>Callistemon viminalis</i>	Weeping Bottlebrush	Native	1
<i>Callitris sp.</i>	Murray Pine	Indigenous	2
<i>Casuarina cunninghamiana</i>	River She Oak	Native	11
<i>Casuarina sp.</i>	Casuarina	Native	1
<i>Corymbia citriodora</i>	Lemon-scented Gum	Native	4
<i>Corymbia maculata</i>	Spotted Gum	Native	11
<i>Corymbia variegata</i>	Northern Spotted Gum	Native	3
<i>Eucalyptus camaldulensis</i>	River Red Gum	Indigenous	102
<i>Eucalyptus cladocalyx</i>	Sugar Gum	Native	34
<i>Eucalyptus intertexta</i>	Smooth Barked Coolibah	Native	5
<i>Eucalyptus leucoxydon</i>	South Australian Blue Gum	Indigenous	51
<i>Eucalyptus leucoxydon ssp. stephaniae</i>	Mallee Blue Gum	Native	1
<i>Eucalyptus salmonophloia</i>	Salmon Gum	Native	16
<i>Eucalyptus sideroxylon</i>	Red Ironbark	Native	8
<i>Eucalyptus sp.</i>	Gum Tree	Native	16
<i>Eucalyptus steedmanii</i>	Steedman's Mallet	Native	1
<i>Eucalyptus stricklandii</i>	Strickland's Gum	Native	1



Species	Common Name	Origin	No. of Trees at Site
<i>Eucalyptus torquata</i>	Coral Gum	Native	6
<i>Ficus macrophylla</i>	Moreton Bay Fig	Native	12
<i>Ficus microcarpa 'Hillii'</i>	Hills Weeping Fig	Native	5
<i>Fraxinus angustifolia ssp. angustifolia</i>	Desert Ash	Exotic	6
<i>Fraxinus angustifolia ssp. oxycarpa 'Raywood'</i>	Claret Ash	Exotic	34
<i>Lagunaria patersonia</i>	Norfolk Island Hibiscus	Exotic	6
<i>Melia azedarach</i>	White Cedar	Exotic	4
<i>Pinus canariensis</i>	Canary Island Pine	Exotic	10
<i>Pinus halepensis</i>	Aleppo Pine	Exotic	69
<i>Schefflera actinophylla</i>	Queensland Umbrella Tree	Native	2
<i>Syagrus romanzoffiana</i>	Cocos Palm	Exotic	16
Total			457