ebs ecology



Marino Coastal Walk

Flora and Fauna Assessment

Marino Coastal Walk Flora and Fauna Assessment

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Prepared by EBS Ecology for Aspect Studios

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Cover photograph: *Ptilotus angustifolius* (Narrow-leaf Yellow-tails), a threatened plant that grows in the Project Area.

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GLOSSARY AND ABBREVIATION OF TERMS

BAM	Bushland Assessment Method
BDBSA	Biological Database of South Australia
CP Act	*Coastal Protection Act 1972*
DAWE	Department of Agriculture, Water and the Environment
DEW	Department for Environment and Water
DP	City of Marion Development Plan
DV Act	*Development Act 1993*
EBS Ecology	Environmental and Biodiversity Services Pty Ltd, trading as EBS Ecology
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
km	kilometre(s)
LSA Act	*Landscapes South Australia Act 2019*
m	metre(s)
MCW	Marion Coastal Walkway
MNES	Matters of National Environmental Significance
NPW Act	*National Parks and Wildlife Act 1972*
NV Act	*Native Vegetation Act 1991*
PMST	Protected Matters Search Tool
Project	design investigations and construction a walkway within Cells 5, 6 and 10 of the Marion Coastal Walkway
Project Area	The area within 10 m of the current walkway alignment that is likely to be impacted by the Project.
SA	South Australia(n)
TEC	Threatened Ecological Community
WoNS	Weeds of National Significance

EXECUTIVE SUMMARY

The coastal walkway from Marino to Hallet Cove was constructed in the mid-late 1990s, with the Marion Coastal Walkway (MCW) covering an 8-kilometre (km) section. The City of Marion's Coastal Walkway Plan provides a renewal plan that prioritises sections of the MCW for upgrade and repair. The plan breaks down the walkway into cells, with each cell prioritised. A high priority has been placed on the design investigations and construction of the walkway in Cell 5 (Grey Road Gully), Cell 6 (Kurnabinna Gully) and Cell 10 (Field River) (the Project).

EBS Ecology was contracted by Aspect Studios to undertake a flora and fauna survey of the Project to inform the design process and identify any ecological constraints based on Project design available at the time of writing. The objectives of this survey were to:

- Identify biodiversity constraints (i.e. threatened species and native vegetation) that may influence the design and location of the walkway; and
- Provide broad recommendations that avoid, minimise or mitigate possible impacts on these constraints.

Native vegetation in the Project Area includes shrubland and grassland communities in poor to fair condition. Five native Vegetation Associations were mapped as a result of the field survey in Cells 5 and 6. Previous mapping undertaken in Cell 10 was found to be accurate, with seven native Vegetation Associations recognised. Vegetation is heavily impacted by weeds, including grass and forb species, with seven species of declared weeds spread widely throughout the Project Area.

Four threatened species were recorded during the survey:

- Yellow-tailed Black Cockatoo (NPW Act Vulnerable);
- Sooty Oyster Catcher (NPW Act Rare);
- *Ptilotus angustifolius* (NPW Act Endangered); and
- *Myoporum parvifolium* (NPW Act Rare).

Ten additional species of threatened or migratory species were assessed as likely to occur based on habitat requirements and past records, although they were not recorded during the survey. Of these, the Hooded Plover (EPBC Act and NPW Act Vulnerable) is known to use the beach in Cell 10 as nesting habitat.

Based on the results of the survey, desktop research and the constraints outlined above, the following recommendations have been made:

- Consider advice from Birdlife Australia as far as is practicable in Project design.
- Locate walkway alignment as far to the east as possible in the Cell 10 dunes, closing existing beach access north and east of the Field River outlet.
- Undertake an EPBC Act self-assessment to test the significance of impact of final Project design on Hooded Plover
- Design walkways to follow existing alignment as far as is practicable.

- Locate any laydown/construction sites outside areas mapped as native vegetation where possible to do so.
- Develop a Vegetation Management Plan to be incorporated in the Construction Environmental Management Plan.
- Develop a Weed Management Plan to be incorporated in the Construction Environmental Management Plan.
- Avoid removing any mature trees, both native and introduced species.

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1 INTRODUCTION

1.1 Project Background

The coastal walkway from Marino to Hallet Cove was constructed in the mid-late 1990s, with the Marion Coastal Walkway (MCW) covering an 8-kilometre (km) section. The walkway contains various pieces of public infrastructure, including stairways, board walks, pathways, lookouts, bins, interpretive signs and benches.

The City of Marion's Coastal Walkway Plan provides a renewal plan that prioritises sections of the MCW for upgrade and repair. The plan breaks down the walkway into cells, with each cell prioritised. A high priority has been placed on the design investigations and construction of the walkway in Cell 5 (Grey Road Gully), Cell 6 (Kurnabinna Gully) and Cell 10 (Field River) (the Project).

EBS Ecology was contracted by Aspect Studios to undertake a flora and fauna survey of the Project to inform the design process and identify any ecological constraints based on Project design available at the time of writing.

Current Project design includes the upgrading of structures and tracks along the current alignment, additional access points and path realignment in some areas.

1.2 Project Area

The Project Area is within the City of Marion local government area and includes the following Cells of the MCW:

- Cell 5 – MCW between Nungamoora Street and Grey Road and including the Grey Road Gully.
- Cell 6 – MCW between Peera Street and Nungamoora Street and including Kurnabinna Gully.
- Cell 10 – MCW between south of the Field River mouth and Grand Central Avenue.

The Project Area is shown in Figure 1 and includes a 10 metre (m) buffer around the existing walkway. It falls within the Green Adelaide Landscape Management Region.

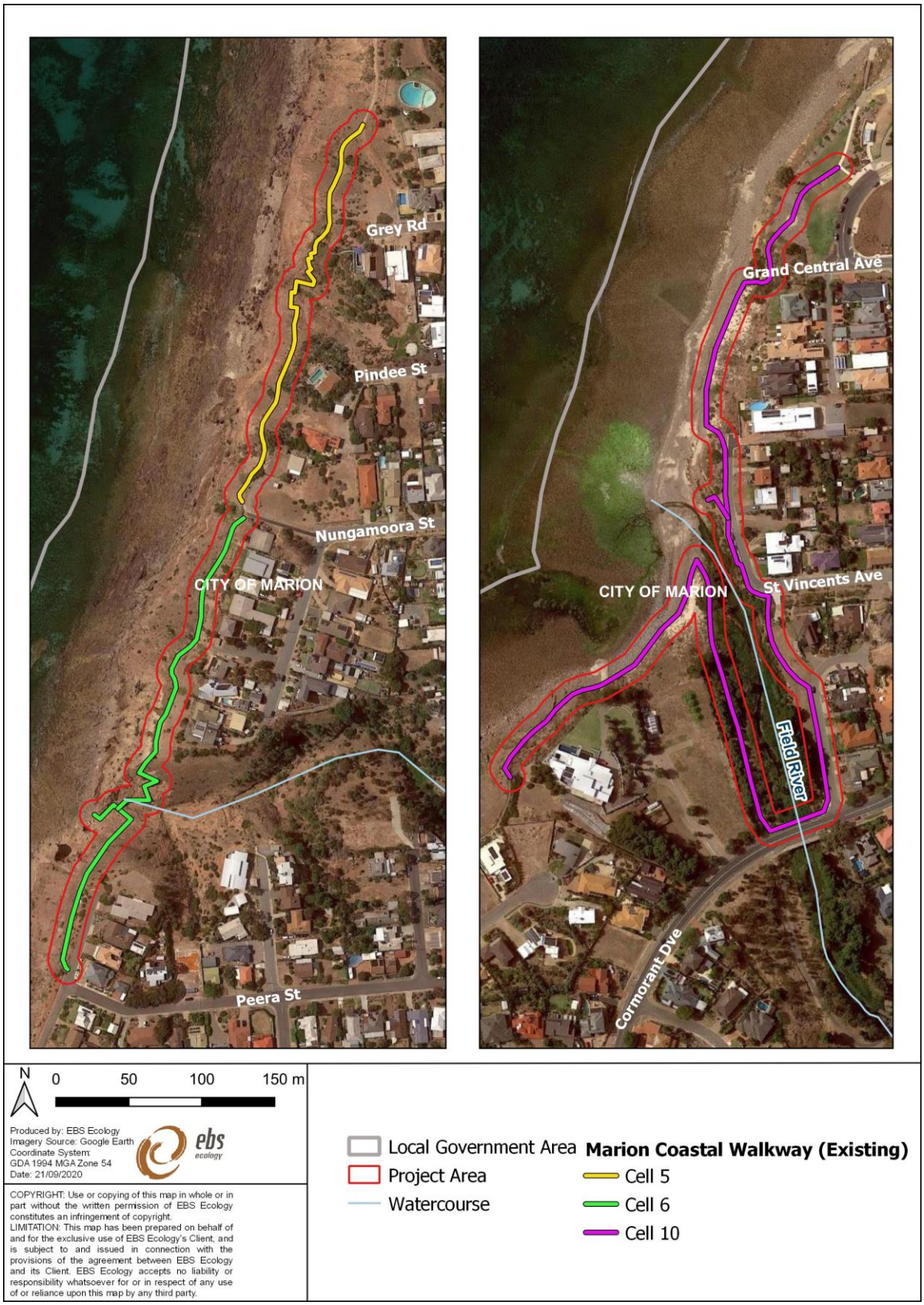


Figure 1. Location of the Project Area.

1.3 Objectives

The Project will create a continuous dedicated walkway for the length of the City of Marion coast, restoring closed sections of walkway and creating a link around the Field River. EBS Ecology was engaged by Aspect Studios to undertake a flora and fauna assessment of the Project Area.

The objectives of the Flora and Fauna Assessment were:

- Identify biodiversity constraints (i.e. threatened species and native vegetation) that may influence the design and location of the walkway; and
- Provide broad recommendations that avoid, minimise or mitigate possible impacts on these constraints.

2 BACKGROUND INFORMATION

2.1 Compliance and legislative summary

A summary of legislation, policy and guidelines associated with the Project relevant to biodiversity and environmental protection is shown in Table 1.

In addition, the *City of Marion Remnant Vegetation Plan 2018 – 2023* outlines the City of Marion's guidelines, priorities and actions for managing remnant vegetation.

The development of track and trails is identified by this Plan as a threat to native vegetation, stating that:

"Tracks, trails and paths in remnant vegetation areas have a significant impact on the remaining 1% of remnant vegetation. Current theories suggest a minimum of 24% remnant vegetation is required for ecological processes, so any impacts on what remains must be minimised. Trails need to be appropriately placed to minimise damage and offset with appropriate maintenance budgets factored into projects, where this is not possible." (City of Marion, 2018).

Previously, Birdlife Australia has recommended guidelines to reduce impacts to Hooded Plover (*Thinornis rubricollis rubricollis*) from development of the walkway at Cell 10 (Birdlife Australia, 2018). These guidelines are summarised below:

East of Field River

- Situate the walkway as far east as possible on the dunes east of the Field River mouth.
- Situate the walkway at the far eastern side of the dunes to allow for habitat retreat due to climate change.
- Remove the two beach access points at either end of the dunes east of the Field River, channelling walkers onto the new formal walkway and away from nesting areas.
- If revegetating dunes following construction, use local native species that provide habitat for nesting plovers (i.e. avoid dense plantings of shrubs).

West of Field River

- Walkway should closely follow the boundary of Council/private land behind the dunes to connect with the base of the existing walkway at the base of the cliffs.
- Terminate the current track behind the dunes to reduce the funnelling of people onto the beach just south of the Field River outlet.

Table 1. Summary of relevant legislation and policy.

Legislation	Description	Relevance to Project	Report Section
Commonwealth			
***Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)**	The EPBC Act provides legislative protection for Matters of National Environmental Significance (MNES) as defined under the act. Where a significant impact on a MNES is likely, a Project must be referred to the Minister for approval.	**Threatened species** No threatened species were recorded during the field survey. However, the Vulnerable Hooded Plover is known to use the beach in Cell 10 as a nesting site. **Migratory species** Several non-breeding migratory species may occur on the beach in Cell 10 during summer.	Section 4.1
South Australia			
***National Parks and Wildlife Act 1972* (NPW Act)**	The NPW Act provides provisions for the protection of native flora and fauna. The act lists threatened species of conservation significance in South Australia.	**Threatened flora** Two flora species listed as Rare under the NPW Act are present in the Project Area. A further two species were not recorded but might possibly occur. **Threatened fauna** Two NPW Act threatened fauna species was recorded during the field survey. A further seven species might possibly occur in the Project Area.	Section 4.1.2 Section 4.1.3
***Native Vegetation Act 1991* (NV Act)**	The NV Act controls the clearing of native vegetation in South Australia.	The City of Marion is situated within metropolitan Adelaide and is therefore exempt from clearance controls under the NV Act. Vegetation surveys were undertaken using methodology approved for assessing vegetation subject the NV Act.	Section 3.2.1 Section 4.2
***Landscapes South Australia Act 2019* (LSA Act)**	The LSA Act recently replaced the *Natural Resource Management Act 2004.* The act establishes regional landscape boards with the aim of delivering NRM related services to communities. Under the LSA Act, landowners have a legal responsibility to manage declared pest plants and animals	The Project Area is in the Green Adelaide Landscape region. Seven species of pest plants declared under the LSA Act were recorded during the field survey.	Section 4.3.2

Legislation	Description	Relevance to Project	Report Section
***Development Act 1993* (DV Act)**	The DV Act and *Development Regulations 2008* provide for proper and efficient planning and development in South Australia. The *Development Regulations 2008* also determine when a coastal development requires referral to the Coast Protection Board for approval.	Some of the larger planted trees, both native and introduced, may be subject to the DV Act as significant or regulated trees.	Not assessed
***Coast Protection Act 1972* (CP Act)**	The CP Act establishes the Coast Protection Board. Developments situated on coastal land may require referral to the board for approval under certain circumstances. Under the CP Act, coastal land is defined as: "Land situated in a zone or area defined in the relevant Development Plan where the name of the zone or area includes the word 'coast' or 'coastal', or which indicates or suggests in some other way that the zone or area is situated on the coast."	The Project Area is situated on coastal land as defined by the CP Act. If the development is not subject to the exclusions listed in Schedule 8 of the *Development Regulations 2008,* it may require referral to the Coast Protection Board for approval.	Not assessed
City of Marion Development Plan (DP)	The DP contains the rules that set out the detailed criteria against which development applications will be assessed.	The Project Area is within the area designated as Coastal Conservation Zone by the DP. The objectives of the Coastal Conservation Zone are: 1. To enhance and conserve the natural features of the coast including visual amenity, landforms, fauna and flora. 2. To contribute to the Metropolitan Open Space System. Low-intensity recreational uses located where environmental impacts on the coast will be minimal.	Section 2.3.2

2.2 Project Description

The Project includes the works described in Table 2. The locations of these activities are shown in Figure 1.

Table 2. Description of works associated with the Project.

Location	Description of works
Cell 5	• Formalisation of informal paths at the end of Grey Road. • Upgrading of two sections of path on existing alignment. • Upgrading/replacement of existing structures on existing alignment, crossing the Grey Road and Nungamoora Road gullies.
Cell 6	• Removal and replacement of the current path parallel to the Esplanade. • Upgrading of three sections of path on existing alignment. • Realignment of one section of path between Kurnabinna Gully and Nungamoora Street. • Realignment and replacement of structure crossing Kurnabinna Gully.
Cell 10	• Formalisation of informal paths at the end of Grand Central Avenue. • Construction of new walkway, including closure of informal beach access, through dunes between Grand Central Avenue and River Parade. • Construction of new walkway behind dunes between Field River and Grand Central Avenue

2.3 Landscape context

2.3.1 Watercourses and wetlands

Cell 10 is located at the mouth of the Field River, a fourth order stream. The walkway crosses the Field River using the existing Cormorant Drive bridge, although an informal crossing point exists where the river flows across the Cell 10 beach. At times of high rainfall or tides, this crossing may be impassable.

The Field River estuary holds semi-permanent waterholes, although the freshwater section of the river only flows seasonally.

The walkway crosses two un-named watercourses that flow through the Kurnabinna and Grey Road Gullies. These are ephemeral streams and only flow during high rainfall events. They were dry at the time of the survey with no connection to the sea.

Watercourses in the Project Area are mapped in Figure 1.

Other than the Field River estuary, there are no wetlands in the Project Area.

2.3.2 Protected areas

The Project Area falls within the Coastal Management Zone, as mapped in the *City of Marion Development Plan* (City of Marion, 2020). Development in the Coastal Management Zone is subject to development controls with reference to environmental protection and may require referral to the Coast Protection Board for approval.

Both Hallet Cove Conservation Park and Marino Conservation Park are nearby, however the Project Area is outside these two reserves.

3 METHODS

3.1 Desktop assessment

A desktop assessment was undertaken to determine the potential for any threatened species and ecological communities to occur in the Project Area. Relevant databases were searched using a 5 km buffer of the Project Area for known records of species and communities listed as threatened under the EPBC Act and the NPW Act.

3.1.1 EPBC Act Protected Matters Search Tool

A Protected Matters Search Tool (PMST) report was generated on 28 July 2020 to identify Matters of National Environmental Significance (MNES) under the EPBC Act relevant to the Project Area. The PMST is maintained by the Department of Agriculture, Water and the Environment (DAWE) and was used to identify species or communities of national environmental significance that may occur or have suitable habitat within the Project Area.

3.1.2 Biological Database of South Australia

The Biological Database of South Australia (BDBSA) was searched through NatureMaps, the web portal maintained by the Department for Environment and Water (DEW) and available at http://spatialwebapps.environment.sa.gov.au/naturemaps/?locale=en-us&viewer=naturemaps. The BDBSA is comprised of a collection of species records compiled from the South Australian Museum, conservation organisations, Birdlife Australia and other information sources. A 5 km buffer surrounding the Project Area was used to search the BDBSA for known records of threatened species. The search was undertaken on the 28 July 2020.

3.1.3 Previous studies

An ecological assessment of Cell 10 was carried out in 2019 by T & M Ecologists (T&M Ecologists, 2019). This study mapped the Vegetation Association at the mouth of the Field River and identified ecological constraints at this location.

The report was used to inform the relevant sections of this study, with the accuracy of mapping confirmed by field investigation. Vegetation Associations in Cell 10 were only remapped if inaccuracies were found. Likelihood of occurrence assessments for Cell 10 were also taken from this source and updated based on field survey results.

3.1.4 Likelihood of occurrence assessment

Threatened species and communities identified by methods described above were assessed as to the likelihood of its occurrence in the Project Area. Each was assigned a rating to describe the nature of its presence; Known / Highly Likely, Likely, Possible and Unlikely. Criteria such as habitat constraints and date and proximity of most recent records were considered in the context of the features of the Project Area when assigning a likelihood rating. This is described further in Table 3.

Table 3. Likelihood rating and criteria for the presence of threatened species and communities.

Likelihood	Criteria
Known / Highly likely	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 since 1995, the area falls within the known distribution of the species and the area provides habitat or feeding resources for the species.
Possible	Recorded since 1995, the area falls within 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 since 1995, 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.

3.2 Field survey

3.2.1 Vegetation associations and condition

Vegetation was surveyed according to the Biodiversity Assessment Manual (BAM). The BAM (Native Vegetation Council, 2019a) was developed by the Native Vegetation Management Unit to assess areas of native vegetation requiring clearance and to calculate the SEB requirements. The method is derived from the Nature Conservation Society of South Australia's (NCSSA) Bushland Condition Monitoring methodology and is suitable for native vegetation assessments in South Australia's agricultural regions.

The BAM requires quantitative on ground and desktop assessments of native vegetation and ecological values. When using the BAM, each area to be assessed (i.e. each application area) is termed a 'Block', which is stratified into 'Sites'. Each Site relates to a Vegetation Association found within the Block, which are assessed in representative 1 ha quadrats and compared to NCSSA 'benchmark' vegetation communities.

Three components of the biodiversity value of the Site are measured and scored:

- Landscape context;
- Vegetation condition; and
- Conservation value.

The factors that influence each of these components and their score ranges are described in Table 4. The scores of these three components are combined to provide the Unit Biodiversity Score (per ha) and multiplied by the size (ha) of each Site to provide the Total Biodiversity Score for each Site.

Table 4. Factors that influence the value of the three components used to calculate the total SEB area and value in the BAM (Native Vegetation Council, 2019a).

Component	Factors
Landscape context	• Percentage vegetation cover within 5 km • Block shape (cleared perimeter: area ratio) • Native vegetation remnancy of IBRA association • Percentage of native vegetation protected within the IBRA association • The presence of riparian vegetation, swamps or wetlands
Vegetation condition	• Native plant species diversity • Number of native lifeforms and their cover • Number of regenerating species • Weed cover and the level of invasiveness of dominant weed species • Mature tree health, fallen timber, hollow-bearing trees and tree canopy • Native: exotic understorey biomass
Conservation value	• The presence of federal or state listed threatened ecological communities and their conservation rating • Number of threatened plant species recorded at the site and their conservation rating • Number of threatened fauna species and their conservation rating or potential habitat occurs within the site

3.2.2 Fauna

All native and exotic fauna species opportunistically encountered (directly observed, or tracks, scats, burrows, nests and other signs of presence) during the native vegetation assessment were recorded. Potential fauna refuge sites, such as hollows, were noted as an indication of availability of suitable habitat. Particular attention was paid to identifying habitat for threatened species. For each opportunistic fauna observation, the species, number of individuals, GPS location, detection methodology (sight, sound or sign) and habitat were recorded.

The beach in Cell 10 was actively searched for Hooded Plover and other migratory shorebirds. The search was conducted according to the *Survey guidelines for Australia's threatened birds – guidelines for detecting birds listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999* (Department of the Environment, 2010). Two methods were used, each carried out by two observers for a period of 20 minutes.

- Observation from vantage points overlooking suitable foraging or roosting habitat at the appropriate period of the tidal cycle; and
- Area search in appropriate habitat on the Cell 10 beach.

3.3 Limitations

Flora and fauna records were retrieved from the PMST and the BDBSA. The BDBSA only includes verified flora and fauna records submitted to Department for Environment and Water (DEW) or partner organisations. It is recognised that information is imperfectly captured and it is possible that significant species may occur in the Project Area that are not reflected by database records. Although much of the BDBSA data has been through a variety of validation processes, the lists may contain errors and should

be used with caution. DEW gives no warranty that the data is accurate or fit for any particular purpose of the user or any person to whom the user discloses the information.

The field survey occurred over a single day in August. a number of flora species recorded could only be identified to genus level due to a lack of distinguishing identification features such as flowers or fruits. This included species such as *Austrostipa* sp.

August is outside the optimal season for detecting migratory shorebirds and the Hooded Plover breeding season. The survey also occurred during low tide, when detecting shorebirds can be more difficult than at other stages of the tidal cycle.

The assessment has been made given the extent of the Project design current at the time of writing. No allowance has been made for any future design changes that might increase the area of the impact footprint.

All information and assessments are based on data available at the time of preparing this report. No allowance is made for additional information that may become available in the future, including detailed Project design.

4 RESULTS

4.1 Matters of national environmental significance

The PMST identified three Matters of National Environmental Significance (MNES) as potentially occurring in the Project Area:

- EPBC Act listed Threatened Ecological Communities (TEC);
- EPBC Act listed Threatened Species; and
- EPBC Act listed Migratory Species.

These MNES are described in more detail in the following Sections.

4.1.1 Threatened ecological communities

The desktop search indicated that one TEC may occur in the Project Area:

- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia (EPBC Act Endangered).

The field survey also found some areas of *Lomandra* spp. dominated grassland. Although not predicted to occur by the desktop search, *Lomandra* spp. grassland may also be considered the TEC listed below:

- Iron-grass (*Lomandra*) Natural Temperate Grassland of South Australia (EPBC Act Critically Endangered)

The field survey confirmed that neither TEC occurs in the Project Area, for those reasons summarised in Table 5.

Table 5. Assessment of the presence of Threatened Ecological Communities.

Threatened Ecological Community	EPBC Act Status	Key Diagnostic Features	Assessment
Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia.	E	• The ecological community occurs on low slopes and plains from central NSW, through northern and central Victoria into South Australia. • The vegetation structure of the ecological community is typically a woodland to open forest. • The tree canopy is dominated (≥ 50% canopy crown cover) by *Eucalyptus microcarpa* (Grey Box). • The mid layer comprises shrubs of variable composition and cover, from absent to moderately dense. • The ground layer also is highly variable in development and composition, ranging from almost absent to mostly grassy to forb-rich. • Derived grasslands are a special state of the ecological community, whereby the canopy and mid layers have been mostly removed to	**Does not occur in the Project Area.** The Project Area is not situated on low slopes and plains, rather situated on coastal cliff tops. The vegetation structure is shrubland and grassland and *Eucalyptus microcarpa* is not present. Given the landscape position, natural vegetation of the area pre-disturbance would have consisted of similar low shrubland.
Iron-grass (*Lomandra*) Natural Temperate	CE	**Condition Class A** – Areas ≥0.1 ha and have ≥30 native plant species and at least 10	**Does not occur in the Project Area.**

Threatened Ecological Community	EPBC Act Status	Key Diagnostic Features	Assessment
Grassland of South Australia.		native broad-leaved herbaceous species not on the disturbance resistant list and have ≥ five native perennial grass species and at least one native perennial tussock per metre (Threatened Species Scientific Committee). **Condition Class B –** Areas ≥0.25 ha and have ≥15 native plant species and at least three native broad-leaved herbaceous species not on the disturbance resistant list and have ≥ four native perennial grass species and at least one native perennial tussock per metre (Threatened Species Scientific Committee).	*Lomandra* grassland in the Project Area consists of two disconnected patches, both <0.25 ha in area. Neither patch has >15 species of native plants.

4.1.2 Threatened flora

The PMST identified eight plant species listed as threatened by the EPBC Act as known or likely to occur in the Project Area. Seven of these are also listed as threatened under the NPW Act. A search of the BDBSA indicated that 22 species listed as threatened under the EPBC Act and/or the NPW Act have been recorded from within 5 km of the Project Area since 1995 (Appendix 1).

The field survey recorded two species listed as Rare under the NPW Act:

- *Ptilotus angustifolius* (Narrow-leaf Yellow-tails) (Figure 2); and
- *Myoporum parvifolium* (Creeping Boobialla) (Figure 3).

These species were recorded in Cell 5 at the locations shown in Figure 4. Including these species, four threatened plant species have been assessed as possible or likely to occur in the Project Area (Table 6). The full likelihood of occurrence assessment for all threatened flora identified by database searches is provided in Appendix 1.

No species listed as threatened by the EPBC Act were recorded during the survey, nor have they been assessed as possible or likely to occur.

Table 6. Threatened flora species known or likely to occur in the Project Area.

Scientific Name	Common Name	Conservation Status		Likelihood of Occurrence	Location
		Aus	SA		
Austrostipa densiflora	Fox-tail Spear-grass		R	Likely	Cell 5 Cell 6
Myoporum parvifolium	Creeping Boobialla		R	Known	Cell 5
Podolepis muelleri	Button Podolepis		V	Likely	Cell 5 Cell 6
Ptilotus angustifolius	Narrow-leaf Yellow-tails		E	Known	Cell 5



Figure 2. *Ptilotus angustifolius*, photographed in Cell 5.



Figure 3. *Myoporum parvifolium*, photographed in Cell 6.

4.1.3 Threatened and migratory fauna

The PMST identified 15 fauna species listed as threatened or migratory by the EPBC Act as known or likely to occur in the Project Area. Twelve of these are also listed as threatened by the NPW Act. A search of the BDBSA indicated that 6 species listed as threatened under the EPBC Act and/or the NPW Act have been recorded within 5 km of the Project Area since 1995 (Appendix 2.).

The field survey recorded one Rare and one Vulnerable species listed by the NPW Act:

- Rare – Sooty Oyster Catcher (*Haematopus fuliginosus*); and
- Vulnerable – Yellow-tailed Black Cockatoo (*Zanda funerea whiteae*).

Two Sooty Oystercatchers were observed foraging on a rock shelf at the base of cliff in Cell 5 (Figure 4), while a flock of Yellow-tailed Black Cockatoos was recorded in planted *Pinus halepensis* (Aleppo Pines) in Cell 10 (Figure 6).

Although searched for Hooded Plover, this species, listed as Vulnerable by both the EPBC Act and NPW Act, was not recorded in beach and dune habitat in Cell 10. However, as the area is a known breeding site last used in 2019, the species has been assessed as known to occur. An additional 11 species of threatened fauna have been assessed as likely or possible to occur, as shown in Table 7. The full likelihood of occurrence assessments for all species identified by database searches if provided in Appendix 2.

Most species listed in Table 7 are marine and wetland species. They possibly occur at times on beach and shore habitat in Cell 10, but would not occur in cliff top or gully habitat in Cells 5 and 6. Three species (listed below) may occur more widely throughout the Project Area, although all require mature trees to be present:

- Yellow-tailed Black Cockatoo;
- Grey-headed Flying Fox; and
- Black-chinned Honeyeater.

Table 7. Threatened and migratory fauna known or likely to occur in the Project Area.

Scientific Name	Common Name	Conservation Status		Likelihood of Occurrence	Location
		Aus	SA		
Actitis hypoleucos	Common Sandpiper	Mi		Possible	Cell 10
Calidris canutus	Red Knot	EN	E	Possible	Cell 10
Calidris ferruginea	Curlew Sandpiper	CR	E	Possible	Cell 10
Egretta sacra sacra	Eastern Reef Heron		R	Highly likely	Cell 10
Haematopus fuliginosus	Sooty Oystercatcher		R	Known	Cell 10
Melithreptus gularis	Black-chinned Honeyeater		V	Possible	Cell 10
Numenius madagascariensis	Eastern Curlew	CR	E	Possible	Cell 10
Pandion haliaetus	Eastern Osprey	Mi	E	Possible	Cell 5 Cell 6 Cell 10
Thinornis cucullatus cucullatus	Hooded Plover	VU	V	Known	Cell 10
Tringa nubularia	Common Greenshank	Mi		Possible	Cell 10
Pteropus poliocephalus	Grey-headed Flying Fox	VU	R	Likely	Cell 10
Zanda funerea whitea	Yellow-tailed Black Cockatoo		V	Known	Cell 10

4.2 Vegetation associations

4.2.1 Cell 5 and Cell 6

Five native Vegetation Associations were mapped as a result of the field survey in Cells 5 and 6:

- *Acacia cupularis* and *Zygophyllum aurantiacum* Low Open Shrubland over *Austrostipa* spp. and exotic grasses and forbs (Table 8).
- *Lawrencia squamata* Sparse Low Shrubland over *Disphyma crassifolia* and *Austrostipa* spp. (Table 9).
- *Lomandra effusa* and *Chloris truncata* Sparse Grassland (Table 10).
- *Olearia axillaris / Atriplex cinerea +/- Acacia cupularis* Low Open Shrubland over *Austrostipa* spp. and exotic grasses and forbs (Table 11).
- *Olearia axillaris, Myoporum insulare* and *Leucophyta brownii* Low Open Shrubland over Chloris truncata and exotic grasses and forbs (Table 12).

Two non-native Vegetation Associations were also recognised and mapped:

- *Olea europaea +/- Pinus halepensis* Low Woodland over *Chrysanthemoides monilifera* and *Avena* sp (Table 13); and
- Revegetation areas and garden plantings (Table 14).

Vegetation associations for Cells 5 and 6 are mapped in Figure 4 and Figure 5.

Native vegetation ranged in condition from poor to fair, with high impact from weeds, particularly introduced species of grasses, such as *Avena* sp. (wild oats), and forbs such as *Oxalis pes-caprae* (Soursob). Along the length of the walkway, numerous informal trails and access points also cause impact to vegetation.

Table 8. Vegetation Association description, *Acacia cupularis* and *Zygophyllum aurantiacum* Low Open Shrubland over *Austrostipa* spp. and exotic grasses and forbs.

***Acacia cupularis* and *Zygophyllum aurantiacum* Low Open Shrubland over *Austrostipa* spp. and exotic grasses and forbs.**			
Dominant Overstorey species	*Zygophyllum aurantiacum* *Acacia cupularis*		
Dominant mid and under storey species	*Threlkeldia diffusa* *Dissocarpus biflorus* *Austrostipa sp.* *Gazania linearis** *Asphodelus fistulosus** *Oxalis pes-caprae**		
Description			
Survey Site	A7	**Location**	GDA 1994 -35.08399, 138.49405
Threatened Species observed	None		
Declared Weeds	*Lycium ferocissimum** (African Boxthorn) *Gazania linearis** (Gazania)		
Low open shrubland situated on shallow soils on upper slopes. Sparse low chenopod shrubs dominate the mid layer, while ground layer vegetation is dominated by introduced grass and forb species. Fair condition, although disturbed by weeds.			
Benchmark Community	Coastal Shrublands of Dunes and Cliff tops		
Unit Biodiversity Score	23.23		

***Denotes introduced species.**

Table 9. Vegetation Association description, *Lawrencia squamata* Sparse Low Shrubland over *Disphyma crassifolia* and *Austrostipa* spp.

***Lawrencia squamata* Sparse Low Shrubland over *Disphyma crassifolia* and *Austrostipa* spp.**			
Dominant Overstorey species	*Lawrencia squamata* *Atriplex cinerea*		
Dominant mid and under storey species	*Disphyma crassifolium* *Austrostipa sp.* *Avena sp.** *Gazania linearis** *Moraea setifolia**		
Description			
Survey Site	A5	**Location**	GDA 1994 -35.0621, 138.5020
Threatened Species observed	None		
Declared Weeds	*Pinus halepensis** (Aleppo Pine) *Lycium ferocissimum** (African Boxthorn)		
Sparse low shrubland in poor condition situated on stony shallow soils of more exposed cliff tops. Ground layer vegetation is sparse, with large areas of bare ground, and dominated by *Disphyma crassifolium* and introduced grasses.			
Benchmark Community	Coastal Shrublands of Dunes and Cliff tops		
Unit Biodiversity Score	15.54		

***Denotes introduced species.**

Table 10. Vegetation Association description, *Lomandra effusa* and *Chloris truncata* Sparse Grassland.

***Lomandra effusa* and *Chloris truncata* Sparse Grassland**			
Dominant Overstorey species	*Atriplex cinerea*		
Dominant mid and under storey species	*Lomandra effusa* *Chloris truncata* *Gazania linearis** *Medicago sp.** *Moraea setifolia**		
Description			
Survey Site	A3, A6	**Location**	GDA 1994 A3: -35.0574, 138.5040 A6: -35.0600, 138.5030
Threatened Species observed	None		
Declared Weeds	*Gazania linearis**(Gazania) *Chrysanthemoides monilifera**(Boneseed) *Lycium ferocissimum** (African Boxthorn)		
Grassland in fair condition on exposed cliff tops with very sparse emergent chenopod shrubs. *Lomandra effusa* and *Chloris truncata* are codominant with introduced forb species.			
Benchmark Community	Coastal Tussock Grasslands of Dunes and Cliffs		
Unit Biodiversity Score	53.13		

***Denotes introduced species.**

Table 11. Vegetation Association description, *Olearia axillaris / Atriplex cinerea +/- Acacia cupularis* Low Open Shrubland over *Austrostipa* spp. and exotic grasses and forbs.

***Olearia axillaris / Atriplex cinerea +/- Acacia cupularis* Low Open Shrubland over *Austrostipa* spp. and exotic grasses and forbs**			
Dominant Overstorey species	*Acacia cupularis*		
Dominant mid and under storey species	*Olearia axillaris* *Atriplex cinerea* *Enchylaena tomentosa* *Oxalis pes-caprae** *Vulpia sp.** *Austrostipa sp.* *Asphodelus fistulosus** *Medicago sp.** *Lomandra effusa*		
Description			
Survey Site	A4	**Location**	GDA 1994 -35.
Threatened Species observed	None		
Declared Weeds	*Lycium ferocissimum** (African Boxthorn) *Gazania linearis** (Gazania)		
Low shrubland in more sheltered sites in poor condition. Heavily impacted by weeds, including *Asphodelus fistulosus* (Onion Weed) and *Oxalis pes-caprae* (Soursob). Less disturbed on the seaward side of the walkway and mid slopes of the cliff.			
Benchmark Community	Coastal Shrublands of Dunes and Cliff tops		
Unit Biodiversity Score	32.21		

***Denotes introduced species.**

Table 12. Vegetation Association description, *Olearia axillaris, Myoporum insulare* and *Leucophyta brownii* Low Open Shrubland over Chloris truncata and exotic grasses and forbs.

***Olearia axillaris, Myoporum insulare* and *Leucophyta brownii* Low Open Shrubland over Chloris truncata and exotic grasses and forbs**			
Dominant Overstorey species	*Olearia axillaris* *Myoporum insulare*		
Dominant mid and under storey species	*Leucophyta brownii* *Threlkeldia diffusa* *Atriplex cinerea* *Chloris truncata* *Lomandra effusa* *Avena sp.** *Arctotheca calendula** *Asphodelus fistulosus** *Oxalis pes-caprae**		
Description			
Survey Site	A2	**Location**	
Threatened Species observed	*Ptilotus angustifolius* *Myoporum parvifolium*		
Declared Weeds	*Chrysanthemoides monilifera** *Gazania linearis**		
Open shrubland on the mid to upper slopes of coastal cliffs, becoming less open towards the upper slopes. Fair condition vegetation, with a diversity of native forb and grass species. However, the site is disturbed by introduced grasses and forbs, such as *Arctotheca calendula* (Cape Weed) and *Avena sp.* (wild oats).			
Benchmark Community	Coastal Shrublands of Dunes and Clifftops		
Unit Biodiversity Score	11.17		

***Denotes introduced species.**

Table 13. Vegetation Association description, *Olea europaea +/- Pinus halepensis* Low Woodland over *Chrysanthemoides monilifera* and *Avena* sp.

***Olea europaea +/- Pinus halepensis* Low Woodland over *Chrysanthemoides monilifera* and *Avena* sp.**			
Dominant Overstorey species	*Olea europaea**		
Dominant mid and under storey species	*Chrysanthemoides monilifera** *Avena sp.** *Gazania linearis** *Oxalis pes-caprae**		
Description			
Survey Site	A1	**Location**	GDA 1994 -35.06155, 138.50244
Threatened Species observed		None	
Declared Weeds		*Gazania linearis** (Gazania) *Pinus halepensis** (Aleppo Pine) *Chrysanthemoides monilifera** (Boneseed) *Olea europaea** (European Olive)	
A non-native woodland situated on shallow rocky soils on the sides and base of a deep gully. Dominated by *Olea europaea* (European Olive) in the upper storey and *Chrysanthemoides monilifera* (Boneseed) in the mid storey. Isolated *Acacia cupularis* occur in the floor of the gully. Ground layer contains introduced grasses and forbs, including *Avena* sp. (wild oats), *Gazania linearis* (Gazania) and *Oxalis pes-caprae* (Soursob).			
Benchmark Community		Non-native - Not assessed	
Unit Biodiversity Score		Non-native - Not assessed	

***Denotes introduced species.**

Table 14. Vegetation Association description, Revegetation and garden plantings.

Revegetation and garden plantings		
Dominant Overstorey species	*Eucalyptus spp.* *Acacia spp.* *Myoporum insulare* *Allocasuarina verticillata* *Scaevola crassifolia*	
Dominant mid and under storey species	*Avena sp.** *Oxalis pes-caprae** *Lolium sp.** *Medicago sp.** *Austrostipa sp.* *Brassica tournefortii**	
Description		
Survey Site	Not surveyed	**Location** Cell 5, Cell6, Cell 10
Threatened Species	None recorded	
Declared Weeds	None recorded	
Revegetation of mixed shrubs and garden plantings, including introduced and native species. This vegetation Association cannot be defined as native vegetation and was not formerly surveyed. However, species lists were collected and the distribution in Cell 5, Cell 6 and Cell 10 mapped.		
Benchmark Community	Non-native - Not assessed	
Unit Biodiversity Score	Non-native - Not assessed	

***Denotes introduced species.**



Figure 4. Vegetation Associations and Project design, Cell 5.

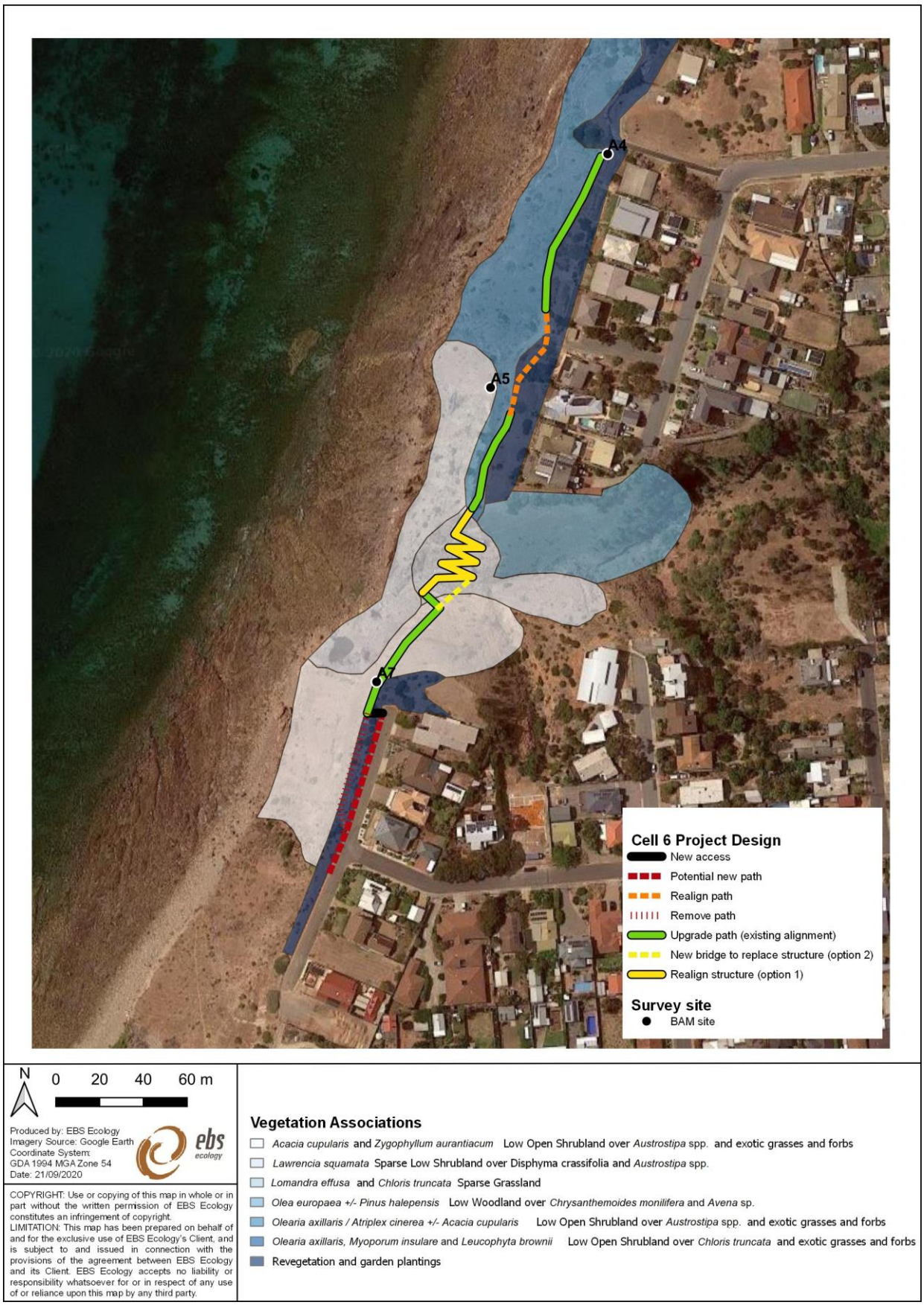


Figure 5. Vegetation Associations and Project design, Cell 6.

4.2.2 Cell 10

Seven native Vegetation Associations have been mapped previously in *Flora and fauna assessment Coast Park – Hallet Cove* (T&M Ecologists, 2019), with the remainder of the area composed of non-native grassland or woodland and revegetation areas. Mapped in Figure 6, these Vegetation Associations were ground truthed and photographed during the field survey. The mapping completed by T&M Ecologists was found to be accurate.

The seven native Vegetation Associations mapped for Cell 10 are listed below. Descriptions of each can be found in T&M Ecologists 2019.

- *Acacia longifolia* ssp. *sophorae* Shrubland (Figure 7).
- *Melaleuca halmaturorum +/- Leptospermum laevigatum* Very Low Open Forest (Figure 8).
- *Nitraria billardierei* Shrubland (Figure 9).
- *Olearia axillaris* and *Myoporum insulare* Low Open Shrubland (Figure 10).
- *Olearia axillaris, Myoporum insulare* and *Leucophyta brownii* Low Open Shrubland (Figure 11).
- *Phragmites australis* Tall Grassland with emergent *Eucalyptus camaldulensis* (Figure 12).
- *Spinifex hirsutus* Tussock Grassland (Figure 13).

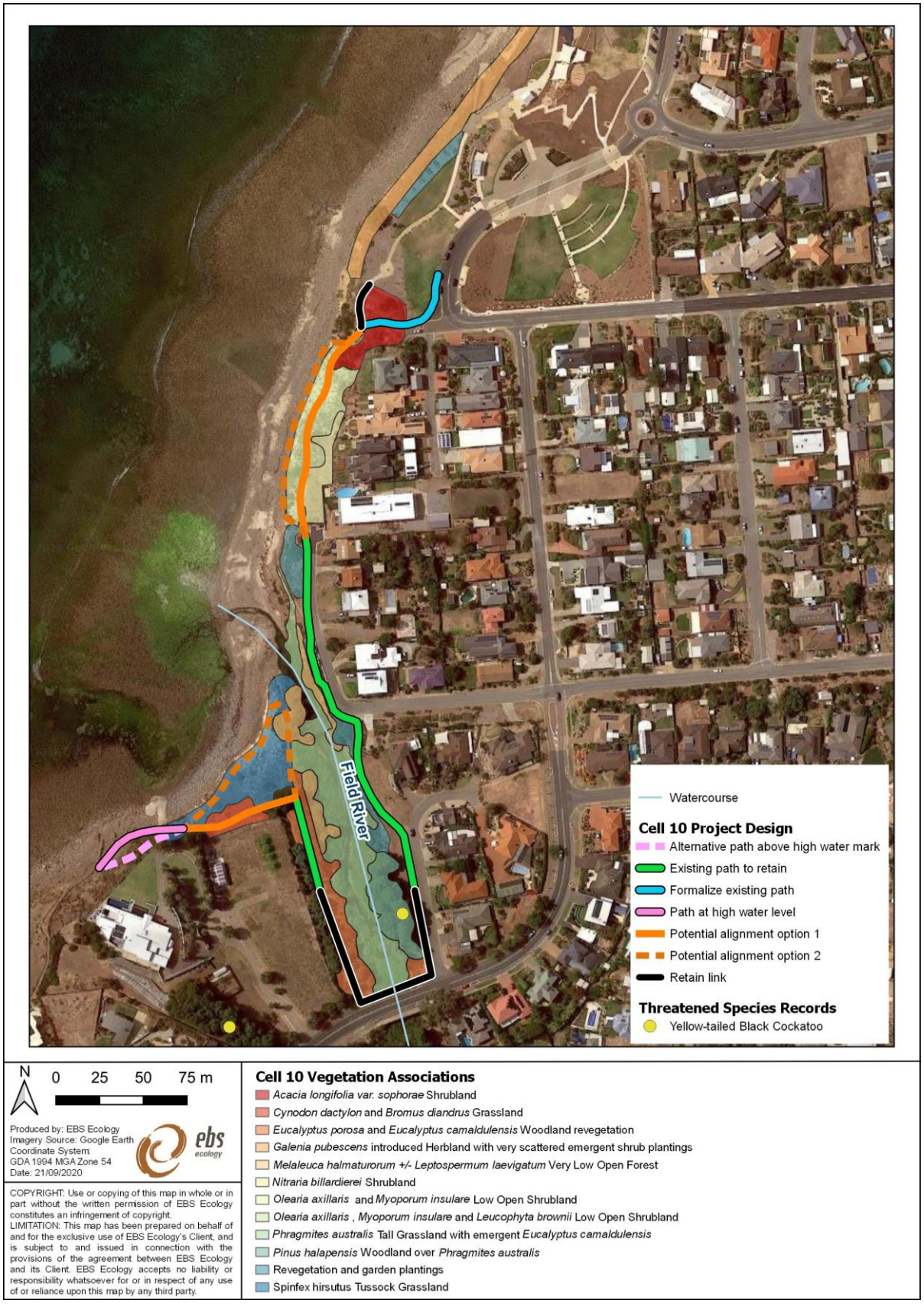


Figure 6. Vegetation Associations and Project Design, Cell 10. Vegetation Association mapping has been taken from *Flora and fauna assessment Coast Park – Hallet Cove* (T&M Ecologists, 2019).



Figure 7. *Acacia longifolia* ssp. *sophorae* Shrubland.



Figure 8. *Melaleuca halmaturorum* +/- *Leptospermum laevigatum* Very Low Open Forest



Figure 9. *Nitraria billardierei* Shrubland.



Figure 10. *Olearia axillaris* and *Myoporum insulare* Low Open Shrubland.



Figure 11. *Olearia axillaris, Myoporum insulare* and *Leucophyta brownii* Low Open Shrubland.



Figure 12. *Phragmites australis* Tall Grassland with emergent *Eucalyptus camaldulensis*.



Figure 13. *Spinifex hirsutus* Tussock Grassland.

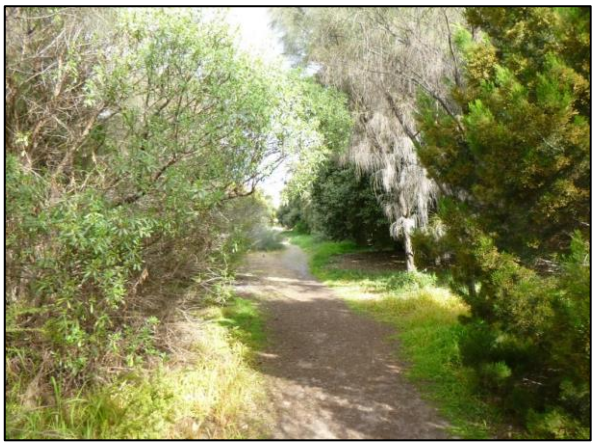


Figure 14. Revegetation of *Eucalyptus camaldulensis* and *Eucalyptus microcarpa*.

4.3 Flora and fauna species recorded during the survey

4.3.1 Flora and fauna

Sixty-six flora species were recorded during the survey (Appendix 3.). This included 27 introduced and 39 native species, two of which are threatened species listed under the NPW Act (see Section 4.1.2).

Fauna was not diverse, consisting mainly of species common to open space in urban areas, with one reptile, 20 bird and 2 mammal species recorded (Appendix 4). Five species recorded were introduced:

- *Vulpes vulpes* (Red Fox);
- *Passer domesticus* (House Sparrow);
- *Rock Dove* (Columba livia);
- *Sturnus vulgaris* (Common Starling); and
- *Turdus merula* (European Blackbird).

Two species listed as threatened under the NPW Act, both birds, were recorded, as discussed in Section 4.1.3.

4.3.2 Weeds

Seven plants declared as weeds under the Landscape SA Act 2019 were recorded. Two of these are also classed as Weeds of National Significance (WoNS). Weeds recorded during the survey are listed in Table 15.

Table 15. Declared weeds and WoNS recorded in the Project Area.

Scientific Name	Common Name	Growth Form	LSA Act Declared	WoNS
Cenchrus setaceus	Fountain Grass	Grass	Yes	No
Chrysanthemoides monilifera	Boneseed	Shrub	Yes	Yes
Gazania linearis	Gazania	Forb	Yes	No
Lycium ferocissimum	African Boxthorn	Shrub	Yes	Yes

Scientific Name	Common Name	Growth Form	LSA Act Declared	WoNS
Olea europaea	European Olive	Tree	Yes	No
Pinus halepensis	Aleppo Pine	Tree	Yes	No
Polygala myrtifolia	Myrtle-leaf Milkwort	Shrub	Yes	No

5 DISCUSSION AND RECOMMENDATIONS

Results of the desktop and field surveys indicate that native vegetation occurs in the Project Area and will potentially be impacted. This consists of shrubland and grassland Vegetation Associations in poor to fair condition. While the area is exempt from the NV Act, clearing of vegetation should occur to be consistent with the *City of Marion Development Plan,* the *City of Marion Remnant Vegetation Plan 2018 – 2023* and the DV Act.

Four flora and 10 fauna species listed as threatened under the NPW Act possibly occur in the Project Area, four recorded during the field survey. Two of these species are also listed as threatened under the EPBC Act and three fauna species listed as Migratory under the EPBC Act are also likely to occur.

Of these fauna species, nine are wetland species that are only likely to occur on the beach and near the Field River outlet in Cell 10, while three species require mature trees for foraging resources, as summarised in Table 16. This list includes the Hooded Plover, listed as Vulnerable under the EPBC Act, that is known to nest on the beach in Cell 10.

No Threatened Ecological Communities occur in the Project Area.

Recommendations for addressing impact to the Hooded Plover are discussed in Section 5.1, while other constraints are addressed in Sections 5.2, 5.3 and 5.4.

Table 16. Threatened and migratory species occurrence in the Project Area.

Threatened species	Legislation	Habitat*	Occurrence
Actitis hypoleucos Common Sandpiper	EPBC Act	Wetlands, beaches	Cell 10
Calidris canutus Red Knot	EPBC Act NPW Act	Wetlands, beaches	Cell 10
Calidris ferruginea Curlew Sandpiper	EPBC Act NPW Act	Wetlands, beaches	Cell 10
Egretta sacra sacra Eastern Reef Heron	NPW Act	Wetlands, beaches	Cell 10
Haematopus fuliginosus Sooty Oystercatcher	NPW Act	Wetlands, beaches	Cell 10
Melithreptus gularis Black-chinned Honeyeater	NPW Act	Requires mature trees	Cell 10
Numenius madagascariensis Eastern Curlew	EPBC Act NPW Act	Wetlands, beaches	Cell 10
Pandion haliaetus Eastern Osprey	EPBC Act NPW Act	Wetlands, beaches	Cell 10
Thinornis cucullatus cucullatus Hooded Plover	EPBC Act NPW Act	Wetlands, beaches	Cell 10
Tringa nebularia Common Greenshank	EPBC Act	Wetlands, beaches	Cell 10
Pteropus poliocephalus Grey-headed Flying Fox	EPBC Act NPW Act	Requires mature trees	Cell 10
Zanda funerea whitea Yellow-tailed Black Cockatoo	NPW Act	Requires mature trees	Cell 10

***Refer to Appendix 2**

5.1 Hooded Plover

Two project design options have been proposed for walkway construction in Cell 10, close to Hooded Plover habitat. These are shown in Figure 15 as Option 1 and Option 2. Hooded Plovers are known to nest high up the beach. In addition to the potential of direct impacts, such as nest trampling and predation by domestic dogs, the species is known to be susceptible from indirect impacts associated with disturbance.

As discussed in Section 2.1, the City of Marion has previously been provided with recommendations by Birdlife Australia for avoiding and minimising impact to Hooded Plovers. The two Project design options proposed address these recommendations as described in Table 17.

As Option 1 addresses most of Birdlife Australia's recommendations, it reduces the impact on Hooded Plovers. It may also have a positive impact, by closing beach access near nesting habitat and reducing disturbance impacts.

It is recommended that Option 1 be developed over Option 2 and that Council or its contractors undertake an EPBC Self-assessment to test the significance of impact on Hooded Plovers. This should occur according to the *Matters of National Environmental Significance Significant impact guidelines 1.1 – Environment Protection and Biodiversity Conservation Act 1999* (Department of the Environment, 2013).

Table 17. Project design and impact to Hooded Plovers.

Location	Previous Recommendations	Option 1*	Option 2*
East of Field River	1. Situate the walkway as far east as possible on the dunes east of the Field River mouth. 2. Situate the walkway at the far eastern side of the dunes to allow for habitat retreat due to climate change. 3. Remove the two beach access points at either end of the dunes east of the Field River, channelling walkers onto the new formal walkway and away from nesting areas. 4. If revegetating dunes following construction, use local native species that provide habitat for nesting plovers (i.e. avoid dense plantings of shrubs).	1. Given the result of consultation with residents, the walkway is positioned as far as is possible to the east. 2. Option 1 does not allow for habitat retreat resulting climate change. 3. Beach access points are removed. 4. Not addressed in project design.	1. Option 2 would construct the walkway directly through the known nesting site of Hooded Plover. 2. Option 2 does not allow for habitat retreat resulting from climate change. 3. Beach access points would become part of the new walkway. 4. Not addressed in project design.
West of Field River	1. Walkway should closely follow the boundary of Council/private land behind the dunes to connect with the base of the existing walkway at the base of the cliffs. 2. Terminate the current track behind the dunes to reduce the funnelling of people onto the beach just south of the Field River outlet.	1. Walkway follows the boundary of Council land closely. 2. Current track to south of the Field River outlet is terminated.	1. Walkway follows Field River and boundary between dune and beach. 2. Track accessing beach is not terminated.

***As mapped in Figure 15.**



Figure 15. Project design options for walkway construction in Hooded Plover habitat, Cell 10.

5.2 Cell 5

Ecological constraints relevant to Cell 5 and recommendations are discussed in Table 18.

Table 18. Cell 5, constraints and recommendations.

Constraint	Comments	Recommendations
Native vegetation	Four native Vegetation Associations occur in Cell 5. All works are proposed to occur on current alignment, except potential new link with Pindee St.	Where possible, design walkway to follow existing alignment and place any laydown/construction sites outside areas mapped as native vegetation. Vegetation Management Plan to be included in the Construction Environmental Management Plan. Weed Management Plan to be included in the Construction Environmental Management Plan.
Threatened flora	Two threatened flor species occur at the northern end of Cell 5. No work is proposed for this location.	

5.3 Cell 6

Ecological constraints relevant to Cell 5 and recommendations are discussed in Table 19.

Table 19. Cell 6, constraints and recommendations.

Constraint	Comments	Recommendations
Native vegetation	Three native Vegetation Associations occur in Cell 6. Potential new path alignment on The Esplanade is in non-native vegetation (revegetation and garden plantings). Walkway realignment north of Kurnabinna Gully is in non-native vegetation (revegetation and garden plantings). Re-development of Kurnabinna Gully crossing will impact native vegetation.	Where possible, design walkway to follow existing alignment and place any laydown/construction sites outside areas mapped as native vegetation. Vegetation Management Plan to be included in the Construction Environmental Management Plan. Weed Management Plan to be included in the Construction Environmental Management Plan.
Threatened flora	No threatened flora were recorded in this Cell during the field survey. However, it is possible that four species may occur that were not detected due to survey limitations.	

5.4 Cell 10

Ecological constraints relevant to Cell 5 and recommendations are discussed in Table 20.

Table 20. Cell 10, constraints and recommendations.

Constraint	Comments	Recommendations
Native vegetation	Seven native Vegetation Associations occur in Cell 10. All works are proposed to occur on current alignment, except potential new link with Pindee St.	Where possible, design walkway to follow existing alignment and place any laydown/construction sites outside areas mapped as native vegetation. Vegetation Management Plan to be included in the Construction Environmental Management Plan. Weed Management Plan to be included in the Construction Environmental Management Plan.
Threatened and migratory fauna	Nine species of threatened or migratory species are known to or possibly utilise the beach area. Three threatened species are known to or possibly utilise mature, flowering trees in Cell 10.	Close or formalise beach access points where feasible to do so. Avoid clearing mature trees, both introduced and native species. Avoid construction of walkway infrastructure on the beach/foredune where possible. Consider advice from Birdlife Australia as far as is practicable in Project Design.

6 REFERENCES

Birdlife Australia. (2018, December 10). RE: Coastal Walkway, Stage 1 - Heron Way to Cormorant Drive, Hallet Cove. Letter to the City of Marion from Birdlife Australia.

Botanic Gardens of South Australia. (2020a, September 17). *Acacia iteaphylla - Willow-leaf Wattle*. Retrieved from Seeds of South Australia: https://spapps.environment.sa.gov.au/SeedsOfSA/speciesinformation.html?rid=164

Botanic Gardens of South Australia. (2020b, September 17). *Austrostipa multispiculis - Small-seed Spear-grass*. Retrieved from Seeds of South Australia: https://spapps.environment.sa.gov.au/SeedsOfSA/speciesinformation.html?rid=602

Botanic Gardens of South Australia. (2020c, September 17). *Austrostipa tenuifolia - Narrow-leaf Spear-grass*. Retrieved from Seeds of South Australia: https://spapps.environment.sa.gov.au/SeedsOfSA/speciesinformation.html?rid=620

Botanic Gardens of South Australia. (2020d, September 18). *Eucalyptus alatissima - Wing-fruited Mallee*. Retrieved from Seeds of South Australia: https://spapps.environment.sa.gov.au/SeedsOfSA/speciesinformation.html?rid=1832

Botanic Gardens of South Australia. (2020e, September 18). *Leptorhynchos elongatus - Lanky Buttons*. Retrieved from Seeds of South Australia: https://spapps.environment.sa.gov.au/SeedsOfSA/speciesinformation.html?rid=2630

Botanic Gardens of South Australia. (2020f, September 18). *Podolepis decipiens - Bright Podolepis*. Retrieved from Seeds of South Australia: https://spapps.environment.sa.gov.au/SeedsOfSA/speciesinformation.html?rid=3434

Botanic Gardens of South Australia. (2020g, September 18). *Podolepis muelleri - Small Copper-wire Daisy*. Retrieved from Seeds of South Australia: https://spapps.environment.sa.gov.au/SeedsOfSA/speciesinformation.html?rid=3439

Botanic Gardens of South Australia. (2020h, September 18). *Ptilotus nobilis ssp. angustifolius - Regal Fox tails*. Retrieved from Seeds of South Australia: https://spapps.environment.sa.gov.au/SeedsOfSA/speciesinformation.html?rid=3658

Botanic Gradens of South Australia. (2020i, September 18). *Swainsona behriana - Behr's Swainson-pea*. Retrieved from Seeds of South Australia: https://spapps.environment.sa.gov.au/SeedsOfSA/speciesinformation.html?rid=4345

City of Marion. (2018). *Remnant Native Vegetation Plan, 2018 to 2023.* City of Marion.

City of Marion. (2020, September 28). *Marion Council Development Plan.* Retrieved from Department for Infrastructure and Transport: https://www.dpti.sa.gov.au/__data/assets/pdf_file/0007/247633/Marion_Council_Development_Plan.pdf

Department for Environment and Heritage. (2008a). *Adelaide and Mount Lofty Ranges Threatened Species Profile - Osborne's Eyebright.* Adelaide: Department for Environment and Heritage.

Department for Environment and Heritage. (2008b). *Adelaide and Mount Lofty Ranges Threatened Species Profile - Black Cotton-bush.* Adelaide: Department for Environment and Heritage.

Department for Environment and Heritage. (2008c). *Adelaide and Mount Lofty Ranges Threatened Species Profile - Pale Leek-orchid.* Adelaide: Department for Environment and Heritage.

Department for Environment and Heritage. (2008c). *Adelaide and Mount Lofty Ranges Threatened Species Profile - Silver Daisy-bush.* Adelaide: Department for Environment and Heritage.

Department for Environment and Heritage. (2008d). *Adelaide and Mount Lofty Ranges Threatened Species Profile - Plum Leek-orchid.* Adelaide: Department for Environment and Heritage.

Department for Environment and Heritage. (2008e). *Adelaide and Mount Lofty Ranges Threatened Species Profile - Black-chinned Honeyeater.* Adelaide: Government of South Australia.

Department for Environment and Water. (2013). *Grey-headed Flying-foxes in South Australia*. Retrieved from Natural Resources Adelaide and Mount Lofty Ranges: https://www.naturalresources.sa.gov.au/adelaidemtloftyranges/plants-and-animals/native-plants-animals-and-biodiversity/native-animals/mammals/grey-headed-flying-fox/grey-headed-flying-foxes-south-aust

Department of Agriculture, Water and the Environment. (2020a). *EPBC Protected Matters Report.* Department of Agriculture, Water and the Environment.

Department of Agriculture, Water and the Environment. (2020b, May 29). *Species Profile and Threats Database - Caladenia tensa, Greencomb Spider-orchid*. Retrieved from Department of Agriculture, Water and the Environment: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=24390

Department of Agriculture, Water and the Environment. (2020c, September 18). *Species Profile and Threats Database - Apus pacificus Fork-tailed Swift*. Retrieved from Department of Agriculture,

Water and the Environment: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=678

Department of Agriculture, Water and the Environment. (2020d, September 18). *Species Profile and Threats Database - Actitis hypoleucos, Common Sandpiper*. Retrieved from Department of Agriculture, Water and the Environment: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=59309

Department of Agriculture, Water and the Environment. (2020e, May 29). *Species Profile and Threats Database - Calidris canutus, Red Knot*. Retrieved from Department of Agriculture, Water and the Environment: http://www.environment.com.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=855

Department of Agriculture, Water and the Environment. (2020f, May 29). *Species Profile and Threats Database - Calidris ferrginea, Curlew Sandpiper*. Retrieved from Department of Agriculture, Water and the Environment: http://www.environment.com.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=856

Department of Agriculture, Water and the Environment. (2020f, May 29). *Species Profile and Threats Database: Pandion haliaetus, Eastern Osprey*. Retrieved from Department of Agriculture, Water and the Environment: http://www.environment.com.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=952

Department of Agriculture, Water and the Environment. (2020g, September 18). *Species Profile and Threats Database - Rostratula australis - Australian Painted Snipe*. Retrieved from Department of Agriculture, Water and the Environment: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=77037

Department of Agriculture, Water and the Environment. (2020h, September 18). *Species Profile and Threats Database - Sternula neresis neresis, Australian Fairy Tern*. Retrieved from Department of Agriculture, Water and the Environment: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=82950

Department of Agriculture, Water and the Environment. (2020i, September 18). *Species Profile and Threats Database - Isoodon obesulus obesulus, Southern Brown Bandicoot*. Retrieved from Department of Agriculture, Water and the Environment: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=68050

Department of Agriculture, Water and the Environment. (2020j, May 29). *Species Profile and Threats Database - Pteropus poliocephalus, Grey-headed Flying-fox*. Retrieved from Department of Agriculture, Water and the Environment: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=186

Department of Environment and Water. (2020). *Native Vegetation Council (NVC) Bushland Assessment Manual - July 2020.* Adelaide: Government of South Australia.

Department of the Environment. (2013). *Matters of National Environmental Significance Significant impact guidelines 1.1 - Environment Protection and Biodiversity Conservation Act 1999.* Canberra: Department of Agriculture, Water and the Environment.

Government of South Australia. (2020, June 16). Retrieved from LocationSA Map Viewer: http://location.sa.gov.au/viewer/?map=hybrid&x=138.57228542&y=-34.97208067&z=18&uids=95,102,180

Government of South Australia. (2020a). Retrieved from NatureMaps: http://spatialwebapps.environment.sa.gov.au/naturemaps/?locale=en-us&viewer=naturemaps

Native Vegetation Council. (2019a). *Bushland Assessment Manual.* Adelaide: Government of South Australia.

Nicolle, D. (1997). *Eucalypts of South Australia.* Adelaide: Lane Print Group.

Office of Environment and Heritage. (2020, September 18). *Australasian Bittern - profile*. Retrieved from Office of Environment and Heritage: https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10105

Pizzey, G., & Knight, F. (2007). *The Field Guide to the Birds of Australia - 8th Edition.* Harper Collins Australia.

Prescott, A. (1991). *It's Blue With Five Petals - Wildflowers of the Adelaide Region.* Prospect: Ann Prescott.

Royal Botanic Gardens of Victoria. (2020b, September 18). *Maireana rohrlachii*. Retrieved from VICFLORA - Flora of Victoria: https://vicflora.rbg.vic.gov.au/flora/taxon/88cf050a-9c3a-49d7-91a7-5918a3c94a33

Royal Botanic Gardens Victoria. (2020a, August 21). *Austrostipa densiflora*. Retrieved from VICFLORA Flora of Victoria: https://vicflora.rbg.vic.gov.au/flora/taxon/6f978ba5-5ef8-4af7-95f6-921b7a6d867c

State Herbarium of South Australia. (2020a, September 17). *Electronic Flora of South Australia species Fact Sheet - Acacia dodonaeifolia*. Retrieved from eFloraSA - Electronic Flora of South Australia: http://www.flora.sa.gov.au/cgi-bin/speciesfacts_display.cgi?form=speciesfacts&name=Acacia_dodonaeifolia

State Herbarium of South Australia. (2020b, September 17). *Electronic Flora of South Australia species Fact Sheet - Acacia whibleyana*. Retrieved from eFloraSA - Electronic Flora of South Australia: http://www.flora.sa.gov.au/cgi-bin/speciesfacts_display.cgi?form=speciesfacts&name=Acacia_whibleyana

State Herbarium of South Australia. (2020c, September 18). *Electronic Flora of South Australia species Fact Sheet - Caladenia pusilla*. Retrieved from eFloraSA - Electronic Flora of South Australia: http://flora.sa.gov.au/cgi-bin/speciesfacts_display.cgi?form=speciesfacts&name=Caladenia_pusilla

State Herbarium of South Australia. (2020d, September 18). *Electronic Flora of South Australia species Fact Sheet - Picris squarrosa* . Retrieved from eFloraSA - Electronic Flora of South Australia: http://www.flora.sa.gov.au/cgi-bin/speciesfacts_display.cgi?form=speciesfacts&name=Picris_squarrosa

State Herbarium of South Australia. (2020e, September 18). *Electronic Flora of South Australia species Fact Sheet - Podolepis jaceoides*. Retrieved from eFloraSA - Electronic Flora of South Australia: http://flora.sa.gov.au/cgi-bin/speciesfacts_display.cgi?form=speciesfacts&name=Podolepis_jaceoides

T&M Ecologists. (2019). *Flora and fauna assessment: Coast Park - Hallet Cove.* Aldgate: Unpublished report for the City of Marion by T&M Ecologists Pty Ltd.

Threatened Species Scientific Committee. (n.d.). *Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia listing advice.* Department of Agriculture, Water and the Environment.

Threatened Species Scientific Committee. (n.d.). *Iron-grass Natural Temperate Grassland of South Australia ecological community Advice.* Department of Agriculture, Water and the Environment.

7 APPENDICES

Appendix 1. Assessment of likelihood for threatened flora.

Scientific name	Common name	Conservation status		Source of information	Last sighting (year)	Habitat constraints	Likelihood of occurrence within project area
		Aus	SA				
Caladenia tensa	Greencomb Spider-orchid	EN		1	No records	The Greencomb Spider-orchid grows on red-brown sandy loams on rises in open woodland dominated by *Eucalyptus leucoxylon* (Department of Agriculture, Water and the Environment, 2020b).	**Unlikely.** There are no records of the species within 5 km of the Project Area and the degraded coastal shrubland is not suitable habitat.
Acacia dodonaeifolia	Hop-bush Wattle		R	2	2014	Mainly in woodland open forest vegetation formation. Soils; hard acidic, yellow duplex, red shallow porous loamy, sandy alkaline yellow duplex (State Herbarium of South Australia, 2020a).	**Unlikely.** Although recorded within 5 km since 1995, the coastal cliff-top and dune habitats found in the Project Area are not suitable for this species.
Acacia iteaphylla	Flinders Ranges Wattle		R	2	2019	Found on northern Eyre Peninsula eastward to the Flinders Ranges and northern Mount Lofty Ranges growing on hillsides amongst rocky outcrops or in valleys along rocky creek banks. Widely planted & naturalised elsewhere and widespread in the Mt Lofty Ranges region (Botanic Gardens of South Australia, 2020a).	**Unlikely.** The Project Area is outside the natural distribution of the species. Recent records likely refer to planted specimens.
Acacia whibleyana	Whibley's Wattle	EN	E	2	2002	This species has a restricted distribution and has been collected in an area within 40 km of Tumby Bay on southern Eyre Peninsula. It has been collected from loamy soils over limestone, sometimes near salt swamps (State Herbarium of South Australia, 2020b).	**Unlikely.** The Project Area is outside the natural distribution of the species. Recent records likely refer to planted specimens.
Austrostipa densiflora	Fox-tail Spear-grass		R	2	2019	Occurs almost exclusively amongst rocks or on very shallow soil overlying rock and	**Likely.**

Scientific name	Common name	Conservation status		Source of information	Last sighting (year)	Habitat constraints	Likelihood of occurrence within project area
		Aus	SA				
						most common in drier, elevated sites (Royal Botanic Gardens Victoria, 2020a).	Recent records occur in Hallet Cove Conservation Park in similar habitat. *Austrostipa* spp. grasses were recorded during the field survey but could not be identified as they weren't flowering.
Austrostipa multispiculis	Many-flowered Spear-grass		R	2	2000	Endemic to South Australia and found on the Yorke Peninsula, Kangaroo Island and the Mount Lofty Ranges growing on limestone loams and sandy loams in woodland and grassland (Botanic Gardens of South Australia, 2020b).	**Unlikely.** The Project Area has no limestone soils or woodland and/or grassland habitats.
Austrostipa tenuifolia			R	2	2000	Found on the Eyre Peninsula, Mount Lofty Ranges, the Murray and the upper South-east in South Australia, growing sandy soils in grassland or grassy woodland associated with *Callitris* or *Allocasuarina.* Al so found in Western Australia and Victoria (Botanic Gardens of South Australia, 2020c).	**Unlikely.** The Project Area has no *Callitris* or *Allocasuarina* grassy woodlands.
Caladenia pusilla	Pigmy Caladenia		R	2	2003	Occurs in clumps or small groups in clay or gravel soils in exposed sites in open forest, often in soils which are boggy in winter but bake hard in summer (State Herbarium of South Australia, 2020c)	**Unlikely.** The only seasonally wet areas are at the bottom of gullies. These sites are heavily impacted by weeds and are not suitable habitat for terrestrial orchid species.
Eucalyptus alatissima	Kingsmill's Mallee		R	2	2012	Restricted to the central western of South Australia growing on gravelly red sands and loams between sand dunes, in open mallee (Botanic Gardens of South Australia, 2020d).	**Unlikely.** The Project Area is outside the natural distribution of the species. Recent records likely refer to planted specimens.

Scientific name	Common name	Conservation status		Source of information	Last sighting (year)	Habitat constraints	Likelihood of occurrence within project area
		Aus	SA				
Eucalyptus fasciculosa	Pink Gum		R	2	2019	Grows on soils of poor fertility, such as sandy or rocky areas, and if often associated with *Eucalyptus leucoxylon* in the Mount Lofty Ranges (Nicolle, 1997).	**Unlikely.** No *Eucalyptus fasciculosa* individuals were recorded during the field survey, despite searching the entire Project Area.
Euphrasia collina ssp. osbornii	Osborne's Eyebright	EN	E	1, 2	2008	Generally occurs in mallee scrubland but has also been found growing in sclerophyll forest and sometimes in sclerophyll woodland, heathy openings in wet sclerophyll forest and a swamp at Mount Compass (Department for Environment and Heritage, 2008a).	**Unlikely.** There is no Mallee habitat in the Project Area.
Leptorhynchos elongatus	Lanky Buttons		E	2	2006	Occurs in woodland and grassland on sandy to sandy loam soils (Botanic Gardens of South Australia, 2020e).	**Unlikely.** Soils in the Project Area, excepting sand dunes in Cell 10, are skeletal soils over shallow rock and no woodland habitat occurs.
Maireana decalvans	Black Cotton-bush		E	2	1996	Found on heavy seasonally waterlogged soils (Department for Environment and Heritage, 2008b).	**Unlikely.** No seasonally waterlogged habitats occur in the Project Area except near the mouth of the Field River. This site has no *Maireana* sp. present.
Maireana rohrlachii	Rohrlach's Bluebush		R	2	2006	Grows on slightly saline and/or gypseous, sandy loam soils, often fringing lakes or in seasonally wet areas (Royal Botanic Gardens of Victoria, 2020b).	**Unlikely.** The limited areas of suitable habitat for the species (areas near the lower slopes and base of gullies) were searched for the

Scientific name	Common name	Conservation status		Source of information	Last sighting (year)	Habitat constraints	Likelihood of occurrence within project area
		Aus	SA				
							species. It was not recorded during the survey.
Myoporum parvifolium	Creeping Boobialla		R	2, 3	2019	Coastal cliffs, sand, and brackish mud flats (Prescott, 1991).	**Known.** Recorded during the field survey.
Olearia pannosa ssp. pannosa	Silver Daisy-bush	VU	V	1	No records	Found in mallee and woodland habitats, with an undergrowth typically dominated by Acacia spp., Melaleuca spp., chenopod shrubs and grasses and sedges. (Department for Environment and Heritage, 2008c).	**Unlikely.** There is no suitable woodland or mallee habitat in the Project Area.
Podolepis decipiens			R	2	2020	More arid woodland, mallee and heath (Botanic Gardens of South Australia, 2020f).	**Unlikely.** There is no suitable woodland, mallee or heath habitat in the Project Area.
Podolepis jaceoides	Showy Copper-wire Daisy		R	2	2006	Occurs in grassland, woodland and mallee, typically on soils of higher nutrient status (State Herbarium of South Australia, 2020e).	
Podolepis muelleri	Button Podolepis		V	2	2020	Found mainly in the Flinders Ranges and the Mount Lofty Ranges, growing on coastal cliffs and on stony sites in woodland and grassland further inland (Botanic Gardens of South Australia, 2020g).	**Likely.** Habitat is suitable. The field survey occurred outside of the species flowering season, meaning any plants present may not have been detected.
Prasophyllum pallidum	Pale Leek-orchid	VU	R	1	No records	Grows singly or in small groups on the more fertile soils of woodland and well-grassed open forests. (Department for	**Unlikely.** Coastal shrublands and cliff tops are not suitable habitat for this species.

Scientific name	Common name	Conservation status		Source of information	Last sighting (year)	Habitat constraints	Likelihood of occurrence within project area
		Aus	SA				
						Environment and Heritage, 2008c).	
Prasophyllum pruinosum	Plum Leek-orchid	EN	E	1	No records	Open woodland and grassy forest with *Callitris gracilis*, *Eucalyptus leucoxylon* and *E. fasciculosa.* Occurs in the open or in the shelter of broom-like shrubs in well drained, fertile loams and sandy soils (Department for Environment and Heritage, 2008d).	**Unlikely.** Coastal shrublands and cliff tops are not suitable habitat for this species.
Ptilotus angustifolius	Narrow-leaf Yellow-tails		E	2, 3	2019	Endemic to South Australia and from near Quorn, north-east of Port Augusta, south to Victor Harbor, growing on rocky slopes or hills (Botanic Gardens of South Australia, 2020h).	**Known.** Recorded during the field survey.
Swainsona behriana	Behr's Swainson-pea		V	2	2006	Once found in the Mount Lofty Ranges and the lower South-east, growing on light or occasionally heavy soils in moist grassland and woodland. Now only found in the northern and eastern side of the Mount Lofty Ranges (Botanic Gradens of South Australia, 2020i).	**Unlikely.** The Project Area is outside the known current distribution of the species and no moist grassland or woodland habitats occur.

Conservation status

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). SA: South Australia (*National Parks and Wildlife Act 1972*). Conservation Codes: CE: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare. ssp.: the conservation status applies at the sub-species level. An asterisk denotes ratings that need to be qualified for a variety of reasons, such as changes to taxonomy or nomenclature since listing or because a species assessed as 'presumed extinct' had to be listed under the Endangered category. Further details are available from the Vascular Plant Metadata document on the DEW website.

Source of Information

1. **EPBC Act Protected Matters Report** (Department of Agriculture, Water and the Environment, 2020a) **– 5 km buffer applied to project area.**
2. **Biological Database of South Australia data extract** (Government of South Australia, 2020a) **- 5 km buffer applied to project area.**
3. **Recorded during the field survey.**

Appendix 2. Assessment of likelihood for threatened fauna.

Scientific name	Common name	Conservation status		Source of information	Last sighting (year)	Habitat constraints	Likelihood of occurrence
		Aus	SA				
Apus pacificus	Fork-tailed Swift	Mi		1	No records	The Fork-tailed Swift is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground and probably much higher. In Australia, they mostly occur over inland plains but sometimes above foothills or in coastal areas. They often occur over cliffs and beaches and also over islands and sometimes well out to sea. They also occur over settled areas, including towns, urban areas and cities (Department of Agriculture, Water and the Environment, 2020c).	**Unlikely.** Possible as a fly-over record only. The species is unlikely to utilise any terrestrial habitat in the Project Area.
Actitis hypoleucos	Common Sandpiper	Mi		1	No records	The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats (Department of Agriculture, Water and the Environment, 2020d).	**Possible.** Although not recorded since 1995, limited suitable habitat for the species exists at the mouth of the Field River and adjacent shoreline habitat.
Botaurus poiciloptilus	Australasian Bittern	EN	E	1	No records	Favours permanent freshwater wetlands with tall, dense vegetation, particularly bulrushes (Office of Environment and Heritage, 2020).	**Unlikely.** There is no suitable habitat in the Project Area, nor any recent records.
Calidris canutus	Red Knot	EN	E	1	No records	Mainly inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs.	**Possible.** Although not recorded since 1995, limited suitable habitat for the species exists at the mouth of the Field River and adjacent shoreline habitat.

Scientific name	Common name	Conservation status		Source of information	Last sighting (year)	Habitat constraints	Likelihood of occurrence
		Aus	SA				
						(Department of Agriculture, Water and the Environment, 2020e).	
Calidris ferruginea	Curlew Sandpiper	CR	E	1	No records	Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms (Department of Agriculture, Water and the Environment, 2020f).	**Possible.** Although not recorded since 1995, limited suitable habitat for the species exists at the mouth of the Field River and adjacent shoreline habitat.
Egretta sacra sacra	Pacific Reef Heron		R	2	2011	Rocky shores, exposed reefs, beaches, tidal rivers and mangroves (Pizzey & Knight, 2007).	**Highly likely.** The species has been recorded within the last 10 years. Shoreline habitat at the Field River mouth and at the base of cliffs is suitable for the species.
Falco hypoleucos	Grey Falcon	VU	R	1	No records	Lightly treed inland plains; gibber deserts, sandridges, pastoral lands and timbered watercourses (Pizzey & Knight, 2007).	**Unlikely.** There is no suitable habitat for the species in the Project Area.
Haematopus fuliginosus	Sooty Oystercatcher		R	3		Intertidal rocky reefs, mostly on ocean shores (Pizzey & Knight, 2007).	**Known.** Recorded during the field survey.
Melithreptus gularis	Black-chinned Honeyeater		V	2	2010	Eucalypt woodland with an annual rainfall range of 400-700 mm, particularly associations containing ironbark and box. Favoured habitats incorporate a mixture of mature and regenerating woodland Eucalypts (Department for	**Possible.** Suitable woodland habitat is very limited in the Project Area and restricted to revegetated areas at the Field River.

Scientific name	Common name	Conservation status		Source of information	Last sighting (year)	Habitat constraints	Likelihood of occurrence
		Aus	SA				
						Environment and Heritage, 2008e)	
Myiagra cyanolueca	Satin Flycatcher	Mi	E	1	No records	Heavily vegetated gullies in forests and taller woodlands. Coastal forests and woodlands during migration (Pizzey & Knight, 2007).	**Unlikely.** Suitable habitat does not exist in the Project Area.
Numenius madagascariensis	Eastern Curlew	CE	E	1	No records	Estuaries and tidal mudflats (Pizzey & Knight, 2007).	**Possible.** Although not recorded since 1995, limited suitable habitat for the species exists at the mouth of the Field River and adjacent shoreline habitat.
Pandion haliaetus		Mi	E	1, 2	1998	Littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are mostly found in coastal areas but occasionally travel inland along major rivers (Department of Agriculture, Water and the Environment, 2020f).	**Possible.** Limited suitable habitat occurs and there are recent records within 5 km of the Project Area.
Rostratula australis	Australian Painted Snipe	EN	E	1	No records	Generally, inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire (Department of Agriculture, Water and the Environment, 2020g).	**Unlikely.** There are no suitably vegetated wetlands in the Project Area and no recent records of the species.
Sternula nereis nereis	Australian Fairy Tern	VU	E	1	No records	Nests on sheltered sandy beaches, spits and banks above the high tide line and below vegetation. Roosting habitat	**Possible.** Although not recorded since 1995, limited suitable habitat for

Scientific name	Common name	Conservation status		Source of information	Last sighting (year)	Habitat constraints	Likelihood of occurrence
		Aus	SA				
						includes rocky or sandy beaches (Department of Agriculture, Water and the Environment, 2020h).	the species exists at the mouth of the Field River and adjacent shoreline habitat.
Thinornis cucullatus cucullatus	Hooded Plover	VU	V	1, 2	1997	Weedy rock shelves and reefs, broad ocean beaches and adjacent sand dunes (Pizzey & Knight, 2007).	**Known.** Recorded during the field survey.
Tringa nubularia	Common Greenshank	Mi		1	No records	Mudflats, estuaries, saltmarshes and fresh and saline wetlands (Pizzey & Knight, 2007).	**Possible.** Although not recorded since 1995, limited suitable habitat for the species exists at the mouth of the Field River and adjacent shoreline habitat.
Isoodon obesulus obesulus	Southern Brown Bandicoot	EN	V	1	No records	Inhabit a variety of habitats including heathland, shrubland, sedgeland, heathy open forest and woodland and are usually associated with infertile, sandy and well drained soils. Within these vegetation communities they typically inhabit areas of dense ground cover (Department of Agriculture, Water and the Environment, 2020i).	**Unlikely.** Habitats in the Project Area do not provide the density of cover in the understorey that the species requires, being composed of low open shrubland and grassland.
Pteropus poliocephalus	Grey-headed Flying-fox	VU	R	1, 2	2020	The Grey-headed Flying-fox requires foraging resources and roosting sites. It is a canopy-feeding frugivore and nectarivore, which utilises vegetation communities including rainforests, open forests, closed and open woodlands, *Melaleuca* swamps and *Banksia* woodlands. It also feeds on commercial fruit crops and on introduced tree species	**Likely.** The species is likely to utilise planted and remnant flowering trees in Cell 10 for foraging.

Scientific name	Common name	Conservation status		Source of information	Last sighting (year)	Habitat constraints	Likelihood of occurrence
		Aus	SA				
						in urban areas. (Department of Agriculture, Water and the Environment, 2020j)	
Zanda funerea whiteae	Yellow-tailed Black Cockatoo		V	2, 3	2018	Forests, woodlands and plantations of *Eucalyptus* and exotic conifers (e.g. *Pinus halepensis* and *Pinus radiata*) (Pizzey & Knight, 2007).	**Known.** Recorded during the field survey.

Conservation status

Aus: Australia (Environment Protection and Biodiversity Conservation Act 1999). SA: South Australia (National Parks and Wildlife Act 1972). Conservation Codes: CE: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare. ssp.: the conservation status applies at the sub-species level. Mi: listed as migratory under the EPBC Act. Ma: listed as marine under the EPBC Act.

Source of Information

1. **EPBC Act Protected Matters Report** (Department of Agriculture, Water and the Environment, 2020a) **– 5 km buffer applied to project area.**
2. **Biological Database of South Australia data extract** (Government of South Australia, 2020a) **- 5 km buffer applied to project area.**
3. **Recorded during the field survey.**

Appendix 3. Flora species recorded during the survey.

Scientific Name	Common Name	NPW Act	EPBC Act	WoNS	LSA Act Declared
Acacia cupularis	Cup Wattle				
Acacia paradoxa	Kangaroo Thorn				
Acacia victoriae ssp.	Elegant Wattle				
*Agave sp.**					
Allocasuarina verticillata	Drooping Sheoak				
*Arctotheca calendula**	Cape Weed				
*Asphodelus fistulosus**	Onion Weed				
Atriplex cinerea	Coast Saltbush				
Austrostipa sp.	Spear-grass				
*Avena sp.**	Oat				
*Brassica tournefortii**	Wild Turnip				
Calostemma purpureum	Pink Garland-lily				
*Carrichtera annua**	Ward's Weed				
*Cenchrus setaceus**	Fountain Grass				Y
Chloris truncata	Windmill Grass				
*Chrysanthemoides monilifera ssp. monilifera**	Boneseed			Y	Y
Convolvulus erubescens complex					
Dianella brevicaulis	Short-stem Flax-lily				
Disphyma crassifolium ssp. clavellatum	Round-leaf Pigface				
Dissocarpus biflorus var.	Two-horn Saltbush				
Dodonaea viscosa ssp.	Sticky Hop-bush				
Enchylaena tomentosa var.	Ruby Saltbush				
*Euphorbia peplus**	Petty Spurge				
*Foeniculum vulgare**	Fennel				
Frankenia pauciflora var.	Southern Sea-heath				
*Freesia laxa**					
*Fumaria sp.**	Fumitory				
*Gazania linearis**	Gazania				Y
*Gomphocarpus cancellatus**	Broad-leaf Cotton-bush				
Lawrencia squamata	Thorny Lawrencia				
Lepidosperma sp.	Sword-sedge				
Leucophyta brownii	Coast Cushion Bush				
Leucopogon rufus	Ruddy Beard-heath				
Lomandra effusa	Scented Mat-rush				
Lomandra sp.	Mat-rush				
*Lycium ferocissimum**	African Boxthorn			Y	Y
Maireana enchylaenoides	Wingless Fissure-plant				
*Medicago minima var. minima**	Little Medic				
*Medicago sp.**	Medic				
Melaleuca lanceolata	Dryland Tea-tree				
*Moraea setifolia**	Thread Iris				
Myoporum insulare	Common Boobialla				

Scientific Name	Common Name	NPW Act	EPBC Act	WoNS	LSA Act Declared
Myoporum parvifolium	Creeping Boobialla	R			
Nitraria billardierei	Nitre-bush				
*Olea europaea ssp.**	Olive			Y	
Olearia axillaris	Coast Daisy-bush				
*Osteospermum sp.**					
*Oxalis pes-caprae**	Soursob				
Pimelea micrantha	Silky Riceflower				
Pimelea serpyllifolia ssp. serpyllifolia	Thyme Riceflower				
*Pinus halepensis**	Aleppo Pine				Y
*Polygala myrtifolia**	Myrtle-leaf Milkwort				Y
Ptilotus angustifolius	Narrow-leaved Yellow-tails	R			
*Reichardia tingitana**	False Sowthistle				
Rhagodia parabolica	Mealy Saltbush				
*Rosmarinus officinalis**	Rosemary				
Rytidosperma sp.	Wallaby-grass				
Salsola australis	Buckbush				
*Scabiosa atropurpurea**	Pincushion				
Scaevola crassifolia	Cushion Fanflower				
Sida intricata	Twiggy Sida				
*Sonchus oleraceus**	Common Sow-thistle				
Threlkeldia diffusa	Coast Bonefruit				
Vittadinia cuneata var.	Fuzzy New Holland Daisy				
Vulpia sp.	Fescue				
Zygophyllum aurantiacum/eremaeum	Shrubby Twinleaf				

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). SA: South Australia (*National Parks and Wildlife Act 1972*). Conservation codes: CE: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare. *: Introduced.

Appendix 4. Fauna species recorded during the survey.

Scientific Name	Common Name	NPW Act	EPBC Act
REPTILES			
Tiliqua rugosa	Sleepy Lizard		
BIRDS			
Gavicalis virescens	Singing Honeyeater		
Anthochaera carunculata	Red Wattlebird		
Chroicocephalus novaehollandiae	Silver Gull		
*Columba livia**	Rock Dove		
Corvus mellori	Little Raven		
Egretta novaehollandiae	White-faced Heron		
Falco cenchroides	Nankeen Kestrel		
Gymnorhina tibicen	Australian Magpie		
Haematopus fuliginosus	Sooty Oystercatcher	R	
Larus pacificus	Pacific Gull		
Microcarbo melanoleucos melanoleucos	Little Pied Cormorant		
Ocyphaps lophotes	Crested Pigeon		
*Passer domesticus**	House Sparrow		
Phalacrocorax sulcirostris	Little Black Cormorant		
Phalacrocorax varius	Pied Cormorant		
Phylidonyris novaehollandiae	New Holland Honeyeater		
*Sturnus vulgaris**	Common Starling		
Thalasseus bergii	Crested Tern		
*Turdus merula**	Common Blackbird		
Zanda funerea whiteae	Yellow-tailed Black Cockatoo		V
MAMMALS			
Tursiops truncatus	Common Bottlenose Dolphin		
*Vulpes vulpes**	Red Fox		

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). SA: South Australia (*National Parks and Wildlife Act 1972*). Conservation codes: CE: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare. *: Introduced.

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