

# Whalers Way Orbital Launch Complex

Terrestrial Biodiversity Technical Report



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## Terrestrial Biodiversity Technical Report

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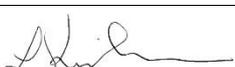
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## Acronyms

Abbreviation	Meaning
AECOM	AECOM Australia Pty Ltd
BAM	Bushland Assessment Method
BDBSA	Biological Databases of South Australia
BOM	Bureau of Meteorology
CCTV	Closed-circuit television
CFS	Country Fire Service
CEMP	Construction Environmental Management Plan
DAWE	Department of Agriculture, Water and Environment (Commonwealth)
Development Act	<i>Development Act 1993 (SA)</i>
DEW	Department for Environment and Water (SA)
DIT	Department for Infrastructure and Transport (SA)
EIS	Environmental Impact Statement
EP	Eyre Peninsula
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)</i>
GPS	Global Positioning System
HA	Heritage Agreement
IBRA	Interim Biogeographic Regionalisation for Australia
LSA Act	<i>Landscape South Australia Act 2019 (SA)</i>
ML	Megalitre
MNES	Matters of National Environmental Significance
NPW Act	<i>National Parks and Wildlife Act 1972 (SA)</i>
NV Act	<i>Native Vegetation Act 1991 (SA)</i>
NVC	Native Vegetation Council
OEMP	Operational Environmental Management Plan
PDI Act 2016	<i>Planning, Development and Infrastructure Act 2016</i>
PMST	Protected Matters Search Tool
SA	South Australia
SARIG	South Australian Resources Information Gateway

Abbreviation	Meaning
SEB	Significant Environmental Benefit
SEDMP	Soil Erosion and Drainage Management Plan
SIG 1.1	Significant Impact Guidelines 1.1 Matters of National Environmental Significance
SPC	State Planning Commission
TEC	Threatened Ecological Community
UBS	Unit Biodiversity Score
WONS	Weed of National Significance
WWOLC	Whalers Way Orbital Launch Complex

## Executive Summary

AECOM Australia Pty Ltd (AECOM) were engaged by Southern Launch.Space Pty Ltd (Southern Launch) to undertake a terrestrial biodiversity assessment for the Whalers Way Orbital Launch Complex (WWOLC) (the Project). Southern Launch intend to establish infrastructure that will support the launch of domestic and international launch vehicles providing the safest and most cost-effective orbital launch site in the world servicing the growing demand for Polar and Sun Synchronous Orbit satellite insertion.

The Project comprises of the following key components, which hereinafter will be referred to as the Project Area:

- Launch Site A;
- Launch Site B, including the construction of a new road alignment to the east and south;
- Infrastructure Site D, including the construction of a new road alignment to the south;
- Range Control Site E;
- Whalers Way Road upgrade; and
- Access track upgrades to the north and west of Infrastructure Site D.

The terrestrial biodiversity assessment initially included a desktop assessment and baseline flora and fauna survey. The outcomes of the baseline survey determined the need for a targeted threatened bird survey and targeted spring flora survey which were subsequently undertaken. The impact assessment considered the results of the terrestrial biodiversity assessment and defined the potential impacts of the Project on terrestrial biodiversity to determine the significance of those impacts associated with the Project. This report presents the results of the field surveys, an assessment of impacts, and the significance of impacts on species of State and Commonwealth conservation significance. The report has addressed the Assessment Guidelines prepared for this Project by the South Australian Department for Infrastructure and Transport (DIT), formerly the Department of Planning, Transport and Infrastructure (DPTI) (DPTI 2020).

### Terrestrial Biodiversity Assessment

Six vegetation associations were described and mapped, including four Low Shrublands and two Mixed Mallee. Vegetation condition was largely moderate to high except at Infrastructure Site D where vegetation condition was lower due to historical degradation.

One flora species, the West Coast Mintbush (*Prostanthera calycina*) protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) was considered likely to occur within the Project Area post the desktop assessment and baseline survey. A further three State listed flora species protected under the South Australian *National Parks and Wildlife Act 1972* (NPW Act) were considered likely to occur within the Project Area post the desktop assessment and baseline survey:

- Alcock's Wattle (*Acacia alcockii*), Rare under the NPW Act;
- Port Lincoln Guinea-flower (*Hibbertia cinerea*), Rare under the NPW Act; and
- Western Daddy-long-legs (*Caladenia bicallata* ssp. *bicallata*), Rare under the NPW Act.

No conservation significant flora or threatened ecological communities (TECs) protected under the EPBC Act or NPW Act were recorded during the field surveys and are considered unlikely to be present.

Six threatened bird species were recorded including four species listed under the EPBC Act:

- Diamond Firetail (*Stagonopleura guttata*), Vulnerable NPW Act;
- Eastern Osprey (*Pandion haliaetus*), Migratory and Marine EPBC Act, Endangered NPW Act;
- Rock Parrot (*Neophema petrophila*), Rare NPW Act;
- Southern Emu-wren (Eyre Peninsula) (*Stipiturus malachurus parimeda*); Vulnerable EPBC Act, Endangered NPW Act;

- Western Whipbird (eastern) (*Psophodes leucogaster leucogaster*), Vulnerable EPBC Act, Endangered NPW Act; and
- White-bellied Sea-Eagle (*Haliaeetus leucogaster*), Marine EPBC Act, Endangered NPW Act.

Three fauna habitats were defined and mapped including Coastal Heath, Shrubland on Scree, and Low Mallee.

### Impact Assessment

For the purposes of the impact assessment a Project Area was defined within which all activities necessary for the purposes of constructing and operating the Project will occur. Project impacts considered planned activities (i.e. construction of launch pads and associated infrastructure, vehicle movement, rocket launches) and unplanned events (i.e. chemicals spills, launch failures) that may occur.

Impacts that have been considered include:

- Clearing of native vegetation;
- Degradation of adjacent vegetation;
- Fauna species injury or mortality;
- Disturbance to breeding and foraging habitat;
- Displacement of species from invasion of weed and pest species;
- Edge effects;
- Habitat fragmentation;
- Barrier effects;
- Dust and light;
- Noise;
- Contamination of surface water (chemical spills); and
- Increased fire risk.

Of these, clearing of native vegetation, noise, and light pollution are likely to lead to impacts to flora and fauna.

For this assessment only species listed under State or Commonwealth legislation have been considered. Significant environmental values that may be impacted are summarised below:

- Clearing 23.76 hectares (ha) of native vegetation which will be offset through a Significant Environment Benefit (SEB) of 1312.94 SEB points, which results in a \$915,078.45 offset plus an administration fee of \$50,329.31. Southern Launch will provide an SEB in the form of an inground offset provided by SEB credit providers within the region; and
- Significant impact to two fauna species listed as threatened under the EPBC Act including the Western Whipbird (eastern) and the Southern Emu-wren (Eyre Peninsula) including habitat loss, fauna mortality from vehicle strike, and indirect impacts that may lead to behavioural changes from noise and light.

Other impacts that were identified but not considered significant include:

- Two abandoned nests for the Eastern Osprey located greater than 2 km from the Project Area where rocket launches are proposed. Construction and operational impacts will be managed accordingly to avoid any impacts to this species therefore no significant residual impact is anticipated;
- Direct and indirect impacts to State listed fauna species including habitat loss, fauna mortality from vehicle strike, and indirect impacts that may lead to behavioural changes from noise and light; and

- Habitat loss of 23.76 ha for State listed fauna species will be managed as part of the SEB offsets package proposed for the Project.

Indirect impacts during construction and operation will be managed through a Construction Environmental Management Plan (CEMP) and Operational Environmental Management Plan (OEMP) which will be developed for the Project.

The mitigation hierarchy as devised by the South Australian Native Vegetation Council (NVC) (NVC 2017) has been applied during the design of the Project. This included reducing the footprint as far as practicable to avoid clearing native vegetation and implementing a CEMP and OEMP to manage indirect impacts. They also include:

- The size of the Project Area has reduced in size from 70.58 ha to 23.76 ha through progressed design considerations;
- Proposed access tracks have been aligned with existing tracks where possible;
- The Project incorporates micro-lift and small-lift rocket vehicles that do not require large areas for infrastructure;
- Areas that will be temporarily cleared for lay-down areas will be rehabilitated in accordance with the CEMP; and
- Mitigation measures outlined in the CEMP and OEMP will include monitoring and contingency actions to ensure that the proposed management measures are effective and fit-for-purpose.

Where impacts to native vegetation, threatened flora and fauna species cannot be avoided by the Project, they will be offset through State and / or Commonwealth requirements.

It is anticipated that the Project will be referred to the Commonwealth Department of Agriculture, Water and Environment (DAWE) under the EPBC Act, and to the NVC under the *SA Native Vegetation Act 1991* (NV Act).

## 1.0 Introduction

### 1.1 Project Overview

AECOM Australia Pty Ltd (AECOM) were engaged by Southern Launch.Space Pty Ltd (Southern Launch) to undertake a terrestrial biodiversity assessment for the Whalers Way Orbital Launch Complex (WWOLC) (the Project). Southern Launch intend to establish infrastructure that will support the launch of domestic and international launch vehicles providing the safest and most cost-effective orbital launch site in the world servicing the growing demand for Polar and Sun Synchronous Orbit satellite insertion.

Southern Launch currently have a number of customers who will be ready to launch from the proposed facility from early 2021. The current development proposal for the Launch Complex is anticipated to be undertaken in five phases across up to four locations on the subject site between 2021 and 2024.

The indicative staging is as follows:

- Stage 1 - A permanent launch pad and permanent launch support infrastructure;
- Stage 2 - A second permanent launch pad and permanent launch support infrastructure;
- Stage 3 - A permanent range operations centre and permanent visitors centre;
- Stage 4 - A permanent engine test stand and test support infrastructure; and
- Stage 5 - Non-conventional launch facilities (not part of the current application).

The Project comprises of the following key components, which hereinafter will be referred to as the Project Area (see Figure 1):

- Launch Site A;
- Launch Site B, including the construction of a new road alignment to the east and south;
- Infrastructure Site D, including the construction of a new road alignment to the south;
- Range Control Site E;
- Whalers Way Road upgrade; and
- Access track upgrades to the north and west of Infrastructure Site D.

For further details of the construction and operation aspects of the Project refer to Section 2.0.

The Project was declared a Major Development under the South Australian *Development Act 1993* (Development Act) by the Minister for Planning on 22 August 2019. As such, a range of environmental assessments are required to support the Major Development Application that Southern Launch is preparing.

### 1.2 Location

The Project Area is located at the southern tip of the Eyre Peninsula in Sleaford, commonly known as Whalers Way (see Figure 1). It is approximately 25 km southwest of Port Lincoln in South Australia (SA), in the District Council of Lower Eyre Peninsula and comprises a portion of the allotment identified in Table 1. The land is owned by Theakstone Property Pty Ltd. Southern Launch have entered into a Commercial Access License ('the License') with Theakstone Property Pty Ltd for specified purposes associated with the Southern Launch Project.

The Project Area has access from Right Whale Road at the north eastern corner of the land. Access to the Project Area from Port Lincoln follows Proper Bay Road, Fishery Bay Road to Right Whale Road before entering the site and continuing via private access track commonly known as Whalers Way Road.

**Table 1 Certificate of Title for the Project Location**

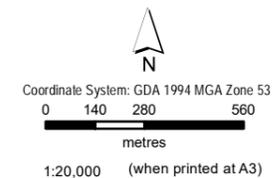
Allotment	Plan	Hundred	Volume	Folio
101	71437	Sleaford	5993	374

### 1.3 Purpose of the Report

The purpose of this report is to:

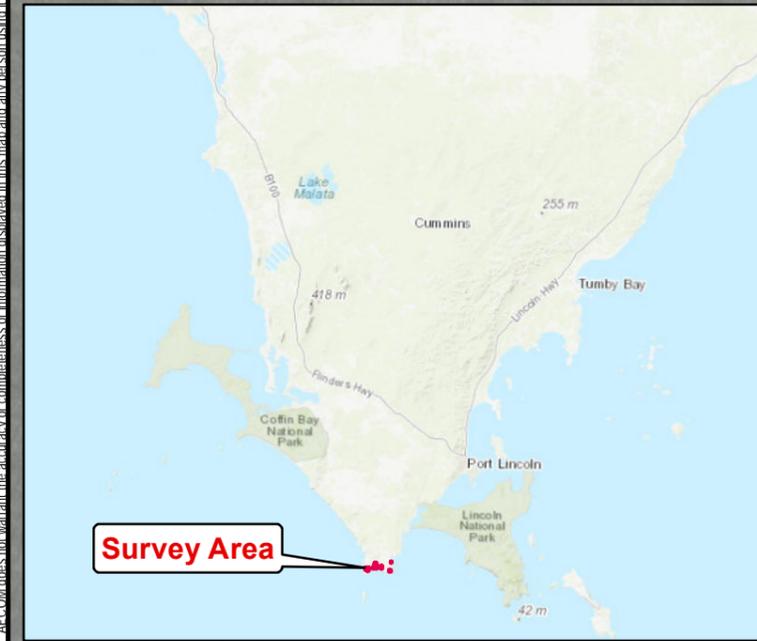
- Present the results of the terrestrial biodiversity assessment;
- Define the potential Project impacts and determine the significance of these impacts on species of conservation significance;
- Assess potential terrestrial biodiversity impacts from the construction and operation of the Project; and
- (where required) Identify feasible and reasonable mitigation measures.

This technical report has been prepared to address DIT's Assessment Guidelines for the Project that are associated with terrestrial biodiversity. The structure and content of the report has been specifically designed to support the Major Development Application and provide sufficient information to satisfy the requirements of Commonwealth and State legislation and be used to inform a Native Vegetation Clearance Application.



**LEGEND**

- Project Area
- Construction Zones



**Project Area**

Southern Launch Whalers Way  
 Flora and Fauna Assessment  
 Whaklers Way, SA

Figure  
**F1**

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## 2.0 Project Components

### 2.1 Construction Phase

The development components of the Project are detailed as follows:

- Change of use of land to introduce an additional use of an aerospace facility in the form of a launch site;
- Construction of buildings and infrastructure, including but not limited to:
  - Assembly Buildings (temporary and permanent);
  - Range Control Facilities;
  - Diesel and / or Hydrogen Fuel Cell Powered Generators;
  - Helicopter Pad(s);
  - Water Tanks;
  - Water Capture and Treatment Systems;
  - Launch Pads;
  - Lightning Rods;
  - Anemometer Towers;
  - Engine Test Stands;
  - Propellant (Liquid, Hybrid and Solid) Storage;
  - Secure Block Houses;
  - Blast Walls;
  - Bunding (for Blast Wave Deflection);
  - Installation of Fibre Optic and Satellite Communication Systems within the Whalers Way Road Upgrade clearance footprint;
  - Installation of High Voltage Power Lines within the Whalers Way Road Upgrade clearance footprint;
- Construction of internal access roads;
- Land division in the form of a lease extending beyond five (5) years;
- Visitor viewing area and interpretative facilities;
- Temporary infrastructure associated with development and construction, including but not limited to:
  - Temporary concrete batching plant;
  - Temporary site and construction offices and facilities;
  - Temporary laydown areas; and
  - Temporary access tracks.

#### 2.1.1 Launch Site A and Launch Site B

The launch facility at Site A is intended to cater for larger conventional launch vehicles of greater than 30 tonnes up to over 100 tonnes. Launch Site A is intended to form Stage 2 of the Project, and is anticipated to be constructed in 2023 or later.

The launch facility at Site B is intended to cater for larger conventional launch vehicles from micro sized (less than 10 tonnes) up to approximately 50 tonnes.

Site B is intended to form Stage 1 of the Project and is anticipated to be constructed as soon as the Project receives relevant regulatory approvals.

Launch Site A and Launch Site B will comprise the following elements:

#### *Assembly Building*

The assembly building will cater for the assembly of the launch vehicles after transport of their components to the site. The building will be approximately 48 m by 24 m with a minimum 7.0 m internal clear height. The building will have internal crane facilities and will allow the design vehicle to enter the building for internal unloading.

The building will have integrated facilities to allow occupation between 20 and 40 staff at peak periods with facilities including toilet and changing facilities, kitchen facilities and offices. The building will be designed to maintain positive pressure for vehicle hygiene purposes.

#### *Roadway between Launch Pad and Assembly Building*

The roadway will be concrete construction with rails to allow for the transport of launch vehicles between the assembly building and the launch pad.

#### *Launch Bunker*

The launch bunker will be a reinforced building which will provide protection to staff in case of explosion or other contingency during the launch process. The building will cater for up to seven staff during launches and will include integrated kitchen and toilet facilities. The building will be designed to be sealed and will feature air filtration systems.

#### *Stormwater*

Site stormwater systems will be based around retaining all stormwater captured on the site footprint. Water will be stored in a lined basin at the downstream end of the site.

Upstream flows will either be captured and retained or intercepted and diverted around the site. Captured stormwater will be utilised in the water deluge system which ameliorates acoustic impacts during the launch. The deluge system will result in significant demand for retained stormwater, through water being converted to steam during the launch process.

#### *Potable Water*

Initially, potable water will be supplied by truck and stored on-site in tanks. As the site is developed, the potable water will be sourced from the stormwater detention basin, treated and then pumped into the tanks. To cater for up to 50 staff on site during peak periods, potable water will be stored in three 25,000 litre water tanks.

#### *Power*

Initially, the site will have a generator to supply all power needs. As the Whalers Way site is developed, it is anticipated that the site will either have access to mains or main on-site power generation with a system including solar and battery storage.

#### *Wastewater*

The proposed use is not anticipated to generate large quantities of wastewater, which will predominantly derive from toilet and kitchen facilities. Site operations, other than the deluge water for the launches, the management of which is addressed separately, will have a low water demand and therefore low generation of wastewater. The site will have a package wastewater treatment system with the capacity to cater for the requirements of 50 people.

#### *Fire*

Initially, water for firefighting needs will be trucked in and stored in the water tanks on site. Once developed, firefighting needs could be taken from the stormwater detention basin.

### *Irrigation*

Areas surrounding the assembly building, launch pad and roadway will be landscaped with grasses and low shrubs and are to be irrigated. Irrigation water will be sourced from the wastewater treatment system and the detention basin. Irrigation is subject to detailed design. An irrigation management plan and water quality monitoring program will be developed to manage this. All irrigation will occur within the Project Area footprints. Irrigated areas are surrounded by gravel areas with a minimum buffer zone of 23 m at one point with most irrigation having a gravel/asphalt buffer zone of greater than 30 m.

### *Detention Basin*

The detention basin at the downstream end of the site is designed to be multifunctional. The basin will capture all stormwater and all launch deluge water. The basin will also store additional irrigation water and surplus firefighting water. The basin will be capable of being automatically refilled from the main dam at Infrastructure Site D, once developed, on a demand basis. Pumping for refilling to be automatic and conducted at night. The basin will be lined with polymer dam lining and will be fenced.

### *Water Deluge System*

Water deluge is required to mitigate two impacts resulting of a launch. Primarily, the water deluge system reduces noise impact by generating water droplets. The water droplets interact with the generated sound waves and convert them to heat energy through the water being turned to steam. The secondary impact is the heat generated by the launch vehicle. The water deluge reduces the heat impact on surrounding concrete and infrastructure.

The design of the water deluge system is to cater for 1000 L/s at 20 m head with the water storage being in a 150,000 litre tank elevated on a 20 m tower. Water is to be pumped into the tower over an eight hour period with delivery by gravity operation.

### *Launch Pad*

The launch pad will be required to cater for significant bending moments as launch vehicles are lifted into position. Launch vehicles may be up to 30 m tall with a mass of 100 tonnes at Launch Site A and 50 tonnes at launch Site B. It is envisaged that the launch pad concrete will be tied into the flame trench concrete to assist in mitigating the bending moments imposed by lifting a launch vehicle into position.

It is envisaged that the launch pad will be approximately 1 m thick (potentially more) and could potentially require piles to counter the bending moment imposed by lifting a launch vehicle into place. Anchor bolts are to be designed and installed to allow for the launch pedestals to be secured in position. Those anchor bolts are to be of an appropriate size and are to be connected into the pad reinforcement to cater for the bending moment imposed by lifting a launch vehicle into place. The launch pad will have removable sections over the flame trench.

### *Removable Launch Pad Sections*

There are to be three concrete platforms which can be craned into and out of position over the flame trench as per the drawing. Each platform is to be appropriately reinforced and supported by 250 mm thick reinforced concrete. Each platform is to be wide enough to fit over the trench and four m long. Each platform is to be securable in position to ensure the launch vehicle thrust does not lift it out of position.

### *Flame Trench*

The flame trench is to be 5 m wide and 35 m long. The trench will have a sump at the low point. Any liquid which remains in the flame trench after a launch needs to be collectable and able to be returned to the detention basin and not enter the environment. All deluge water over the launch pad should naturally flow into the flame trench to ensure capture.

### *Fuel and Oxidiser Bunds*

The fuel and oxidiser bunds are concrete banded areas where the tanks storing the fuels will be located.

### *Flare Stack and Cold Box*

The flare stack will allow for the disposal of surplus fuels by burning off. Surplus oxidisers will be disposed of through disposal into the cold box.

#### *Blast Walls*

Blast walls are to be constructed at the fuel bund, oxidiser bund and launch bunker. Blast walls are a combination of poured in situ reinforced concrete retaining walls fronted with earth bunds.

#### *Pads – Heli, Lidar and Radar*

The launch site will feature a helipad which will be of asphalt construction and will include lighting, windsocks and painting are to be to the appropriate standard. The helipad provides for emergency access to the site and is not intended to cater for routing use.

The lidar and radar pads are to be concrete with access to electricity and communications. These facilities will allow for tracking of the vehicles post launch.

#### *Radio and Other Towers*

A radio tower located adjacent to the launch bunker is to be 30 m high. Two camera towers are to be no less than 15 m high. Lightning Towers will be constructed around the site to protect launch infrastructure and vehicles from electrical storms.

#### *Lighting*

Lighting of the launch facilities will be provided for both security and operational purposes. Area lighting will also be provided from buildings and potentially towers.

#### *Commercial Vehicle Access and Parking*

Roads for commercial vehicles are to be designed to cater for 19 m semi-trailer vehicles. There will be very low vehicle movements in respect of heavy vehicle movements.

Vehicle movement generators for the launch site include:

- Launch Vehicle Fuel delivery (3 per week);
- Oxidiser delivery (3 per week);
- Generator Fuel delivery (1 per week);
- Septic Tank Pump Out (1 per week);
- Launch Vehicle transport to site (1 per week); and
- Crane movements (3 per week).

Two vehicle parking spaces for delivery vehicles, one adjacent to the fuel bund and one adjacent to the oxidiser bund, will be of concrete construction.

#### *Fences and Gates*

A perimeter fence is to be 2000 mm tall wire mesh topped with three strands of barbed wire. Two double gates are required for access control at the perimeter fence. Perimeter fencing will need to fully enclose the detention basin.

1200 mm tall tubular steel edge protection fencing is required around the flame trench. Some of the edge protection fencing is required to be removable to allow the installation of a launch platform.

#### *Site Security*

In addition to the physical security, IP closed-circuit television (CCTV) is to cover the site entrances and throughout the site. All buildings and structures are to be alarmed.

#### *Waste*

All waste is to be contained on-site in appropriate receptacles and trucked off-site by a licensed contractor in accordance with regulatory requirements. Waste types are typical for an office structure and will include kitchen and office waste.

Waste fuels will be burnt off using the flare stack. Waste oxidisers will be disposed of in the cold box. Fuels/Oxidisers/Chemicals which cannot be disposed of in the flare stack or cold box will be trucked off-site by a licensed contractor in accordance with regulatory requirements.

### *Parking*

The staff parking area is to be of asphalt construction to meet the relevant standards in respect of parking dimensions and number of disabled carparks.

### **2.1.2 Infrastructure Site D**

Infrastructure Site D will initially consist of a quarry and workspace to produce engineered pavement materials. That site will be developed over time to include:

- Dam – 30 megalitre capacity;
- Pump Station;
- Electrical Generation or Storage Site;
- Workshop;
- Rocket Storage Building; and
- Rocket Motor Test Station.

Infrastructure Site D is located at the low point of the catchment area for the proposed dam. Surrounding facilities (workshop, pump station etc) need to be designed to ensure all overland flow water from the catchment reaches the dam.

### *Dam*

The location of the proposed dam has been identified to have suitable material for civil construction around the site. Materials recovered will be used on the subject site for bulk fill and road pavements.

The dam will have a capacity of 30 megalitres and installation of the dam will include polymer lining. The dam will be enclosed by a 1800 mm chain mesh fence with three strands of barbed wire. The dam will be bounded by a gravel roadway to allow for vehicle access for maintenance.

### *Pump Station*

The water stored in the dam will be pumped directly to water storage on sites Launch Sites A and B and Range Control Site E.

### *Workshop*

The proposed workshop will be the base for site wide maintenance staff. The workshop will be a shed of approximately 20 m by 15 m with an internal clear height of seven metres. The workshop is a steel portal warehouse type structure on a reinforced concrete slab.

The workshop will contain a single office, toilet, shower, kitchen and meal facilities for staff. The open areas of the shed will feature space to undertake maintenance and repair works which are non-launch vehicle related. The workshop will cater to an estimated staff level of five at the ultimate development of the site.

### *Rocket Storage Building*

The rocket storage building will be used to store small (typically less than three metre length) rockets. The building will be hardened to meet appropriate standards for this type of facility. The building will have firefighting facilities to meet appropriate standards for this type of facility.

The site will be enclosed by a 1800 mm high chain mesh fence topped with three strands of barbed wire and a lockable double gate. The structure will have two (connected) blast walls located adjacent to it.

### *Rocket Motor Test Site*

This facility will allow for the testing of rocket motors in a controlled environment. The facility will include the installation of a 20 m by 20 m concrete pad. Steel frames to support the motors will be

designed and fabricated on a case by case basis by clients and installed on the pad for short periods of time.

### **2.1.3 Range Control Site E**

Range Control Site E is the range control building which will oversee operations on the site. It will also have a visitor information centre and the main operations area for security and emergency services. The building will be positioned close to the entry to the site from Right Whale Road.

The building is to be approximately 25 m by 12 m and will be architecturally designed to enhance the launch experience for visitors. The building will feature bitumen carparking with spaces for staff and visitors, including disabled spaces in accordance with relevant standards. The car parking area will also feature dedicated car parking for emergency services.

The facility will provide integrated office accommodation, toilet facilities and kitchen facilities for up to 40 staff and 20 VIPs/visitors. The VIPs/visitors would be watching the launch.

Roof stormwater will be captured and directed to three 25,000 litre tanks to be utilised as potable water and for firefighting requirements. Swales will direct overland stormwater flows around the site. Suitable water quality treatment and detention will be provided for stormwater from carparking and other hard surface areas.

Wastewater will be treated by a package wastewater treatment system and irrigated onto a dedicated area. Waste will typically be office and kitchen waste which will be stored in appropriate receptacles and removed from site by a licensed contractor.

## **2.2 Operations Phase**

The Project will cater for launches by a variety of customers. The number of launches is anticipated to grow over time, with approximately six launches anticipated in the first year of operations, increasing to a maximum of 36 launches in year five of operations.

The facility has been uniquely designed to enable the launch sites to be used by multiple customers, who will transport their equipment and launch vehicle stages to the site before undertaking final assembly in preparation for the launch. Once the launch is complete, the customer will remove their equipment and vacate the launch site ready for occupation by the next customer.

Typically, a launch cycle will run in the order of 3-5 weeks from occupation to vacation of a launch site, however the exact timeframe will vary based on the nature of the launch vehicle and the specific requirements of an individual launch mission.

Following vacation of a launch site, routine inspections, maintenance and repair will be undertaken.

When a launch site is not occupied, the intensity of activity will typically be very low, particularly in times where no maintenance or repair work is occurring. Accordingly, the intensity of use of the site will vary throughout the course of the year, with times where there is no material activity on-site and only routine security present. At other times, when multiple launch sites are occupied, the level of activity will be more significant with larger numbers of staff on site.

A typical launch timeline is described in the Section 2.2.1. This best describes the ebb and flow of the proposed use of the Project Area.

The vehicles which will be launched from Whalers Way could be solid, hybrid or liquid fuelled. They will range in height from less than 5.0 m to approximately 30 m.

### **2.2.1 Typical Launch Timeline**

The nature and activity associated with each launch will be unique, based on the specific requirements of the mission. However, the process for launches will have a high degree of commonality in activities as the launch site is occupied and preparations for the launch proceed. Furthermore, launches are a highly structured operation requiring input and oversight of numerous Australian State and Commonwealth authorities.

A typical launch will see an increase in the intensity of site operations approximately 21-28 days prior to the launch. The following timeline indicates a typical sequence of activities leading up to and following a launch.

- 4 weeks prior to launch date:
  - Quality Assurance processes are completed at site and the launch site is verified as being suitable for occupation by the customer;
  - Specific notification with and coordination with local stakeholders and regulatory authorities is undertaken.
- 3-4 weeks prior to launch date:
  - Launch vehicle components will arrive in Australia to an off-site reception facility;
  - Customs and import processes will be undertaken, followed by an initial acceptance inspection;
  - It is anticipated that off-site installation of components will occur as required to minimise the amount of assembly (and assembly time) required at the Project Area. It should be noted that proposed concept of multi-use launch infrastructure is a relatively unique concept. Customers want to find the most cost-effective way to launch into space. This includes embracing newer technologies that would minimise the amount of time they spend at a launch site, hence it is anticipated that the initial installation processes for both launch vehicles and payloads will occur offsite. This could occur in Port Lincoln, Adelaide or elsewhere in Australia. The customer will undertake acceptance inspections of the launch site ready for formal occupation.
- 2-3 weeks prior to launch:
  - The customer will occupy the launch site. Once this occurs, the customer will begin to bring equipment to the site. The number of personnel on-site (both customer and Southern Launch personnel) will begin to increase approximately three weeks prior to launch and will continue to increase progressively as the launch approaches.
- 1-2 weeks prior to launch:
  - By this time the customer has occupied the launch site. Depending on the nature of the launch, the launch vehicle will be transported to site between 7-14 days prior to the launch;
  - The launch vehicle will be brought to site in the form of partially assembled stages for mating on-site;
  - As the stages of the launch vehicle are brought to site by truck, they will be transported into the assembly building;
  - During this period, the Southern Launch Range Operations Manager will continue coordination and liaison with local authorities in advance of the launch;
  - The Launch Table is moved into position at the launch pad in preparation for the installation of supporting infrastructure;
  - At this point there will be a further increase in equipment being brought to site, with radio and IT equipment for the management and monitoring of the launch being delivered;
  - In the assembly building, the vehicle assembly continues, with stages being mated and other external and internal components added to the launch vehicle;
  - Externally, systems including fuel, oxidiser, communications and IT are connected to the launch table;
  - There will be a continued increase in the number of staff at the site during this period.
- 7 days prior to launch:
  - Fuels and oxidisers trucked to site and decanted into the on-site storage at the launch pad;

- Vehicle assembly continues and the connection of systems to the launch table also continues.
- 2-7 days prior to launch:
  - At this time, the major assembly of the launch vehicle will be close to complete. This enables one or more 'Dress rehearsals' of launch to be undertaken. These processes will test roll-out, erection and countdown procedures, however, do not involve engine firing although they can involve fuelling the launch vehicle. Typically, after a dress rehearsal is complete, the launch vehicle will be rolled back to the assembly building for storage;
  - Coordination continues with local authorities and external regulatory authorities;
  - There will be a continued increase in staff numbers, with peak staff numbers typically reached at some point during this period.
- 1 day prior to launch:
  - The day prior to launch will be focussed on checking and testing of systems in preparation of the launch. This will include a run through of checks similar to launch day and verification all systems associated with the launch are working;
  - On the day prior to launch the flight readiness review will be undertaken and a go/no-go decision will be made. If a no-go decision is made, a rescheduled launch date may be determined;
  - Relevant liaison with State / Commonwealth agencies to confirm regulatory arrangements in place.
- Day of launch:
  - On the launch day there will be the final roll-out of vehicle to launch pad for launch. The vehicle will be attached to launch table and erected. Umbilicals will be attached to the vehicle and launch system checks begin;
  - 1 hour before launch - Following completion of roll-out procedures, the final preparation of the vehicle for launch will proceed. This will include evacuation of staff from the launch pad to safe areas of the site. Once the evacuation is completed, fuelling of the launch vehicle commences which involves decanting the fuel and oxidiser into the internal tanks for the vehicle. Once fuelling commences, critical countdown commences and final critical system checks undertaken;
  - 30 seconds before lift-off the deluge water system activates;
  - Vehicle engine(s) ignite for lift off. Umbilicals and connections to launch table disconnect and the vehicle commences vertical ascent. The vehicle clears the tower and continues on launch trajectory;
- Post-launch site activities:
  - Following the launch of the vehicle, launch pad systems will be made safe. This will include initial checks, following which fuel, oxidiser and cryogenic lines will be checked and purged;
  - Once the launch pad is made safe a comprehensive set of checks for foreign object damage at the launch pad and surrounding areas will be undertaken;
  - Mission control and range control continue to monitor the launch vehicle until after payload separation, which will typically occur 1-2 hours after launch;
  - Once the launch vehicle payload has separated, systems shutdown procedures begin, and disassembly of the launch pad and other equipment can proceed. This will include the launch table being disconnected and packed away;
  - The customer disassembles and vacates assembly building and launch pad;
  - Once the customer has vacated, acceptance checks are undertaken by Southern Launch;
  - As required, maintenance and repair work undertaken on-site between customers; and

- The launch sequence then starts again for subsequent customers.

### 2.2.2 Suborbital Rockets

Whalers Way will also be used to launch rockets that do not go into orbit around the Earth. These rockets are known as sounding rockets or suborbital rockets. They are used to access altitudes between 50 and 120 km, which are too high for balloons to reach, and too low for satellites. Typical purposes for sounding rocket missions include:

- Atmospheric research;
- Test and qualify space systems; and
- STEM education.

The payloads these rockets are often quite small, weighing in the range of 2 to 20 kg. Their composition would potentially include electronics, metallic structures, optical materials like glass or ceramics, and batteries. These small payloads can be launched to altitudes above 120 km, from which they can descend through the atmosphere.

Because they have small payloads and address specific research questions, many sounding rockets are designed to be low-cost and rapidly deployable. They will generally be smaller than orbital rockets. They may consist of more than one rocket stage. Thrust is mostly provided by solid propulsion but can also be supplied through other propulsion technologies including hybrid and liquid.

Certain developers of orbital launch vehicles use suborbital flights to test stages. If these flights test the first stage of an orbital vehicle, the launch will more closely resemble an orbital launch. If these launches test upper stages, they will generally resemble scientific-type sounding rocket flights, but have engineering payloads instead of experiments. These kinds of launches are not likely to happen more than once or twice during the development of an orbital launch vehicle and as such, will be relatively rare occurrences, happening no more than once per year.

When launched at overland rocket ranges, sounding rocket payloads are normally recovered and reused, with the rocket body being single use and lost during standard operation. Since launches at Whalers Way will be over the water, it will be impractical in many cases to recover the payloads and they would be left to sink in the ocean.

Given the potential complexity of retrieving payloads from the open ocean, sounding rocket launches will be infrequent on the Whalers Way site and will generally be undertaken at Southern Launch's Koonibba site. It is envisaged that there would typically be one or two sounding rocket launches undertaken at Whalers Way per year with a maximum of potentially six per annum. This number is additional to the estimated 36 conventional launches per annum at the Whalers Way site.

The T-Minus Engineering Dart is an early example of the sounding rockets that Southern Launch intends to operate. That vehicle consists of lightweight and powerful booster motor and a smaller dart-shaped payload compartment that separates from the booster and continues substantially further downrange. The dart component is between 900 and 1500mm with a diameter or less than 50mm. The dart will have a total mass, including payload, of between 3 and 5 kg. This component of the rocket will reach speeds of between Mach 5 and 6.

The Booster is approximately 2 to 3 m in length, up to approximately 400 mm diameter with a loaded mass of between 15 and 30 kg. The booster section of the sounding rocket will return to earth between 3 to 8 km downrange. The dart section will return to earth between 40 to 150 km downrange.

### 3.0 Legislative Framework

An overview of the Commonwealth and State legislation that is relevant to environmental aspects of the Project is presented in Table 2.

**Table 2** Legislation Description and Relevance to the Project

Legislation	Description and Project Relevance
<b>Commonwealth</b>	
<i>Environment Protection and Biodiversity Conservation Act 1999</i>	<p>The <i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act) protects Matters of National Environmental Significance (MNES) which includes Ramsar Wetlands, threatened species, threatened ecological communities (TEC) and migratory species.</p> <p>Any significant impacts on MNES require the approval of the Commonwealth Minister for the Environment. This is done through a three-step process: Referral, Assessment and Approval. This technical report will inform the Referral stage of this process.</p> <p>The Commonwealth Department of Agriculture, Water and Environment (DAWE) assesses the information in the Referral and attachments (including this report) and makes recommendations to the Commonwealth Minister for the Environment (or delegate) on whether the project impacts are significant enough to require Assessment and Approval.</p>
<b>South Australia</b>	
<i>Planning, Development Infrastructure Act 2016</i>	<p>The <i>Planning, Development Infrastructure Act 2016</i> (PDI Act) provides for planning and regulates development in the State, to regulate the use and management of land and buildings and the design and construction of buildings. Subject to this Act, no development may be undertaken unless the development is an approved development. A development is an approved development if, and only if, a relevant authority has assessed the development against, and granted consent in respect of the provisions of an appropriate Development Plan. The PDI Act establishes a new planning and development scheme to replace the current scheme operating under the <i>Development Act 1993</i></p>
<i>Landscape South Australia Act 2019</i>	<p>Under the <i>Landscape South Australia Act 2019</i> (LSA Act) landholders have a legal responsibility to manage declared pest plants and animals and prevent land and water degradation. Under the LSA Act there is eight new regional Landscape SA boards (LSA boards), responsible for administering the LSA Act.</p>
<i>National Parks and Wildlife Act 1972</i>	<p>Native plants and animals in SA are protected under the <i>National Parks and Wildlife Act 1972</i> (NPW Act). It is an offence to take a native plant or protected animal without approval. Threatened plant and animal species are listed in Schedules 7 (Endangered species), 8 (Vulnerable species) and 9 (Rare species) of the NPW Act.</p> <p>Persons must not:</p> <ul style="list-style-type: none"> <li>• Take a native plant on a reserve, wilderness protection area, wilderness protection zone, land reserved for public purposes, a forest reserve or any other Crown land;</li> <li>• Take a native plant of a prescribed species on private land;</li> <li>• Take a native plant on private land without the consent of the owner (such plants may also be covered by the <i>Native Vegetation Act 1991</i> (NV Act));</li> <li>• Take a protected animal or the eggs of a protected animal without approval;</li> <li>• Keep protected animals unless authorised to do so; and</li> <li>• Use poison to kill a protected animal without approval.</li> </ul>

Legislation	Description and Project Relevance
<p><i>Native Vegetation Act 1991</i></p>	<p>Native vegetation in SA is protected under the NV Act and <i>Native Vegetation Regulations 2017</i>. Any proposed clearance of native vegetation in SA (unless exempt under the <i>Native Vegetation Regulations 2017</i>) is to be assessed against the NV Act Principles of Clearance and requires approval from the Native Vegetation Council (NVC).</p> <p>The Project is considered to fall under Part 3, Division 5, Regulation 12 &amp; 13 Major Developments and Projects.</p> <p>The requirements a proponent must undertake for the clearance of native vegetation for Major Developments and Projects include:</p> <ul style="list-style-type: none"> <li>• Notification or application to NVC: In accordance with the PDI Act, the NVC is provided an Environmental Impact Statement (EIS), Public Environment Report or development report for comment;</li> <li>• Assessment: The NVC will assess the clearance against whether there are any other alternatives that involve no clearance, less clearance or clearance of vegetation that is less significant (or has been degraded to a greater extent than the vegetation proposed to be cleared);</li> <li>• Approval: Clearance can occur if development consent is granted under the <i>Development Act</i> and the provision of a Significant Environmental Benefit (SEB) (on-ground or payment) is approved by the NVC; and</li> <li>• SEB: Required as per SEB approval (or payment into the Native Vegetation Fund).</li> </ul>

## 4.0 Methodology

The scope included a terrestrial biodiversity assessment and impact assessment, described below.

### 4.1 Terrestrial Biodiversity Assessment

The terrestrial biodiversity assessment included a desktop assessment, baseline field survey, targeted field survey, data processing and a reporting component.

#### 4.1.1 Desktop Assessment

A detailed desktop assessment was conducted to inform the baseline field survey, describe the existing environment and determine the potential environmental values present within the Project Area. The desktop assessment considered the following resources:

- The EPBC Act Protected Matters Search Tool (PMST) administered by DAWE was searched for an area encompassing an additional 10 km buffer on the Project Area (DAWE 2020a);
- The Department for Environment and Water (DEW) Biological Databases of SA (BDBSA) via NatureMaps was used to identify flora and fauna records and vegetation mapping (DEW 2020a);
- Aerial imagery;
- SA Resources Information Gateway (SARIG, 2020); and
- Eyre Peninsula fauna surveys 2004 and 2009 as published on NatureMaps (DEW 2020b) and in Brandle (2010).

Additional reports including site specific background documents and previous investigation reports were utilised as appropriate including:

- Bird Report 1982-1999 (Carpenter et al. 2003);
- Western Whipbird National Recovery Plan (DELWP 2016);
- Approved Conservation Advice for West Coast Mintbush (DEWHA 2008);
- Approved Conservation Advice for Southern Emu-wren (Eyre Peninsula) (DotE 2013a);
- Species Profile and Threats Database for Australian Fairy Tern, Mallee Whipbird, Southern Emu-wren, Eastern Osprey (DAWE 2020);
- Approved Conservation Advice for Fairy Tern (DSEWPC 2011);
- Distribution and status of the Osprey in South Australia (Dennis, T.E. 2007a);
- Behavioural Ecology of the Southern Emu-wren (Maguire G. S. 2005);
- The Western Whipbird on Eyre Peninsula (McNamara, D. 1966);
- Status Review and Action Plan for the Southern Emu-wren (Eyre Peninsula) (Pickett M, 2002);
- Status and Distribution of the Southern Emu-wren (Eyre Peninsula) at the Proposed Cathedral Rocks Windfarm Site (Pickett, M. 2003);
- Recovery Planning for the Southern Emu-wren (Eyre Peninsula) - 2004 Survey (Pickett, M. 2004a);
- Draft Recovery Plan for the Southern Emu-wren (Eyre Peninsula) - 2005 – 2009 (Pickett, M. 2004b);
- Southern Emu-wren (Eyre Peninsula) and Western Whipbird Monitoring at the Cathedral Rocks Wind Farm Heritage Agreement Area - Spring 2004 (Pickett, M. 2004c);
- Southern Emu-wren (Eyre Peninsula) and Western Whipbird Monitoring at the Cathedral Rocks Wind Farm Heritage Agreement Area - Spring 2005 (Pickett, M. 2005);

- Habitat Management Guidelines for the Southern Emu-wren (Eyre Peninsula). Port Lincoln, South Australia (Pickett M, 2006);
- Eyre Peninsula Coastal Action Plan and Conservation Priority Study, Volume 1, Eyre Peninsula NRM Board and Department of Environment and Natural Resources, Adelaide (Caton, B., Detmar, S., Fotheringham, D., Laurence, S., Quinn, J., Royal, M., Rubbo, N. and Sandercock, R. 2011);
- The status of the Osprey (*Pandion haliaetus cristatus*) in Australia. Journal of Raptor Research 48: 408-414 (Dennis, T. E. and Clancy, G. P. 2014);
- A review of Osprey distribution and population stability in South Australia. South Australian Ornithologist 43, 38–54 (Detmar, S. A. and Dennis, T. E. 2018);
- The status of the White-bellied Sea-Eagle and Osprey on Kangaroo Island in 2005. South Australian Ornithologist 35, 47–51. December 2006 (Dennis TE and Baxter CI 2006);
- The White-bellied Sea-Eagle as a key indicator species by which to measure the health and stability of coastal biodiversity in South Australia. Prepared for KINRMB 2014, updated 2015 (Dennis TE, Detmar S and Patterson C 2015);
- Distribution and status of White-bellied Seaeagle, *Haliaeetus leucogaster*, and Eastern Osprey, *Pandion cristatus*, populations in South Australia. The Journal of The South Australian Ornithological Association Inc. V37 (Part 1) (Dennis TE, Detmar SA, Brooks AV and Dennis HM 2011a);
- Phases and Duration of the White-bellied Sea-Eagle *Haliaeetus leucogaster* breeding season in South Australia and the implications for habitat management. Corella 36:63-68 (Dennis TE, Fitzpatrick GJ and Brittain RW (2012);
- Effects of human disturbance on productivity of White-bellied Sea-Eagles (*Haliaeetus leucogaster*). Emu 111:179-185 (Dennis TE, McIntosh RR final inspection and Shaughnessy PD 2011b);
- A review of Osprey distribution and population stability in South Australia. South Australian Ornithologist 43 (1-2) (Detmar, S. A. and Dennis, T. E. 2018);
- A review of White-bellied Sea-Eagle distribution and population stability over time in South Australia. South Australian Ornithologist Pp.55-71 (Dennis T.E. and Detmar, S.A., 2018); and
- Detailed assessment of potential impacts to Eastern Osprey and White-bellied Sea-eagle at Whalers Way (Jacobs 2020).

A likelihood of occurrence assessment was completed for all threatened species and communities that were identified in the desktop assessment. The existing environment of Whalers Way and the Project Area was used to determine the likelihood of occurrence.

The likelihood assessment considers the presence of suitable habitat, number of records, date of records, and proximity of known records to Whalers Way. Four categories are used for the assessment, including:

- **Unlikely:** No preferred/suitable habitat present. Species unlikely to be present on the site at any time or during any season. No records of species/community in Project Area;
- **Possible:** Potentially suitable habitat present lacking condition, specific floristics, or complexity data. Species may visit or fly over however habitat is unlikely to be considered critical to the survival of the species. No recent records of species/community in Project Area;
- **Likely:** Suitable habitat is present. One or more recent records of species/community; and
- **Known:** Species known to be present, confirmed records and suitable habitat is present.

The likelihood of assessment was undertaken initially at the desktop assessment stage of the Project and then updated post the baseline surveys and targeted flora and fauna surveys. Refer to Appendix

D for likelihood of occurrence assessment for threatened flora species and Appendix E for likelihood of occurrence assessment for threatened fauna species.

#### 4.1.2 Field Survey

A baseline field survey was undertaken between 16 - 19 March 2020 by a NVC Accredited ecologist.

##### 4.1.2.1 Flora and Vegetation

A vegetation survey was undertaken in accordance with the NVC Bushland Assessment Method (BAM) 2019 (Native Vegetation Council, 2019). The NVC BAM was designed for assessing vegetation that is located within the agricultural region of SA. The BAM uses biodiversity 'surrogates' or 'indicators' to measure biodiversity value against benchmark communities. Each area to be assessed is termed an application area (Launch Site), within which different vegetation associations (Sites) are identified.

Three components of the biodiversity value of the site are measured and scored (Table 3) including vegetation condition, conservation value and landscape context. These three component scores are combined to provide a Unit Biodiversity Score (UBS) for a hectare (ha) which can be multiplied by the size of the Site (ha) to provide a Total Biodiversity Score for the Site.

The Project Area was traversed on foot and a flora species inventory was recorded.

**Table 3 Components Measured to Determine the Biodiversity Value of a Site**

Parameter	Factors
Vegetation condition	<ul style="list-style-type: none"> <li>Vegetation utilisation (i.e. level of grazing);</li> <li>Biotic (i.e. presence of litter mats and palatable shrubs under canopies) and physical disturbance (i.e. bare scalds, tracks and other soil disturbance);</li> <li>Vegetation stratum; and</li> <li>Introduced plant species cover (i.e. weed cover).</li> </ul>
Conservation value	<ul style="list-style-type: none"> <li>The presence of Commonwealth or State listed threatened ecological communities, and their conservation rating;</li> <li>Number of threatened plant species recorded at the site, and their conservation rating; and</li> <li>Number of threatened fauna species for potential habitat occurs within the site, and their conservation rating.</li> </ul>
Landscape context	<ul style="list-style-type: none"> <li>Number of landform features in the Project Area;</li> <li>Size of the Project Area;</li> <li>Percentage (%) of vegetation protected within the Interim Biogeographic Regionalisation for Australia (IBRA) sub-region; and</li> <li>Presence of a wetland, watercourse or lake.</li> </ul>
Mean annual rainfall	<ul style="list-style-type: none"> <li>The mean annual rainfall for the assessment area.</li> </ul>
Area of clearance	<ul style="list-style-type: none"> <li>The area of native vegetation (ha) to be cleared for the Project.</li> </ul>

Targeted searches were conducted for threatened flora species that were considered likely to occur in the Project Area. A ramble survey method was adopted (i.e. randomly walking through areas of vegetation attempting to cover different topography and habitats) to ensure best coverage of the Project Area.

Where threatened flora species were identified, the following was recorded:

- Location using a handheld Global Positioning System (GPS) unit (accuracy 5m);
- Population extent;
- Vegetation association; and
- Additional habitat observations where relevant.

#### 4.1.2.2 Fauna and Fauna Habitat

Fauna habitats were assessed for specific habitat components including consideration of structural diversity and refuge opportunities for fauna, in order to determine the potential for these habitats to support threatened species. The survey focussed on searching for habitat that would be utilised by threatened species identified in the desktop assessment as having the potential to occur in the area.

Fauna habitat assessments were undertaken at sample point locations throughout the Project Area that were considered the best representative of the area where qualitative aspects such as canopy coverage, surface strew, litter, understorey density etc were recorded. The fauna habitat assessments included:

- Location;
- General habitat description;
- Habitat condition and disturbance types;
- Dominant/characteristic flora species and vegetation layers;
- Presence and abundance of key habitat features such as large mature trees, small and large hollows, fallen logs, coarse and fine litter, decorticated bark, bare ground, grass, stones and boulders, rock crevices, soil cracks, vines, dense shrubs, water bodies etc.;
- Presence of fauna and secondary signs (e.g. scats, digging, tracks, burrows, egg shell, bones, feathers etc); and
- Connectivity of habitat.

Fauna observations focussed on avian species, using distinctive calls and direct observation. All observations were made between daylight hours of 0700 and 1700.

## 4.2 Targeted Fauna Bird Survey

Targeted fauna surveys were commissioned following the baseline survey to determine the presence and extent of particular threatened fauna species utilising the native vegetation at Whalers Way. Two fauna species of conservation significance including the Southern Emu-wren (Eyre Peninsula) (*Stipiturus malachurus parimeda*) and Western Whipbird (eastern) (*Psophodes leucogaster leucogaster*) were subject to additional targeted field surveys between 22 - 24 June 2020.

Methods utilised to conduct field surveys were informed by relevant available information for the two species including:

- Species Profiles and Threats database information (DAWE 2020b);
- Approved Conservation Advice for *Stipiturus malachurus parimeda* (Southern Emu-wren - Eyre Peninsula) (DotE 2013a);
- Survey Guidelines for Australia's Threatened Birds: Guidelines for detecting birds listed as threatened under the EPBC Act (DEWHA 2010); and
- Behavioural Ecology of the Southern Emu-wren (*Stipiturus malachurus*) (Maguire 2015).

The Southern Emu-wren (Eyre Peninsula) assessment was undertaken as a broadscale assessment, covering an area of approximately 350 ha over 3 days (DEWHA 2010). This meant that the overall assessment was comprised of targeting known records and then searching within key habitat types where previous observations have not been made to fill gaps in distribution. Areas within habitats without known records but within infrastructure footprints were also checked for observations.

All previous records within the Whalers Way area were from 2002 -2008. No new records since that period have been made nor any known records lodged with DEW confirmed since then.

The methodology involved walking through the preferred habitat and listening for calls or physical signs of the species. If a call was heard or brief sightings, judicious use of call playback applications were used to confirm the sighting. A hand held GPS unit was used to record the location within 10 m and the number and sex of individuals was recorded where possible.

Western Whipbird (eastern) are incredibly difficult to observe by sight but have a highly unique and unmistakable call. According to the Guidelines for detecting birds listed as threatened under the EPBC Act (DEWHA 2010), they are described as timid, elusive and cryptic, occupies dense habitat and more often heard than seen. Distinctive song is usually the only indication of presence. Detection by this method is determined as the best method for this species. Five previous records in the Whalers Way area from 2004 were also recorded by call. This species was recorded frequently during baseline ecological assessments. Due to the inability in many cases to get within close range, very flexible spatial accuracy on observations is required at 0-100 m (DEWHA 2010).

### 4.3 Targeted Flora Survey

A targeted flora spring survey was commissioned following the baseline survey to determine the presence and extent of EPBC Act and NPW Act listed flora species utilising the Project Area at Whalers Way. A desktop assessment was undertaken for the individual infrastructure locations with a 20 km buffer applied. The Baseline assessment undertook a standard 10 km buffer which is typically suitable to garner a cross section of species within the local area. The location and shape of the Whalers Way area means that buffers of 10 km have 75% of the area within a marine environment and not covering a wide range of terrestrial habitat types. An updated desktop assessment using a 20 km buffer enables a more thorough baseline in determining the extent of possible species utilising this habitat which can then further guide a targeted assessment.

The targeted flora spring survey was undertaken by NVC Accredited ecologists between 13 - 15 October 2020.

The Project Area was assessed as a grid search with an approximately 10 m intervals giving a 5 m each side of the transect search. The desktop assessment guided the targeted survey with species that were considered likely to occur given highest order of priority with other additional herbaceous annual species not previously recorded added to flora species lists for the bushland assessments.

Access tracks were assessed with one surveyor covering each side as an up and back method with approximately 10 m covered off on each side. The Whalers Way Road was assessed from a vehicle driven at walking pace along each side of the road.

Additional sites were assessed whereby areas of highest habitat preference were examined to determine if any threatened species were present within Whalers Way but potentially not within the Project area footprints. This was largely undertaken as cliff top surveys, swales with richer soil types, or areas of poorly represented vegetation communities such as *Melaleuca* ephemeral swales immediately north of the Project Area.

Following the baseline surveys, and based on existing records and presence of habitat within the Project areas, four threatened flora species protected under the either the EPBC Act or NPW Act were considered as likely occurring within the Project Area and a further seven flora species protected under the either the EPBC Act or NPW Act were considered possible to occur within the Project Area. These species were targeted during the targeted spring flora survey (Refer to Section 6.1.2 for details of species).

### 4.4 Impact Assessment

The impact assessment takes into consideration the Project Area and the immediate surrounds of the defined Project Area, which includes the Whalers Way Peninsula to ensure all indirect impacts were considered.

The Project impacts considered planned activities (e.g. construction of launch pads and associated infrastructure, vehicle movement, rocket launches) and unplanned events (e.g. chemicals spills, launch failures) that may occur during construction and operation. These were used to inform the assessment against the EPBC Act *Significant Impact Guidelines 1.1 Matters of National Environmental Significance* (DEWHA 2013) (SIG 1.1) and the terrestrial biodiversity elements of the Assessment Guidelines (DPTI 2020).

The impact assessment considered impacts on flora and fauna species protected under Commonwealth EPBC Act and the SA NPW Act.

The impact assessment considers all ecological values that occur in the Project Area. Values are discussed in terms of their listing status, existing knowledge and the potential for Project interaction.

The assessment of impacts on species considered the following relevant documents and guidelines:

- Conservation Advice for West Coast Mintbush (*Prostanthera calycina*) (DEWHA 2008);
- Species Profiles and Threats database information (DAWE 2020b);
- Conservation Advice for *Stipiturus malachurus parimeda* (Southern Emu-wren - Eyre Peninsula) (DotE 2013a);
- Conservation Advice for Fairy Tern (*Sternula nereis nereis*) (DSEWPAC 2011); and
- Behavioural Ecology of the Southern Emu-wren (*Stipiturus malachurus*) (Maguire 2015).

#### 4.4.1 Assessment of Matters of National Environmental Significance

Section 7.2 provides an assessment against the SIG 1.1. The Project has the potential to have a significant impact on MNES values of Threatened species and Migratory species. The environmental values of the Project as they relate to the EPBC Act were determined through a review of the EPBC PMST (DAWE 2020a), the baseline and targeted surveys, and known and available scientific information on relevant EPBC Act listed species in relation to their habitat needs and requirements.

The assessment of significance of the impact was determined by considering SIG 1.1 which states:

*'A 'significant impact' is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment, which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts.'*

The likelihood of the Project resulting in a significant impact is assessed as:

- Unlikely;
- Potential; or
- Likely.

#### 4.4.2 Major Development Assessment

The Project was declared a Major Development by the South Australian Minister for Planning on 22 August 2019. The Application was referred to the independent statutory authority State Planning Commission (SPC). The SCP considered the application and identified the key social, environmental and economic issues relevant to the assessment of the proposed development and determined that it would be assessed as an EIS. Assessment Guidelines have been provided that must be addressed in the EIS in order for SCP to conduct their formal assessment.

This report has provided an assessment against the terrestrial biodiversity guidelines focussing on ecological values including:

- Native vegetation;
- Terrestrial flora and fauna species and habitats; and
- Introduced weeds, pathogens and pests.

## 4.5 Limitations

### 4.5.1 Ecological Surveys

The compiled list of fauna observations does not represent all species expected to occur within the Project Area. Being an opportunistic only survey, the likelihood of detection of many species is largely reduced with many species active for small periods of the day or nocturnal, limiting the ability to assess their occurrence. Despite this, habitat assessment through vegetation association mapping combined with historical records allows for reasonable determination of the likelihood of presence of threatened species.

The survey results present a snapshot in time of current conditions. Fauna species that have been recorded previously at Whalers Way (identified in the desktop assessment) were also recognised as occurring in the Project Area.

The targeted survey for Southern Emu-wren (Eyre Peninsula) and Western Whipbird (eastern) was conducted in winter. Spring is considered the ideal survey time for maximising presence of these two species as both species nesting and breeding season is from spring through summer.

Marine species have been included in the desktop assessment however the report did not include an assessment of these species or impacts on these. A detailed assessment for marine species has been captured in the Marine Biodiversity Technical Report.

#### **4.5.2 Impact Assessment**

This report and assessment have been prepared under the Assessment Guidelines and approval pathway detailed in the current *Development Act*. As the Project was declared a Major Project pursuant to Section 46 of the *Development Act*, the assessment will continue under the *Development Act*, notwithstanding of the implementation of the *Planning, Development and Infrastructure Act 2016* and the Planning and Design Code for the subject site on 31 July 2020.

Species listed as Marine under the EPBC Act were not assessed as part of this assessment.

Species that had a moderate or low likelihood of occurrence in the terrestrial biodiversity assessment were not included in the impact assessment.

The assessment of significance is informed by publicly available information. Gaps in knowledge may influence the outcome of the significance assessment.

Where critical habitat for a species is not specified, the DEWHA (2013) SIG 1.1 were used which defines critical habitat as areas that are necessary:

- For activities such as foraging, breeding, roosting, or dispersal;
- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators); and
- To maintain genetic diversity and long term evolutionary development, or for the reintroduction of populations or recovery of the species or ecological community.

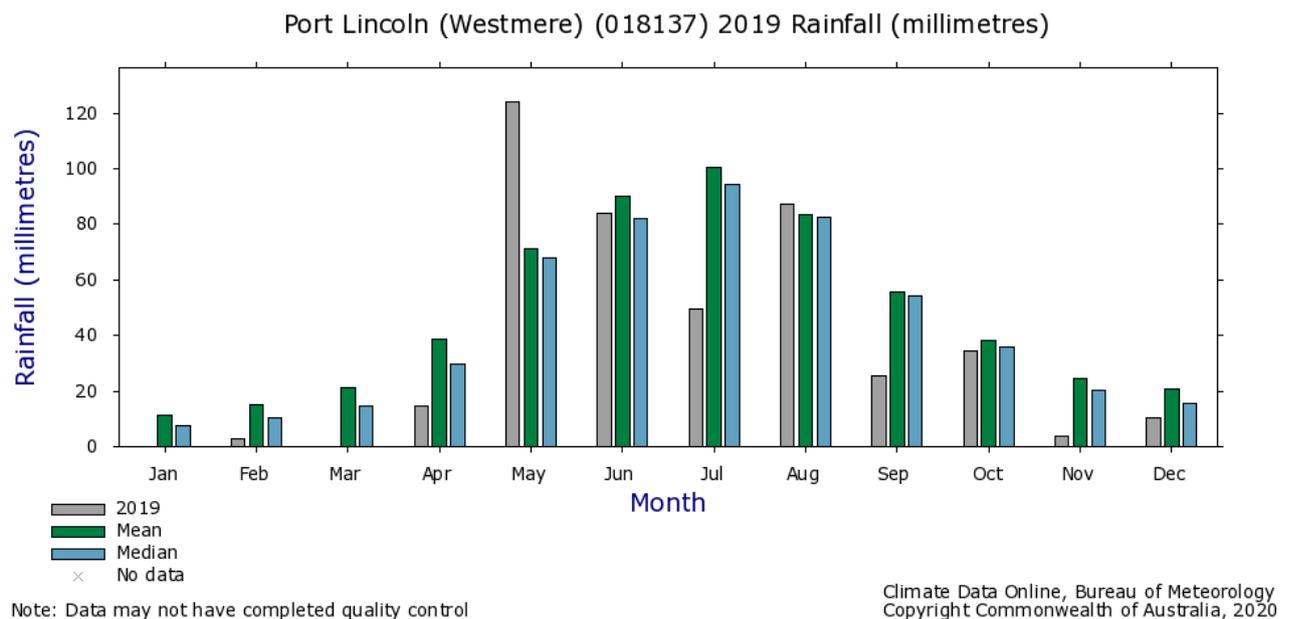
## 5.0 Existing Conditions

### 5.1 Climate

Climate at Whalers Way is classified as Csb under the Koppen and Geiger system. This depicts it as warm-summer Mediterranean Climate temperature of warmest month greater than or equal to 10 °C, and temperature of coldest month less than 18 °C but greater than –3 °C, precipitation in driest month of summer half of the year is less than 30 mm and less than one-third of the wettest month of the winter half, temperature of each of four warmest months 10 °C or above but warmest month less than 22 °C.

Temperature and rainfall data were obtained from Bureau of Meteorology (BOM) (2020) online database from weather stations North Shields (Port Lincoln AWS) and Port Lincoln (Westmere) respectively. Temperature data shows colder maximum monthly temperatures in 2019 by 1.2 °C to 3 °C. Daily minimum temperatures were relatively similar to the average mean minimum temperatures.

Rainfall in the months preceding the survey was often below average. Mean annual rainfall is 575.3 mm, with 2019 experiencing a dry year of only 436.2 mm of rain. The effects of the changing climate on flora, vegetation and fauna species remains unknown. The field survey was conducted after a dry spell of eight months (Figure 2). This may cause a reduction in presence of annual species and suitable identification material.



**Figure 2** Rainfall Data (Port Lincoln Westmere Station 018137) (BOM, 2020)

### 5.2 Conservation Reserves and Marine Parks

There are no national recreation and conservation parks or regional reserves protected under the NPW Act within the Project Area. The following conservation reserves are located within the vicinity of the Project Area:

- Thorny Passage Marine Park located approximately 500 m south of the Project Area;
- Sleaford Mere Conservation Park located approximately 8 km northeast of the Project Area;
- Lincoln National Park located approximately 8 km northeast of the Project Area (which Includes Liguanea Island, within 7 km south of the Project Area); and
- Lincoln Conservation Park located approximately 13 km north of the Project Area.

### 5.3 Native Vegetation Heritage Agreement

A Heritage Agreement covering the Project Area was established under the former *SA Heritage Act 1978* (now replaced by the *Heritage Places Act 1993*) of Portion, registered as dealing number 6456268 listed on the Certificate of Title for the purposes of a Native Vegetation Heritage Agreement HA 148. The Agreement is now protected under the NV Act. Under the above agreement the land (being the land subject to the agreement as depicted on the 'Plan for Heritage Agreement') is dedicated to the conservation of native vegetation and native fauna.

The Native Vegetation Heritage Agreement HA 148 will require amendment in order to facilitate the Project.

### 5.4 Noise

Unattended background noise monitoring was undertaken at five locations between Tuesday 17<sup>th</sup> March and Friday 19<sup>th</sup> March 2020. Monitoring equipment was installed during the baseline flora and fauna survey. Each monitoring location was described in terms of the vegetation present in the area as outlined in Table 4. Notes included in this table provide an indication of the typical noise environment of each monitoring location.

**Table 4 Measurement Locations and Site Descriptions**

Site ID	Site Description	Environment Notes	Measured Noise Level, dB			
			Day (L <sub>A90</sub> )	Night (L <sub>A90</sub> )	Day (L <sub>Aeq</sub> )	Night (L <sub>Aeq</sub> )
1	<i>Eucalyptus angulosa</i> , low mixed Mallee	Low Mallee, average height approximately 1.5m tall. Some leaf rustle noise. No sea noise noted.	24	32	42	37
2	<i>Eucalyptus angulosa</i> , low mixed Mallee	Noise logger placed in semi open area where breaks in dense bush. No sea noise noted.	23	30	38	33
3	<i>Eucalyptus diversifolia</i> , mixed low Mallee	Noise logger placed in semi open area where breaks in dense bush, quite large areas of low heath breaks within patches. No sea noise noted.	23	26	39	30
4	Degraded <i>leucopogon parvifolius</i> , Open shrubland	Noise logger located approximately 300 metres away from windmill. No sea noise notes.	27	35	46	41
5	<i>Beyeria lechenaultia</i> , very low shrubland	Gentle sea noise audible at western end. Very low levels of shrub noise, with very low shrubland average height of 0.5m.	24	30	51	48

Key observations from the existing conditions noise monitoring include:

- Overall, background noise levels in the study area were low. This is typical of rural and remote areas with low residential density and little to no exposure to transportation or industrial noise.
- The night-time background noise levels are greater than the day-time background noise levels at all locations. Reasons for this have not been established, however, it is possible for this to be caused by insects or birds.

It is expected that the noise environment across the study area would be similar to those measured at the five monitoring locations. The local acoustic environment being predominantly influenced by weather-induced noise, such as wind interaction with nearby vegetation and wildlife.

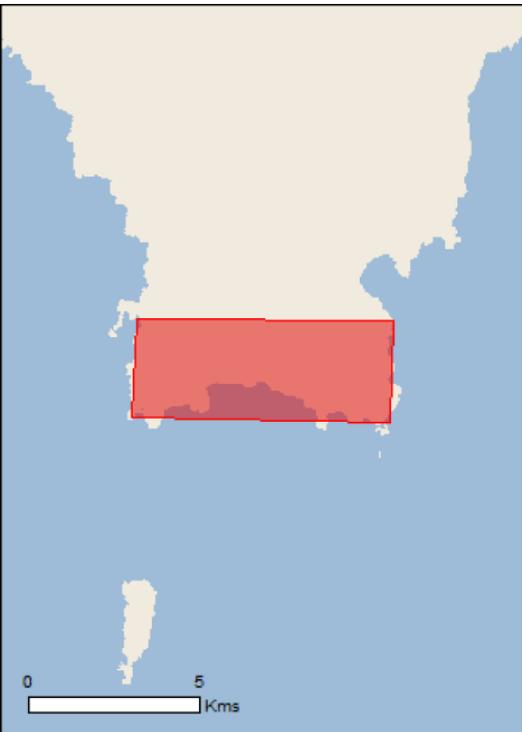
## 6.0 Terrestrial Biodiversity Assessment

### 6.1 Desktop Assessment

#### 6.1.1 Protected Matters Search Tool

The EPBC PMST identified 44 threatened species and 45 migratory species listed under the EPBC Act as potentially occurring or suitable habitat potentially occur within 10 km of the Project Area (refer to Table 5). Listed marine dependent species (i.e. turtles, sea-lions, fish, whales, other cetaceans) are included in Table 5 however are not discussed further at this stage. The PMST report is provided in Appendix C.

**Table 5 EPBC Protected Matters Search Tool Results Summary**

Search Area (10 km buffer)	MNES Listed under the EPBC Act	Results
	World heritage properties	None
	National heritage properties	None
	Wetlands of international importance	None
	Great Barrier Reef marine park	None
	Commonwealth marine area	1
	Threatened ecological communities	None
	Threatened species	44
	Migratory species	45
	Commonwealth land	None
	Commonwealth heritage places	None
	Listed marine species	78
	Whales and other cetaceans	14
	Critical habitats	None
	Commonwealth reserves terrestrial	None
	Commonwealth reserves marine	None
	State and Territory reserves	6
	Regional forest agreements	None
	Invasive species	21
	Nationally important wetlands	1
Key ecological features (marine)	2	

#### 6.1.2 Threatened Flora

The initial desktop assessment (PMST and BDBSA) identified 11 threatened flora species that may occur within 10 km of the Project Area. Post the baseline survey a desktop assessment of a 20 km buffer was applied to enable a more thorough baseline in determining the extent of possible threatened flora species utilising habitat within the region. The desktop assessment has identified 33 species of Commonwealth of State conservation including:

- Five species listed under the EPBC Act; and
- 28 species listed under the NPW Act.

Of these, four threatened flora species are considered likely to occur within the Project Area:

- Alcock's Wattle (*Acacia alcockii*), Rare under the NPW Act;
- Port Lincoln Guinea-flower (*Hibbertia cinerea*), Rare under the NPW Act;
- Western Daddy-long-legs (*Caladenia bicalliata* ssp. *bicalliata*), Rare under the NPW Act; and
- West Coast Mintbush (*Prostanthera calycina*), Vulnerable under both the EPBC Act and NPW Act

An additional seven threatened flora species are considered possible to occur within the Project Area:

- Annual Candles (*Stackhousia annua*), Vulnerable under both the EPBC Act and NPW Act;
- Eyre Peninsula Fringe-lily (*Thysanotus wangariensis*), Rare under the NPW Act;
- Hidden Leek-orchid (*Prasophyllum occultans*), Rare under the NPW Act;
- Leafless Globe-pea (*Sphaerolobium minus*), Rare under the NPW Act;
- Limestone Leek-orchid (*Prasophyllum calcicole*), Vulnerable under the NPW Act;
- Scaly Poa (*Poa fax*), Rare under the NPW Act; and
- Snowdrop Spurge (*Phyllanthus calycinus*), Rare under the NPW Act.

Lists of all flora species recorded or predicted to occur are provided in Appendix D and includes their conservation status, habitat descriptions and likelihood assessment. Those species assessed as having an unlikely occurrence in the Project Area are not considered further in this assessment.

### 6.1.3 Threatened Fauna

The desktop assessment (PMST and BDBSA) identified 112 threatened fauna species that may occur within 10 km of the Project Area. This included 71 bird species, 36 fish species, 23 mammal species, and three reptile species listed as:

- Nine species listed as threatened under the EPBC Act;
- 25 species are listed as threatened and Migratory and/or Marine under the EPBC Act;
- 67 species are listed as Migratory and/or Marine under the EPBC Act; and
- 11 species are listed under the NPW Act.

Of these, the following threatened fauna species are known to occur, likely to occur or possible to occur within 10 km of the Project Area:

- Australian Bustard (*Ardeotis australis*), Vulnerable under the NPW Act, known occurrence;
- Australian Fairy Tern (*Sternula nereis nereis*), Vulnerable under the EPBC Act and NPW Act, likely occurrence;
- Bar-tailed Godwit (*Limosa lapponica baueri*), Vulnerable under the EPBC Act, possible occurrence;
- Black-faced Cormorant (*Phalacrocorax fuscescens*), Marine under the EPBC Act, possible occurrence;
- Black Falcon (*Falco subniger*), Rare under the NPW Act, known occurrence;
- Cape Barren Goose (*Cereopsis novaehollandiae*) (NC), Rare under the NPW Act, known occurrence;
- Common Greenshank (*Tringa nebularia*), Migratory and/or Marine under the EPBC Act, likely occurrence;
- Diamond Firetail (*Stagonoleura guttata*), Vulnerable under the NPW Act, known occurrence;
- Eastern Osprey (*Pandion haliaetus*); Migratory and/or Marine under the EPBC Act and Endangered under the NPW Act, known occurrence;
- Elegant Parrot (*Neophema elegans*), Rare under the NPW Act, known occurrence;

- Hooded Plover (*Thinornis rubricollis rubricollis*), Vulnerable and Marine under the EPBC Act and Vulnerable under the NPW Act, likely occurrence;
- Northern Siberian Bar-tailed Godwit (*Limosa lapponica menzbieri*), Critically Endangered under the EPBC Act, possible occurrence;
- Pacific Gull (*Larus pacificus*), Marine under the EPBC Act, possible occurrence;
- Painted Buttonquail (*Turnix varius*), Rare under the NPW Act, likely occurrence;
- Peregrine Falcon (*Falco peregrinus*), Rare under the NPW Act, known occurrence;
- Purple-gaped Honeyeater (*Lichenostomus cratitius occidentalis*), Rare under the NPW Act, known occurrence;
- Rock Parrot (*Neophema petrophila*), Rare under the NPW Act, known occurrence;
- Sanderling (*Calidris alba*), Migratory under the EPBC Act, possible occurrence;
- Short-tailed Shearwater (*Ardenna tenuirostris*), Migratory and/or Marine under the EPBC Act, possible occurrence;
- Sooty Oystercatcher (*Haematopus fuliginosus*), Rare under the NPW Act, known occurrence;
- Southern Emu-wren (Eyre Peninsula), Vulnerable under the EPBC Act and Endangered under the NPW Act, known occurrence;
- Western Whipbird (eastern), Vulnerable under the EPBC Act and Endangered under the NPW Act, known occurrence; and
- White-bellied Sea-Eagle (*Haliaeetus leucogaster*), Marine under the EPBC Act and Endangered under the NPW Act, known occurrence; and
- Yellow-tailed Black Cockatoo (*Zanda (Calyptorhynchus) funerea whiteae*), Vulnerable under the NPW Act, likely occurrence.

A list of threatened fauna species identified during the desktop assessment is provided in Appendix E. Those species that are considered unlikely likelihood of occurrence are not considered further in this assessment.

## 6.2 Vegetation

### 6.2.1 Threatened Ecological Communities

No TECs are known or considered likely to occur at Whalers Way. The closest TEC is the Eyre Peninsula Blue Gum (*Eucalyptus petiolaris*) Woodland, listed as Endangered under the EPBC Act. This community occurs approximately 30 km north of the Project Area.

### 6.2.2 Vegetation Associations

The Project Area covers 23.76 ha of native vegetation. Vegetation community composition at Whalers Way (i.e. the Project Area and surrounds) was transitional dependent on two major factors; exposure to salt laden winds, and soil type and depth. The elevation of the area ranged from 50 to 120 m above sea level.

Soil types within this area ranged from bare sheet limestone to moderately mobile sand dunes. Between these extremes, the large part of the area was highly alkaline decomposed limestone and light grey loams. Some lower elevation areas within these were grey silty loams that retained water for short periods evidenced by heavier vegetation and the presence of bog tolerant species such as Creeping brooklime (*Samolus repens*) and Stonecrop (*Crassula* sp.).

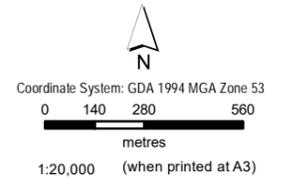
Six vegetation associations were observed within the Project Area (Table 6; Appendix F). Vegetation gradually transitions from one association to another, effectively causing a mosaic landscape lacking distinct changes in vegetation. The six associations are all considered typical of coastal communities that occur along the southern Eyre Peninsula.

Table 6. Vegetation Associations Mapped within the Project Area

Number	Association Name	Association Description	Representative Photo
1	Pale Turpentine Bush ( <i>Beyeria lechenaultii</i> ) Dryland Tea-tree ( <i>Melaleuca lanceolata</i> ) Low Shrubland over sclerophyllous shrubs	<p>Primarily dominant on the near cliff zone where stable dune habitats were present intertwined with exposed sheet limestone which was generally devoid of vegetation or contained only sparse sclerophyllous shrubs. Cover within Association 1 was generally high with the most diverse floristic community observed across the area with a mix of primarily coast front species co-habiting with other taller shrubs which were persisting in the hollows resulting in a mixed community. This association had the highest visual incidence of small skinks and dragons observed opportunistically.</p> <p>Low bird species richness was present with the windy conditions meaning many species were retreating to lower or more dense cover during the day.</p>	
2	Prickly Ground Berry ( <i>Acrotriche patula</i> ) Very Low Open Shrubland	<p>Occupies exposed and/or elevated sections of clifftop where a lack of soil, high alkalinity and salt laden winds result in specific niche communities dominated by ground hugging shrubs and mat plants. The average overstorey height in these areas is less than 300 mm in most instances.</p>	

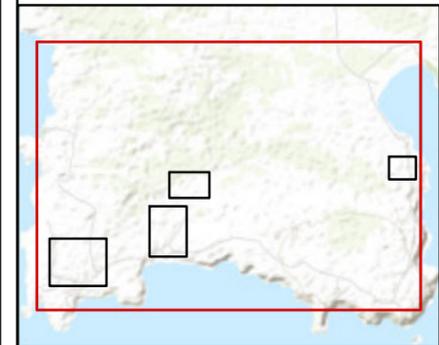
Number	Association Name	Association Description	Representative Photo
3	Coastal White Mallee ( <i>Eucalyptus diversifolia</i> ) Low Mixed Mallee over sclerophyllous shrubs	Recorded on stable dunes where grey sandy loams overlay sheet limestone. These were often transitional between the low coastal shrublands of the clifftop edges and the higher elevation calcareous clay loam soils. Association 3 occurs in patches, varying from circular 'hummocks' to linear lunettes further from the coast. The interpatch spaces were generally sheet limestone occupied by Association 1. With distance from the coastline, the community structure changed by way of a more continuous and taller stratum with average heights of 3.5 m and a denser canopy cover.	
4	Ridge Fruited Mallee ( <i>Eucalyptus angulosa</i> ) +/- Coastal White Mallee ( <i>Eucalyptus rugosa</i> ) Low Mixed Mallee	Present where soils were largely a calcareous silty loam. The soil surface was highly stable and formed a thick crust with high levels of biocrust and Moss species. <i>Melaleuca</i> species were a common species in this Association compared to those on lighter soils with Coastal White Mallee. Inter-patches were dominated largely by Association 6 (limestone <i>Callitris</i> sp.). In areas where the community was protected from high coastal winds the strata were taller, with an average of 3 m compared to 2 m near the coast.	

Number	Association Name	Association Description	Representative Photo
5	Coastal Bearded Heath ( <i>Leucopogon parviflorus</i> ) Low Very Open Shrubland over exotic annual grasses	Disturbed regenerating association with pioneer species such as Coast Bitter Bush ( <i>Adriana quadripartita</i> ) present that were otherwise absent from the intact sections of the Project site. Numerous environmental weed species were present throughout the area and grass species were overwhelmingly annual exotic species such as Brome ( <i>Bromus</i> ), Fescue ( <i>Vulpia</i> ) and Wild Oat ( <i>Avena</i> ). Overall, the condition was very poor and regeneration of local species was patchy.	
6	Native Pine ( <i>Callitris</i> sp. 'Limestone') Low Shrubland	Dominated by <i>Callitris</i> sp. 'Limestone' mixed with other sclerophyllous shrubs. It occurred exclusively with Association 4 on calcareous silty loam soils. Condition of these communities was generally good with the only perennial exotic species present Sea Lavender ( <i>Limonium companyonis</i> ) which increased with proximity to the coast.	



**LEGEND**

- Project Area
- Construction Zones
- New track
- Existing track to be maintained
- Track to widened
- 1. *Beyeria lechnaultii* (Pale Turpentine Bush) Shrubland over sclerophyllous shrubs
- 2. *Acrotriche patula* (Prickly Ground Berry) Very Low Open Shrubland
- 3. *Eucalyptus diversifolia* (Coastal White Mallee) Low Mixed Mallee over sclerophyllous shrubs
- 4. *Eucalyptus angulosa* (Ridge Fruited Mallee) +/- *Eucalyptus rugosa* (Coastal White Mallee) Low Mixed Mallee
- 5. *Leucopogon parviflorus* (Coastal Bearded Heath) Low Very Open Shrubland over exotic annual grasses
- 6. *Callitris canescens* (Native Pine) Low Shrubland

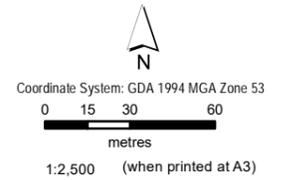


**Vegetation Associations within the Project Area Survey Area**

Southern Launch Whalers Way  
 Flora and Fauna Assessment  
 Whaklers Way, SA

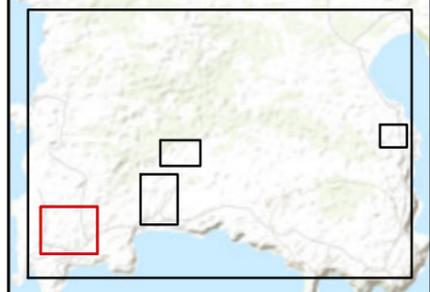
Figure  
**F3a**

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**LEGEND**

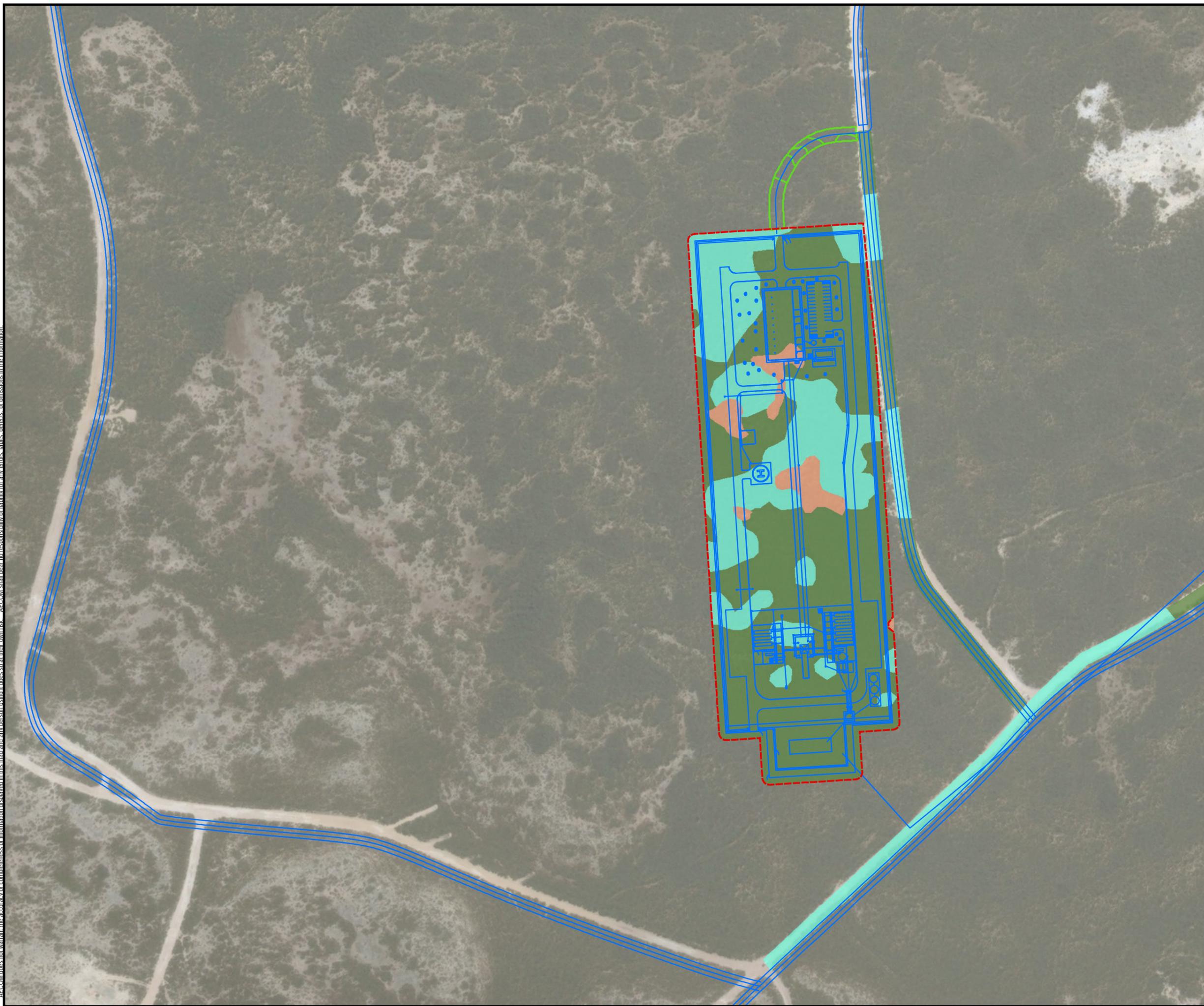
- Project Area
- Construction Zones
- New track
- 1. *Beyeria lechnaultii* (Pale Turpentine Bush)  
 *Melaleuca lanceolata* (Dryland Teatree) Low Shrubland over sclerophyllous shrubs
- 2. *Acrotriche patula* (Prickly Ground Berry)  
 Very Low Open Shrubland
- 3. *Eucalyptus diversifolia* (Coastal White Mallee) Low Mixed Mallee over sclerophyllous shrubs



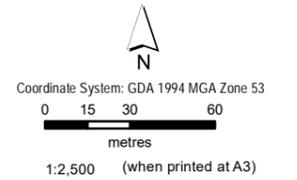
**Vegetation Associations within the Project Area  
 Lauch Site A**

Southern Launch Whalers Way  
 Flora and Fauna Assessment  
 Whaklers Way, SA

**Figure  
 F3b**

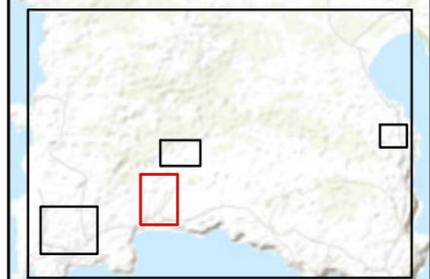


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**LEGEND**

- Project
- Construction Zones
- New track
- 1. *Beyeria lechnaultii* (Pale Turpentine Bush)
- Melaleuca lanceolata* (Dryland Teatree) Low Shrubland over sclerophyllous shrubs
- 2. *Acrotriche patula* (Prickly Ground Berry) Very Low Open Shrubland
- 3. *Eucalyptus diversifolia* (Coastal White Mallee) Low Mixed Mallee over sclerophyllous shrubs
- 6. *Callitris canescens* (Native Pine) Low Shrubland

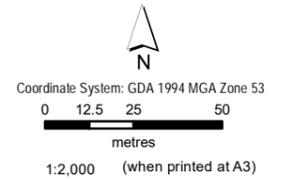


**Vegetation Associations within the Project Area  
 Launch Site B**

Southern Launch Whalers Way  
 Flora and Fauna Assessment  
 Whaklers Way, SA

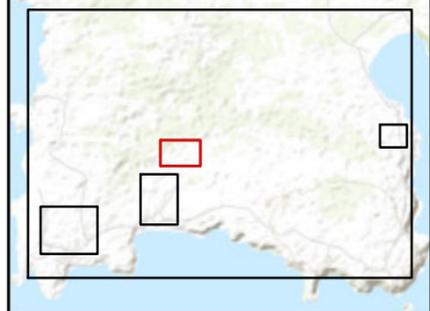
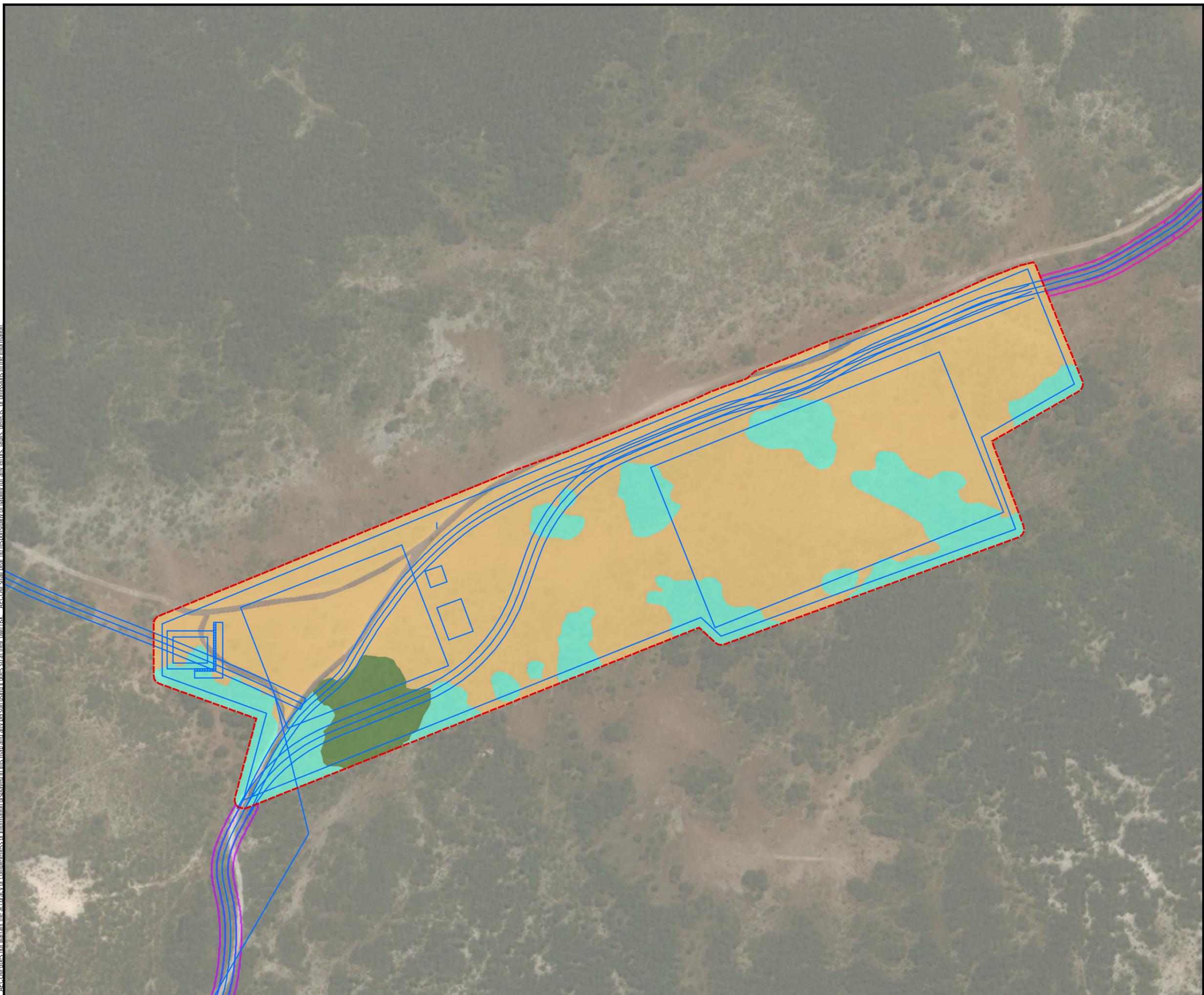
Figure  
**F3c**

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**LEGEND**

- Project Area
- Construction Zones
- Existing track to be maintained
- Track to widened
- 1. *Beyeria lechnaultii* (Pale Turpentine Bush)
- 2. *Melaleuca lanceolata* (Dryland Teatree) Low Shrubland over sclerophyllous shrubs
- 3. *Eucalyptus diversifolia* (Coastal White Mallee) Low Mixed Mallee over sclerophyllous shrubs
- 4. *Leucopogon parviflorus* (Coastal Bearded Heath) Low Very Open Shrubland over exotic annual grasses

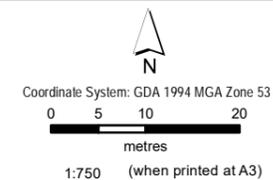


**Vegetation Associations within the Project Area Infrastructure Site D**

Southern Launch Whalers Way  
 Flora and Fauna Assessment  
 Whaklers Way, SA

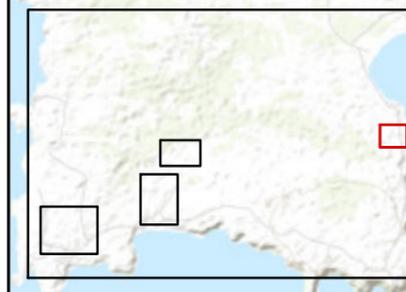
Figure  
**F3d**

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**LEGEND**

- Project Area
- Construction Zones
- 4. *Eucalyptus angulosa* (Ridge Fruited Mallee) +/- *Eucalyptus rugosa* (Coastal White Mallee) Low Mixed Mallee



**Vegetation Associations within the Project Area  
 Range Control Site E**

Southern Launch Whalers Way

Flora and Fauna Assessment

Whaklers Way, SA

Figure  
**F3e**

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The extent of the vegetation associations within the Project Area is presented in Table 7.

**Table 7 Proposed Vegetation Clearance Footprint**

Veg Assoc	Project Area							Total (ha)
	Site A	Site B	Site D	Site E	Access B-D	Access Roads	Whalers Way Access Road	
1	3.34	0.58	0.29		0.1		0.63	<b>4.94</b>
2	0.23					0.11	0.4	<b>0.74</b>
3	1.54	4.06	1.41		0.62	0.22	0.51	<b>8.36</b>
4				0.75			0.45	<b>1.2</b>
5			4.92					<b>4.92</b>
6		0.4					3.2	<b>3.6</b>
<b>Total</b>	<b>5.11</b>	<b>5.04</b>	<b>6.62</b>	<b>0.75</b>	<b>0.72</b>	<b>0.33</b>	<b>5.19</b>	<b>23.76</b>

### 6.2.3 Vegetation Condition

The BAM assessment scores showed that Launch Site A (BAM Site A1) had the highest condition score of 74.53 and Launch Site A had the highest average score of 67.09. The lowest condition score was at Infrastructure Site D (D5) which had a score of 30.66. The condition score results from the BAM assessments is presented in Figure 4.

The scores are largely influenced by partial clearing, weed invasion and species richness.

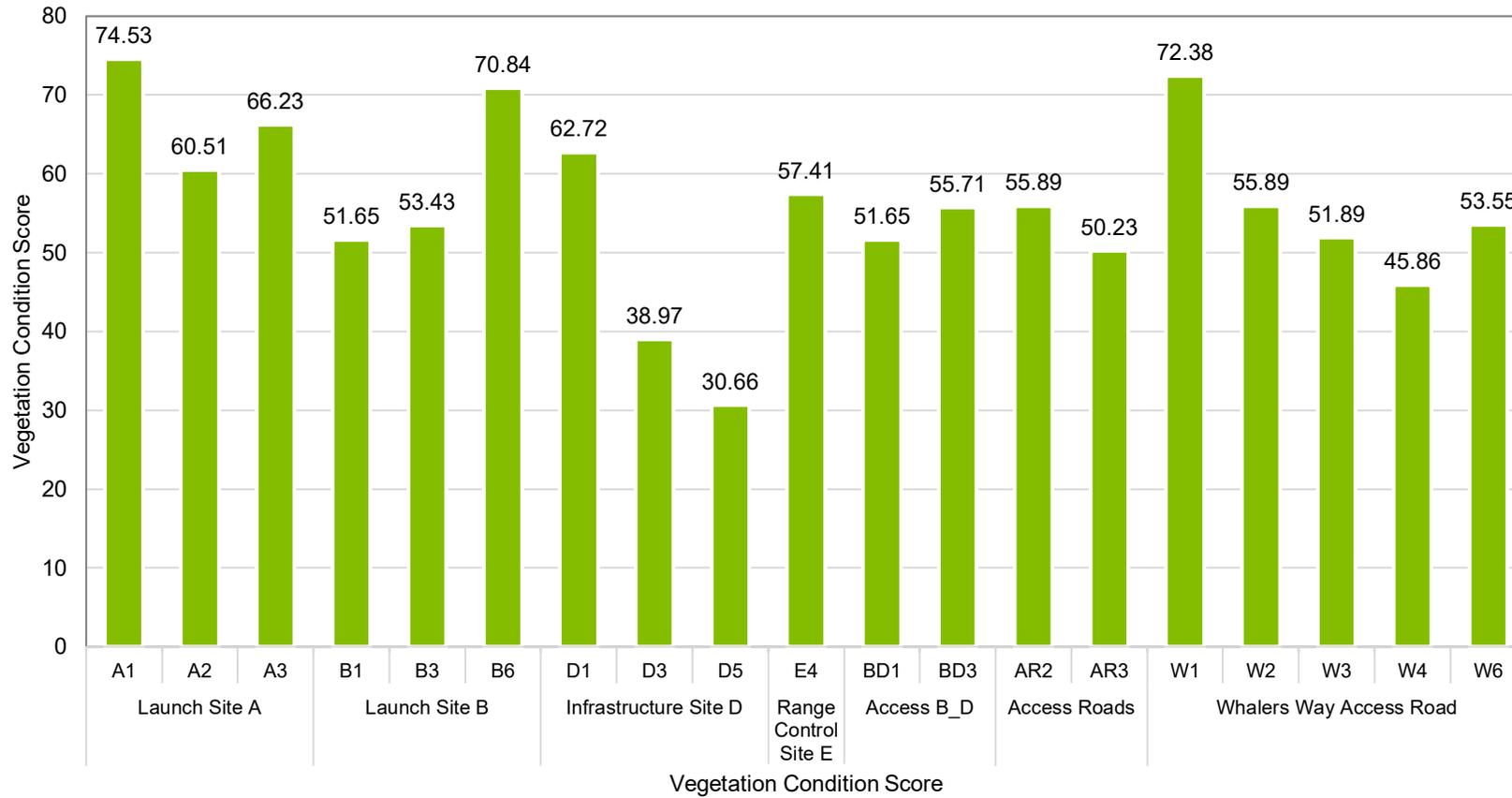


Figure 4 Vegetation Condition Scores

## 6.3 Flora

### 6.3.1 Threatened Flora Species

Following detailed assessments of the Project Area, road and access tracks and opportunistic searches, no threatened flora species listed under the EPBC Act or NPW Act were observed within the Project Area or within the general Whalers Way region.

The nature of the Project Area and the proximity to the coast result in the landscape being particularly harsh and requiring high salt load and high saline tolerant soils. This leaves a very narrow pH band for nutritional requirements meaning species present are highly specialised.

The flora species detailed below are tolerant of these conditions, however looking over historical records show that the large majority of records are located on the eastern side of the peninsula. These areas are likely to have a far lower salt spray load and potentially lower wind velocity. The cliffs of the Whalers area potentially increase the wind velocity at the tops of the cliffs meaning these areas are subject to far harsher conditions than other surrounding areas.

While the vegetation is largely intact and of good condition, the diversity of flora species generally is low comparatively with other areas of intact vegetation on the Eyre Peninsula. The numbers of threatened species for an area of largely intact vegetation is surprisingly low, which if compared to an area such as the Koppio Hills, 40 km north of the Project Area, would likely return three times the number.

There is a low likelihood of threatened flora species being located within the Project Area. A baseline survey and a targeted flora survey across the Whalers Way general area and Project Area over two seasons, including walking the entire Whalers coastal band during targeted Southern Emu Wren surveys did not identify any threatened flora species.

Refer to Appendix B for full details of the targeted flora survey.

#### 6.3.1.1 Commonwealth Listed Species

One species, the West Coast Mintbush was considered likely to occur in the desktop assessment.

##### West Coast Mintbush

West Coast Mintbush occurs with *Eucalyptus diversifolia* and there are several historical records near the Project Area. Vegetation Associations 3 and 4 represent suitable habitat for this species. The plant is small and may be overlooked when not in flower, which are a prominent red colour. An intense targeted search for this species returned no individuals. During the targeted survey *Prostanthera serpyllifolia* was recorded along coast fringe in similar preferred habitat. The West Coast Mintbush likely of occurrence post targeted survey was reduced to unlikely.

One species, the Annual Candles was considered possible to occur in the desktop assessment.

##### Annual Candles

Annual Candles are an annual herb, which may be confused with perennial *Stackhousia aspericocca*. The perennial species of *Stackhousia* was recorded within both *Eucalyptus angulosa* and *E. diversifolia* communities on numerous occasions during the targeted survey however no presence of the annual threatened species were observed. The Annual Candles likely of occurrence post targeted survey was reduced to unlikely.

#### 6.3.1.2 State Listed Species

Three states listed flora species were considered likely to occur in the desktop assessment.

##### Alcocks Wattle

Alcocks Wattle grows in sand over limestone in Mallee communities. There are known records in the vicinity within Port Lincoln National Park and Cathedral Rocks, and habitat was present in the Project Area.

This species is a common component of mallee communities, particularly on the southern side of Port Lincoln where the shallow limestone outcrops associated with *Eucalyptus socialis* and *Eucalyptus*

*conglobata* occur however there are numerous records on the south eastern corner of the Lincoln National Park and further west of the Whalers Way area. The record located within Whalers Way near Groper Bay is thought to be incorrect coordinates with two other associated records; (*Eucalyptus gillanii* and *Xanthorrhoea semiplana ssp. tatei*) not being present and the record description does not match the location. This species was not recorded during the targeted survey. This species is more likely north of the Project Area and remains likely to occur within the Whalers Way Heritage Agreement but unlikely within the Project Area.

#### **Port Lincoln Guinea-flower**

Decumbent habit with cane-like branches that scramble into other vegetation. Can be up to 2m high. Grows usually on sandy soil often with limestone outcrops in more or less coastal scrub to low mallee vegetation on the southern point of Eyre Peninsula. Conservation status: Although restricted in its distribution Port Lincoln Guinea-flower is locally common and conserved in Lincoln National Park. Record within Whalers Way associated with few other records which appear to be wrong coordinates.

This species was targeted heavily during the targeted flora survey, primarily due to Hibbertia species being flowering prolifically during the survey period. Consistently looking for morphological characteristics of this species as well as regular flower checks and stamen counts, no individuals of this species were observed within any project footprints or road areas. Other records in the regional area are associated with *Gahnia* sedgelands and away from the exposed coast so potentially unlikely within Whalers Way and not present within Project Area.

#### **Western Daddy-long-legs**

Occurs singly or in small clumps in calcareous sands or in leaf litter on limestone and chiefly coastal. Recorded from Fishery Bay to Cape Jervis on light brown sand growing near *Leucopogon parviflorus*, *Caladenia latifolia* and *Asparagus asparagoides*.

Flowers from August to September. Only a few records on lower Eyre Peninsula with one within 20 km. The habitat description and locations of other records suggests that this species may be present somewhere in the wider Whalers Way area however no *Caladenia* of any species were observed during the targeted surveys. This species would remain as a targeted species in any other surveys within the area due to habitat preferences. Possible/Likely within wider Whalers Way. Unlikely within Project Area.

Six states listed flora species were considered likely to occur in the desktop assessment.

#### **Eyre Peninsula Fringe-lily**

Perennial, with small (5-10 mm diam.) rhizome with stiff fibrous non-tuberous roots; plant leafless at maturity. Recorded within 10 km, on limestone outcropping with *Eucalyptus angulosa*. Described as occurring with *Eucalyptus angulosa* mallee, all records are well north of Project Area and associated also with *Xanthorrhoea* and *Melaleuca*, not present within Project Area and unlikely to occur.

#### **Hidden Leek-orchid**

Plants occur singly or in small groups in well-grassed open forests. Habitats recorded include: mallee-broombush or in low scrub about rock, outcrops in the Lower North wheat-belt, on shallow soils over rock, including limestone, often with other Leek-orchids near Native Pine woodland with mixed shrubs on sandy soil, along with *Prasophyllum occidentale* and *P. pallidum*.

Another *Prasophyllum* species preferring *Eucalyptus diversifolia* mallee however no *Prasophyllum* were recorded within the Project Area or within Whalers Way area associated with the Project in general. Almost all areas had abundant presence of *Microtis* sp. (Onion Orchid) and *Acianthus* sp. (Mayfly Orchids) during the survey but no other evidence of orchid species was observed.

#### **Leafless Globe-pea**

Rush-like shrub usually <50 cm high; stems terete, mostly leafless, sometimes with a few linear leaves. Sclerophyll forests, woodlands and heathlands.

Described as preferring *Eucalyptus diversifolia* mallee on sandy loams however records are more associated with distance from exposed coastline and along roper Bay Road. No observations made during field surveys despite flowering aligning with survey period. Highly Unlikely.

### Limestone Leek-orchid

Flowers September to early October. Flowering is not dependent on fire or disturbance. As the name *callicola* (growing in calcium rich soils) suggests, plants occur only in calcareous soils, either in leaf litter on travertine limestone, in calcareous sand or in red-brown loam over limestone, usually within a few kilometres of the sea, either in scrubby heath or under mallee, but uncommonly, usually as single plants or small groups widely spread.

Recorded within Lincoln National Park growing with *Eucalyptus diversifolia* and *Acacia rupicola*. Suggests this species may be present in northern extent of Whalers area but following field survey is very unlikely to be present within the Project areas adjacent the coast.

### Scaly Poa

Known from dune mallee and gypsum plains and near-coastal sands. Other records on lower Eyre Peninsula have affinity with sand dunes making it unlikely this species is present within Whalers Way. Two records at Fishery Bay highlighted the species however the dune habitat preference is very sparsely present within Whalers Way. Definitely not present within Project areas, unlikely within Whalers other than possibly Redbanks area on western side.

### Snowdrop Spurge

Most records are located on the eastern side of the peninsula and while having similar habitat preferences of coastal mallee, most records indicate an association with species such as *Acacia paradoxa* (Kangaroo Thorn) which was not present within the Project areas. May have a presence in the northern extent of Whalers Way, but unlikely in the Project Area

#### 6.3.2 Exotic Flora Species

Exotic flora species were observed occasionally in the Project Area. One Weed of National Significance (WONS) was recorded, namely, Bridal Creeper (*Asparagus asparagoides*) at Launch Site B. The Bridal Creeper is also listed as Declared Weed under the LSA Act.

The most common exotic flora species was Sea Lavender (*Limonium companyonis*), which is not listed as a WONS or a Declared Weed under the LSA Act. Exotic flora species recorded included:

- Bridal Creeper (*Asparagus asparagoides*), WONS and SA Declared Weed;
- Horehound (*Marrubium vulgare*), SA Declared Weed;
- Onion Weed (*Asphodelus fistulosus*);
- Sea Lavender (*Limonium companyonis*); and
- Stinkweed (*Dittrichia graveolens*).

The highest density of exotic flora was observed at Launch Site B where community structure was noted as highly disturbed.

## 6.4 Fauna

### 6.4.1 Fauna Habitat

Three fauna habitats have been defined and mapped for the Project Area based on the results of the field assessment. These habitats are described as follows:

- Coastal Heath: high quality habitat with multiple shrub layers and sedges, grass tussocks and mat plants with low exposed bare ground area;
- Shrubland on Scree: high quality habitat particularly for small reptiles as it includes plants, rock/stones with cracks, and sand hummocks; and
- Low Mallee: high quality fauna habitat with numerous structural layers of vegetation with moderate to high litter cover.

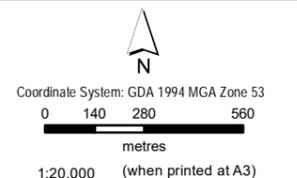
It is likely that many of the threatened bird species identified in the desktop assessment will fly over the area. In particular, the 17 species that are present or considered to have a high likelihood of

occurring. These species are highly mobile, it is therefore difficult to predict to what extent they utilise an area without completing a comprehensive bird census. The species that are considered most likely to utilise the habitat in the Project Area, based on their habitat preference and foraging behaviour, have been identified in Table 8. Fauna habitats are mapped in Figure 5.

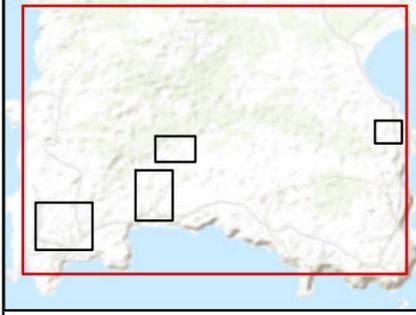
Table 8 Fauna Habitats of the Project Area

Habitat	Description	Threatened Species that may Utilise Habitat	Photo
Coastal Heath	<p>Low Shrubland with overstorey canopy typically around 0.6 m to 1 m range with relatively dense cover provided by shrubs.</p> <p>This was considered high quality fauna habitat due to multiple shrub layers as well as sedges, grass tussocks and mat plants.</p> <p>Significant fauna habitat characteristics include:</p> <ul style="list-style-type: none"> <li>• sandy grey soils formed into hummocks or small hills</li> <li>• low area of bare ground</li> <li>• dense plant cover present in patches</li> <li>• numerous plant lifeforms providing high foraging opportunities.</li> </ul> <p>Area: 4.92 ha</p>	<p>Foraging, roosting and breeding habitat for:</p> <ul style="list-style-type: none"> <li>• Southern Emu-wren (Eyre Peninsula)</li> <li>• Western Whipbird (eastern)</li> <li>• Elegant Parrot</li> <li>• Rock Parrot</li> <li>• Purple-gaped Honeyeater</li> <li>• Painted Buttonquail</li> <li>• Diamond Firetail</li> </ul>	
Shrubland on Scree	<p>This habitat comprises a very low shrub and sedge layer of &lt;0.3 m with individual shrubs having dense cover.</p> <p>This was considered high quality fauna habitat (particularly for small reptiles) due to complex structural elements such as plant habit/lifeform, stone cover with extensive cracking and sand hummocks.</p> <p>Significant fauna habitat characteristics include:</p> <ul style="list-style-type: none"> <li>• sandy grey soils formed into hummocks or small hills</li> <li>• small bare ground areas</li> <li>• dense plant cover present in patches</li> <li>• larger flat stones and crevices</li> </ul> <p>Moderate levels of dead and decaying organic matter.</p> <p>Area: 4.34 ha</p>	<p>Foraging habitat for:</p> <ul style="list-style-type: none"> <li>• Southern Emu-wren (Eyre Peninsula)</li> <li>• Rock Parrot</li> </ul>	

Habitat	Description	Threatened Species that may Utilise Habitat	Photo
<p>Low Mallee</p>	<p>Dense Mallee with low overstorey height between 2 -5 m dependent on wind exposure.                      This was considered high quality fauna habitat due to number of structural layers present and moderate number of lifeforms within most areas.                      Significant fauna habitat characteristics include:</p> <ul style="list-style-type: none"> <li>• Moderate to high levels of litter cover</li> <li>• High level of canopy cover</li> <li>• Dense foliage and prickly leaf structure of many plants provides high value refuge habitat</li> </ul> <p>Moderate levels of dead and decaying organic matter.</p> <p>Area: 14.47 ha</p>	<p>Foraging, roosting and breeding habitat for:</p> <ul style="list-style-type: none"> <li>• Western Whipbird (eastern)</li> <li>• Southern Emu-wren (Eyre Peninsula)</li> <li>• Elegant Parrot</li> <li>• Rock Parrot</li> <li>• Purple-gaped Honeyeater</li> </ul> <p>May provide habitat for:</p> <ul style="list-style-type: none"> <li>• Painted Buttonquail</li> <li>• Diamond Firetail</li> </ul>	



- LEGEND**
- Project Area
  - Construction Zones
  - Coastal Heath
  - Low Mallee
  - Shrubland on Scree
  - Not Classified

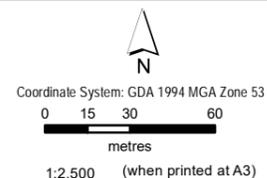


**Fauna Habitat within the Project Area Survey Area**

Southern Launch Whalers Way  
 Flora and Fauna Assessment  
 Whaklers Way, SA

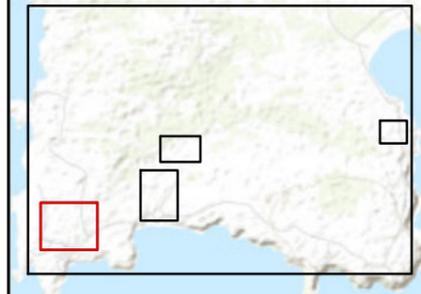
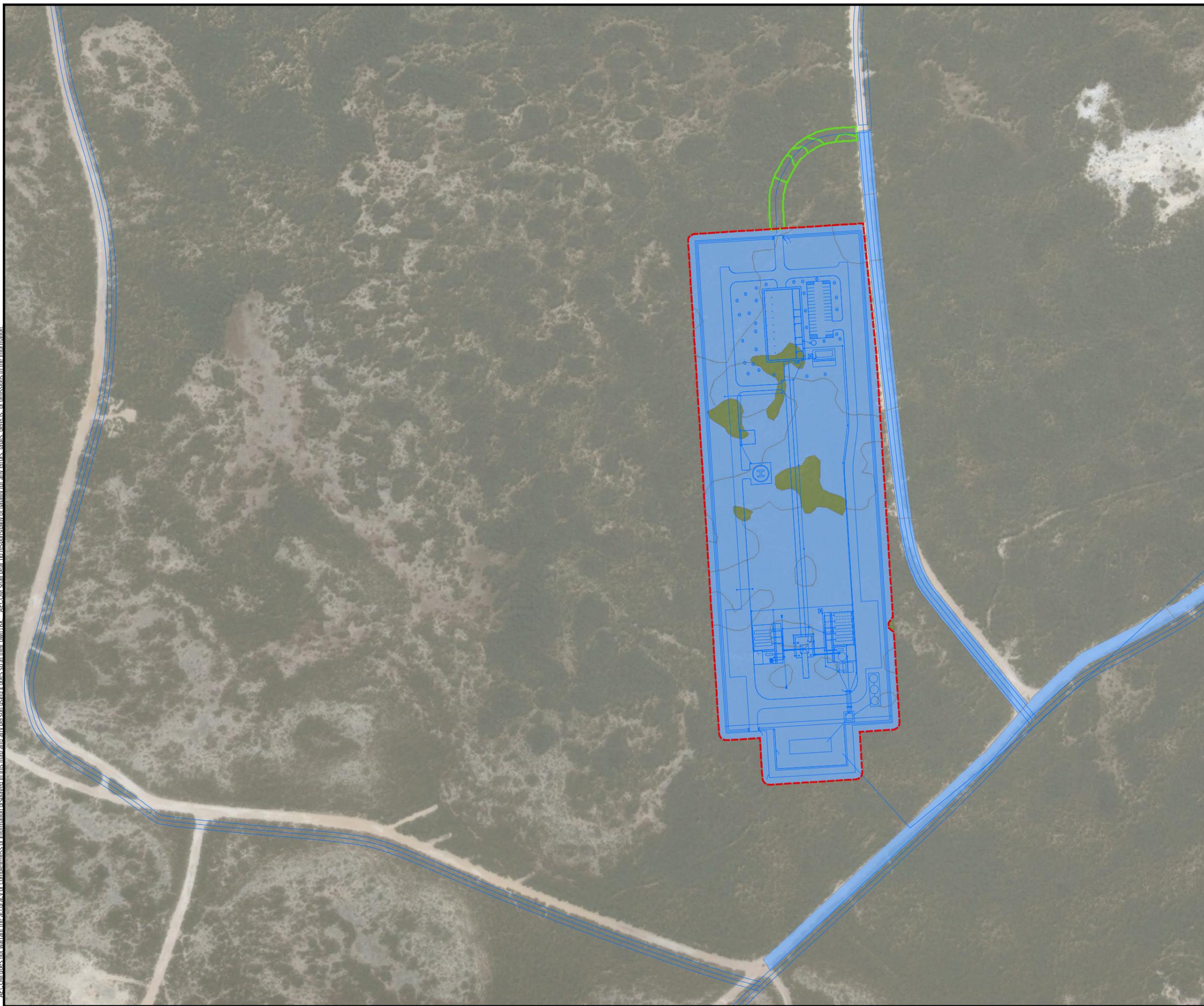
Figure  
**F5a**

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**LEGEND**

- Project Area
- Construction Zones
- Coastal Heath
- Low Mallee
- Shrubland on Scree
- Not Classified

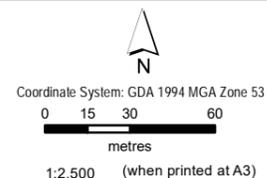


**Fauna Habitat within the Project Area  
 Lauch Site A**

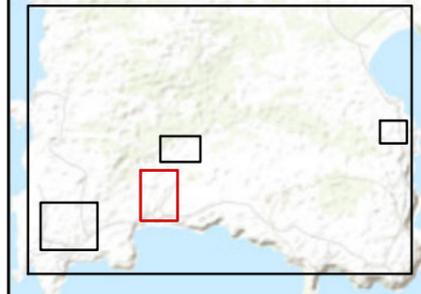
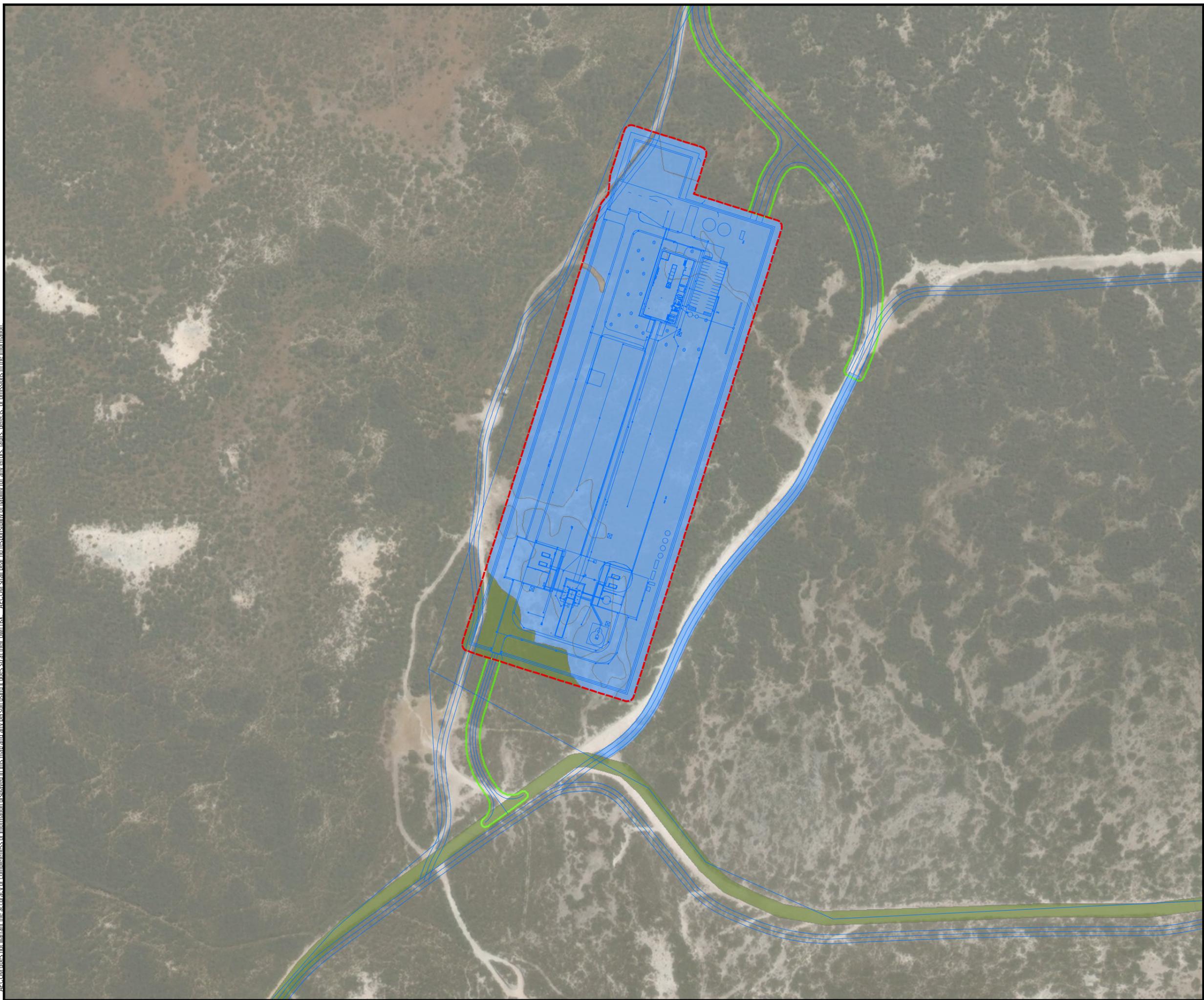
Southern Launch Whalers Way  
 Flora and Fauna Assessment  
 Whaklers Way, SA

**Figure  
 F5b**

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- LEGEND**
- Project Area
  - Construction Zones
  - Coastal Heath
  - Low Mallee
  - Shrubland on Scree
  - Not Classified

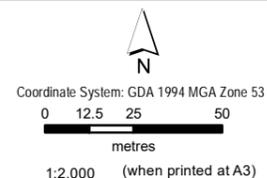


**Fauna Habitat within the Project Area  
 Launch Site B**

Southern Launch Whalers Way  
 Flora and Fauna Assessment  
 Whaklers Way, SA

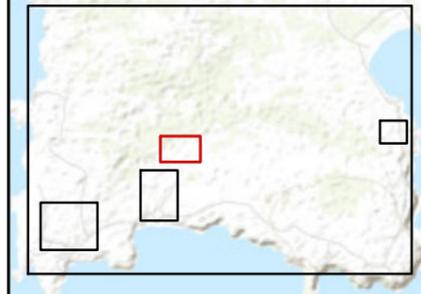
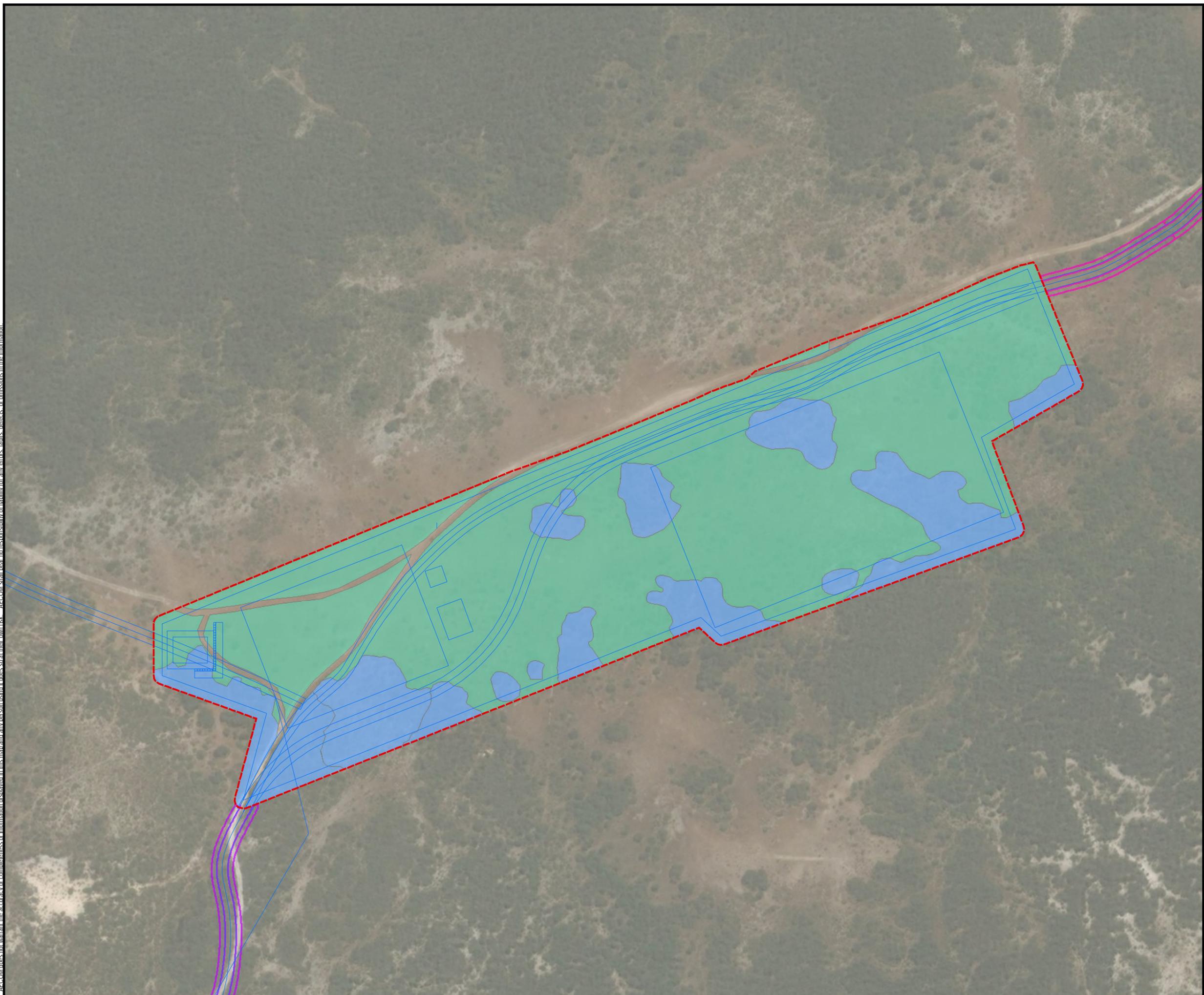
Figure  
**F5C**

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**LEGEND**

- Project Area
- - - Construction Zones
- Coastal Heath
- Low Mallee
- Shrubland on Scree
- Not Classified

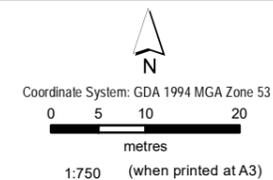


**Fauna Habitat within the Project Area  
 Infrastructure Site D**

Southern Launch Whalers Way  
 Flora and Fauna Assessment  
 Whaklers Way, SA

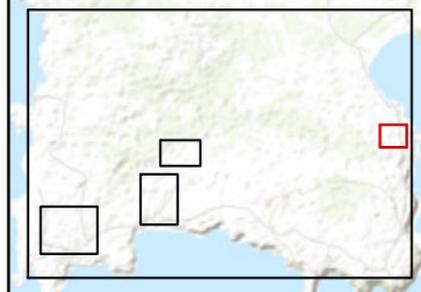
Figure  
**F5d**

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**LEGEND**

- Project Area
- Construction Zones
- Coastal Heath
- Low Mallee
- Shrubland on Scree
- Not Classified



**Fauna Habitat within the Project Area  
 Range Control Site E**

Southern Launch Whalers Way  
 Flora and Fauna Assessment  
 Whaklers Way, SA

Figure  
**F5e**

AECOM does not warrant the accuracy or completeness of information displayed in this map and any person using it does so at their own risk. AECOM shall bear no responsibility or liability for any errors, faults, defects, or omissions in the information.

#### 6.4.2 Threatened Fauna Species

A total of six threatened fauna species have been recorded during the field surveys (baseline and targeted) (Table 9):

- Diamond Firetail (*Stagonopleura guttata*), Vulnerable NPW Act – three records;
- Eastern Osprey, Migratory and Marine EPBC Act, Endangered NPW Act – one bird observed near Cape Carnot and one nest was recorded on a cliffs edge 2 km from launch Site B and 3 km from Launch Site A;
- Western Whipbird (eastern), Vulnerable EPBC Act, Endangered NPW Act – numerous individuals recorded by call;
- Rock Parrot (*Neophema petrophila*), Rare NPW Act – 14 records;
- Southern Emu-wren (Eyre Peninsula); Vulnerable EPBC Act, Endangered NPW Act – 18 individuals were sighted consisting of four pairs, one group of three and seven singles; and
- White-bellied Sea-Eagle (*Haliaeetus leucogaster*), Marine EPBC Act, Endangered NPW Act – one pair.

Ten other threatened fauna (bird) species are known to occur at Whalers Way (NatureMaps 2020), described in Table 9. These species are all bird species listed under the NPW Act and include three species listed as threatened, one species listed as migratory and marine, and one species listed as marine under the EPBC Act.

Table 9 Summary of EPBC Act and NPW Act-listed fauna species present or with a high likelihood of occurrence in the Project Area

Taxon	Common Name	Conservation Code		Habitat Type	Source
		EPBC Act	NPW Act		
<i>Ardeotis australis</i>	Australian Bustard	-	V	Ground dweller, common in grasslands, woodland and in agricultural areas (Birdlife 2020).	Three historical records
<i>Cereopsis novaehollandiae (NC)</i>	Cape Barren Goose	-	R	Coastal grasslands and wetlands (Birdlife 2020).	Three historical records
<i>Falco peregrinus</i>	Peregrine Falcon	-	R	A well-known falcon, the Peregrine inhabits a vast array of environs in Australia. Usually uncommon and migratory (Pizzey & Knight 2007).	Three historical records
<i>Falco subniger</i>	Black Falcon	-	R	Sparsely spread across inland Australia where it is found along tree-lined water courses and isolated woodlands. It may move to coastal areas and is known to have regular seasonal movements (Birdlife 2020).	Three historical records
<i>Haematopus fuliginosus</i>	Sooty Oystercatcher	-	R	Occurs over the Southern Ocean. Non-breeding visitor to Australia. Breeds on Campbell Island and Auckland Island (Birdlife 2020).	Four historical records
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	Ma	E	Occupies all coastal areas extending inland through main waterways, coastal islands, coastal lakes and along some inland rivers. It forages primarily for fish over large areas of open water.	Recorded during field survey, four historical records
<i>Lichenostomus cratitius occidentalis</i>	Purple-gaped Honeyeater		R	Inhabits mallee heathlands and sometimes mallee with open understorey (Birdlife 2020).	Five historical records
<i>Neophema elegans</i>	Elegant Parrot	-	R	Inhabits open areas including grasslands, shrublands, mallee, woodlands and thickets, bluebush plains, heathlands, saltmarsh and farmland (Birdlife 2020).	One historical record
<i>Neophema petrophila</i>	Rock Parrot	-	R	Restricted to coastlines and offshore rocky islands, frequenting windswept coastal dunes, mangroves, saline swamps and rocky islets (Birdlife 2020).	Recorded during field surveys

Taxon	Common Name	Conservation Code		Habitat Type	Source
		EPBC Act	NPW Act		
<i>Pandion haliaetus</i>	Eastern Osprey	Mi, Ma	E	Occurs in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia. Found in coastal areas of open fresh, brackish or saline water for foraging.	Recorded during field survey
<i>Psophodes leucogaster</i>	Western Whipbird (eastern)	V	E	Inhabits mallee and thicket vegetation in coastal and inland areas of southern SA. Prefers habitat with an open layer of mallee 3-5m tall with an understorey of dense shrubs at 1.5-2m tall. Occurs in scrub on flats, dunes, and limestone.	Recorded during field surveys
<i>Stagonoleura guttata</i>	Diamond Firetail	-	V	Found in open grassy woodland, heath and farmland or grassland with scattered trees.	Recorded during field survey
<i>Sternula nereis</i>	Australian Fairy Tern	V	V	Nests in southern Australia on sheltered sandy beaches, spits and banks above the high tide line and below vegetation between October and February. Occupies a variety of habitats including offshore, estuarine or lacustrine islands, wetlands and mainland coastline.	Two historical records
<i>Stipiturus malachurus parimeda</i>	Southern Emu-wren	V	E	This species is confined to the extreme south of the Eyre Peninsula. It occurs in shrubland/heathland, mallee and sedgeland. The population at Whalers Way is considered one of five important populations (DAWE 2020e).	Recorded during targeted survey, 74 historical records
<i>Turnix varius</i>	Painted Buttonquail	-	R	Prefer closed canopies with understorey cover in temperate and eastern tropical forests and woodlands (Birdlife 2020). Also known from scrub and grassy habitat.	Three historical records
<i>Zanda (Calyptorhynchus) funerea whiteae</i>	Yellow-tailed Black Cockatoo	-	V	Favours Eucalypt woodland and pine plantations (Birdlife 2020).	Six historical records

Conservation codes:

EPBC Act: CE Critically endangered, E Endangered, V Vulnerable, Mi Migratory, Ma Marine

NPW Act: E Endangered, V Vulnerable, R Rare

#### 6.4.2.1 Commonwealth Listed Species

Species listed under the EPBC Act as Threatened or Migratory and/or Marine that are known, likely or possible to occur are discussed in this Section.

##### Australian Fairy Tern

The Australian Fairy Tern (*Sternula nereis nereis*) occurs along the coasts of Victoria, Tasmania, SA and Western Australia; occurring as far north as the Dampier Archipelago near Karratha (DAWE 2020c). The number of mature Australian Fairy Terns has been estimated at 3000–9000 individuals from up to 170 sites with only a few hundred pairs remaining in SA (DAWE 2020c).

The Australian Fairy Tern nests on sheltered sandy beaches, spits and banks above the high tide line on sandy substrate with low sparse vegetation (DEWHA 2011). Nests have been recorded on coral shingle on continental islands or coral cays, sandy islands and beaches inside estuaries, and on open sandy beaches (DAWE 2020c). If breeding fails at one area, the birds will often move to new locations to attempt relaying (DAWE 2020c). Colonies tend to occupy areas rather than specific sites, and nest sites are often abandoned after one year, regardless of success (DAWE 2020c). This species forages on small bait size fish, sometimes plant material, molluscs and crustaceans in inshore waters and on Australian mainland (NACC 2020).

There have been two sightings of Australian Fairy Tern at Whalers Way, one of which was a potential nest on Red Banks Beach (DEW 2020a) which is 1.3 km from the Project Area. Due to the proximity of historical records and the presence of suitable habitat, it is likely that this species occurs in the Project Area despite it not being recorded during the field surveys undertaken for this Project.

##### Bar-tailed Godwit

Non-breeding visitor to Australia where it occurs in coastal habitats including intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. There is potentially habitat for the species, however none were sighted during field surveys and it is an infrequent visitor to southern parts of Australia. The Bar-tailed Godwit likelihood of occurrence post field surveys reduced to unlikely.

##### Black-faced Cormorant

The Black-faced Cormorant prefers coastal waters where they are found in flocks in large bays, deep inlets, rocky headlands and islands. The species was not recorded during surveys and there is no suitable habitat for species within the Project Area. The likelihood of occurrence for this species was reduced to unlikely post field surveys.

##### Common Greenshank

Found in a variety of inland wetlands and sheltered coastal habitats. It occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass. The species was not recorded during surveys and there is no suitable habitat for species within the Project Area. The likelihood of occurrence for this species was reduced to unlikely post field surveys.

##### Eastern Osprey

The Eastern Osprey occurs in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia where it forages in fresh, brackish or saline water (DAWE 2020f). Adult Eastern Ospreys are mostly resident or sedentary around breeding territories and typically breed in monogamous pairs from April to February in Australia (DAWE 2020f). They forage more widely but continue to make at least intermittent visits to their breeding grounds in the non-breeding season.

Comprehensive surveys of Osprey distribution in SA are regularly undertaken, with recent surveys being undertaken in 2008-2010 (Dennis et al 2011) and 2015-2017 (Detmar and Dennis 2018). Comparison of the two surveys has revealed a decline in occupied territories from 58 to 43. The greatest decline has occurred at western SA locations and on Kangaroo Island. Of the 43 remaining known territories, only 30 occur on the mainland. Recent studies also considered that the current population is considered to be unstable with a number of nest relocations and 'refugee' pairs relocating to start new territories. Multiple contributing factors are likely to be influencing the instability in the current distribution (Detmar and Dennis 2018).

The Whalers Way Peninsula occurs in an area with known Osprey territories that were still occupied during the most recent surveys between 2015-2017 (Detmar and Dennis 2018). The Project Area is considered to be within the southeastern extent of the 'western Eyre Peninsula' bioregion. A number of nests in this bioregion, particularly those on 'sea-stacks' were severely damaged in the storms of 2015/2016. A total of 17 occupied territories were located between Wahgunyah Conservation Park (Far West) and Cape Catastrophe (south eastern point of Lincoln National Park) during the recent surveys (Detmar and Dennis 2018). It is noted that there were eight territories recorded east of the Project Area, six of which are on offshore islands. Three nearby territories being the near-shore artificial platform at the Port Lincoln Marina, a remote area of Lincoln National Park (located in 2015 by sea-based survey) (Detmar and Dennis 2018), and one on Thistle Island.

In SA the breeding habitat is limited to mostly semi-arid open coastal landscapes with low coastal vegetation (Dennis et al 2011a). In such habitats, nests are typically on an exposed cliff, broken terrain, with no visual screening of on near-shore sea-stacks that are vulnerable to damage from storm surge and severe weather (Jacobs 2020).

There is a small and fragmented breeding population on the coast of SA which is known from Head of Bight east to Cape Spencer and Kangaroo Island (Dennis 2007 and DAWE 2020f). Active nests in the Great Australian Bight region were found to be, on average, around 33 km apart, with a range of 3 – 83 km (DAWE 2020f). The Eastern Osprey is known to form long-term pair bonds and use the same nesting locations over long time periods, where preferred nest sites can be used for successive generations (Dennis 2007b cited in Dennis and Detmar 2018). Breeding occurs during May and December.

Key threats and disturbances to the species include:

- Recreation activities within the core territory;
- Landscape scale habitat degradation (e.g. vegetation clearance, fire, land use change, overgrazing, development);
- Proximity to dwellings, tracks, walking trails, drone use areas, marine industry, impacts to prey availability;
- Recreational activities above nest level;
- Access by humans and predators (e.g. fox);
- Surfing, lookouts / carparks (Detmar and Dennis 2018); and
- Interspecies conflicts e.g. kleptoparasitism (food / prey stealing) and spatial competition from White-bellied Sea-Eagle (Dennis 2007a cited in Dennis and Clancy 2014).

Active nests are also known to occur between Whalers Way and Port Lincoln (Jacobs 2020). BDBSA records for 20 km buffer on the Whalers Ways site are summarised as:

- 34 records between 1970 and 2018 (BDBSA and Birdlife records, DEW extract Nov 2020);
- A number of these records would be the same birds /pairs as they are seen at similar locations within a couple days of each other; and
- Of the 34, three Records between 1970 and 1971 and 12 have low spatial reliability and 12 records between 2009 and 2015 have not spatial reliability entered.

One Eastern Osprey was recorded near Cape Carnot during the baseline field survey and one nest was recorded on a cliffs edge approximately 2000 m from Launch Site B and 2975 m from Launch Site A. Further assessment in the Jacobs (2020) report indicates there is a second nest located near Cape Wiles approximately 4070 m from Launch Site B and 4990 m from Launch Site A (Jacobs 2020).

Recent surveys on 26/11/2020 and 8/12/2020 by NVC Accredited Land and management Consultant Larry Bebbington (Jacobs 2020) did not observe recent activity at the nesting sites. During 2020 surveys observed no recent (past 3+ years) nest building activities or fresh chalk at the abandoned Osprey nest sites and concluded that following attempts to rebuild in 2017, the nests have been abandoned due to human disturbance (Jacobs 2020).

The nests are not currently active and have anecdotally not been active for the past five years, however this species has been known to return to inactive nests (DAWE 2020f). The Jacobs (2020) report details examples of Eastern Osprey nests persisting with / habituating to noisy environments at Port Lincoln Wharf and Thistle Island.

These distances to unoccupied /abandoned nests are all at or larger than the state-wide buffer (2000m) that is recommended to be avoided during the core breeding period of active nests to avoid human induced disturbance impacts.

### **Fork-tailed Swift**

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. They mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. They are also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes. They sometimes occur above rainforests, wet sclerophyll forest or open forest or plantations of pines. The species was not recorded during the field surveys and suitable habitat was not recorded within the Project Area. The Fork-tailed Swift likelihood of occurrence post field surveys was reduced to unlikely.

### **Hooded Plover**

Mainly occurs on wide beaches backed by dunes with large amounts of seaweed and jetsam, creek mouths and inlet entrances. Suitable habitat present. Sighted 20 times in 2004 comprising 50 individuals within the vicinity of the Project Area. No records within Redbanks Bay where beach has lack of refuge sites with boulders present at base of cliff at high tide mark. Sure to be present at Fisheries Beach however unlikely within close proximity to Project Area. The Hooded Plover likelihood of occurrence post field surveys was reduced to unlikely.

### **Northern Siberian Bar-tailed Godwit**

Non-breeding visitor to Australia where it occurs in coastal habitats including intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. There is potentially habitat for the species, however none were sighted during field surveys and it is an infrequent visitor to southern parts of Australia. The Northern Siberian Bar-tailed Godwit likelihood of occurrence post field surveys was reduced to unlikely.

### **Pacific Gull**

Prefers sandy beaches or sometimes rocky coasts and/or areas that are protected from ocean swells including estuaries, bays and harbours. It has also been seen on farmland and rubbish piles. This species was not recorded during the field surveys. The Pacific Gull likelihood of occurrence post field surveys was reduced to unlikely.

### **Sanderling**

Coastal species, open sandy beaches exposed to open sea-swell and exposed sandbars and spits and shingle banks where they forage in wave-wash zone amongst rotting seaweed. May occur on sheltered sandy shorelines of estuaries, inlets and harbours. This species was not recorded during the field surveys. The Sanderling likelihood of occurrence post field surveys was reduced to unlikely.

### **Short-tailed Shearwater**

Found in coastal waters. Likely to be present on adjacent offshore islands potentially. This species was not recorded during the field surveys. The Short-tailed Shearwater likelihood of occurrence post field surveys was reduced to unlikely.

### **Southern Emu-wren (Eyre Peninsula)**

The Southern Emu-wren (Eyre Peninsula) is restricted to the southern tip of the Eyre Peninsula where it is known from 11 populations estimated at less than 1000 mature individuals that are severely fragmented and isolated with no one population comprising more than 250 individuals (Pickett 2002; DAWE 2020e).

Whalers Way supports one of the 11 populations and is recognised as important for the long-term survival and recovery of the Southern Emu-wren (Eyre Peninsula) (DAWE 2020e).

All three fauna habitats recorded during the baseline field survey are likely to provide breeding and foraging habitat for this species.

During the targeted survey all previous records, except for the north western most records off Redbanks track area, were confirmed (Figure 6). At least four locations were recorded as probable new breeding pairs/groups, between Cape Wiles west to Blue Whale Bay. Another potential new pair was recorded west of Cape Carnot. In total 18 individual birds, consisting of four pairs, one group of three and the seven singles were sighted (Table 10).

Based on the availability of habitat it is assumed that groups/individuals inhabit the entire coastal strip from Cape Wiles, west to Redbanks and beyond, linking with the wind farm records which conforms with Pickett (2006). Almost all records occurred within 200-800m from the cliff edge although some records were as little as 115 m from the cliff edge and the average around 300 m.

The south-western section of Whalers Way near Launch Site A has the highest frequency and broadest geographical section of critical habitat. Based on the broadscale assessment where records were spaced at an average of 300-400 m intervals on average, each containing on average 2 individuals, over the approximately 7.5 km length of the coastal strip and allowing for missed records and areas of higher density, it would be difficult to acknowledge that many more than 100 mature individuals inhabit the Whalers Way area in total. For further information on the species refer to Appendix A.

**Table 10 Southern Emu-wren (Eyre Peninsula) observations recorded during June 2020 Targeted Survey**

Name	Comment	Ind. Observed	UTM Zone 53H	
			Easting	Northing
WWSEW1	Near pre-existing Cape Carnot records	1M, 1F	557328	6133639
WWSEW2	Near pre-existing Cape Carnot records	1M	557334	6133535
WWSEW3	Near pre-existing Cape Carnot records	1F	557406	6133466
WWSEW4	Near pre-existing Cape Carnot records	1M, 1F	557477	6133947
WWSEW5	Near pre-existing Cape Carnot records	1M	557638	6134098
WWSEW6	Near pre-existing Point du Bastion record	1M	562434	6133039
WWSEW7	New record	1M	561617	6133309
WWSEW8	New record	1M, 1F	561326	6133327
WWSEW9	New record	1M	560789	6133447
WWSEW10	New record in proximity to pre-existing record	1M, 1F	560561	6133729
WWSEW11	New record west of Cape Carnot	1M	556878	6133739
WWSEW12	Near pre-existing Groper Bay record	2M, 1F	558655	6134055

### Western Whipbird (eastern)

The Western Whipbird (eastern) occurs in SA and Victoria, in three widely separated areas – the Murray Mallee region of Victoria and SA, and on the Eyre and Yorke Peninsulas of SA (DAWE 2020d).

The total population is estimated at 6,000 mature birds with the largest sub-population of 5,000 birds is on the southern Eyre Peninsula which is restricted to sites around Coffin Bay National Park and Lincoln National Park (DELWP 2016).

The Western Whipbird prefers mallee scrub on sandy flats, dunes or limestone with an overstorey of mallee eucalypts including *Eucalyptus incrassata*, *E. socialis*, *E. leptophylla* and *E. diversifolia*, and a dense species-rich understorey comprising shrubs such as *Melaleuca lanceolata*, *M. uncinata* and

*Baeckea behrii*, *Callitris verrucosa*, *Allocasuarina* spp., *Hakea muelleriana*, *Leptospermum coriaceum*, and *Triodia irritans*, and also in *Acacia* species thickets (DELWP 2016).

This species builds nests from twigs, bark and grass that is made in dense bush, and forages on the ground and among lower foliage feeding on insects and spiders (DAWE 2020d). The species is largely sedentary and can only make short distance flights which limits its dispersal across areas that have been largely cleared (DAWE 2020d).

All three fauna habitats recorded during the baseline field survey are likely to provide foraging habitat for this species.

During the targeted survey the Western Whipbird (eastern) was observed by call and also there was one sighting of the species crossing a road. Seven individual records were recorded by GPS (Table 11) however the number of birds observed by call outweighed these records significantly. The species was and is considered prolific at Whalers Way. Within the Project Area the habitat of the Western Whipbird (eastern) was generally low Mallee trees 1.5 to 2 m tall comprising *Eucalyptus diversifolia* (Vegetation Association 3) and low *Eucalyptus angulosa* (Vegetation Association 4) over an open understorey of low shrubs. The preferred habitat for Western Whipbird occurs extensively in the Project Area and surrounds.

For further information on the species refer to Appendix A.

**Table 11 Western Whipbird (eastern) observations recorded during June 2020 Targeted Survey**

Name	Comment	Ind. Observed	UTM Zone 53H	
			Eastin g	Northin g
WWWW B1	Two birds responding to each other's call	2 (song)	557618	6134086
WWWW B2	Single bird calling	1 (song)	557177	6134694
WWWW B3	Single bird calling near project site footprint	1 (song)	560317	6133916
WWWW B4	Single bird calling near project site footprint	1 (song)	560422	6134448
WWWW B5	Single bird calling recorded during Southern Emu Wren survey	1 (song)	560896	6133755
WWWW B6	Single bird calling near project site footprint	1 (song)	562470	6135285
WWWW B7	Single at road edge brief sighting	1 (sighting)	557241	6134935

### White-bellied Sea-Eagle

White-bellied Sea-Eagle (*Haliaeetus leucogaster*) is listed as Marine under the EPBC Act and Endangered under the NPW Act. The White-bellied Sea-Eagle is a marine species that forages on fish and does not breed in Australia.

The most recent review of White-bellied Sea-Eagle distribution in SA confirmed a total of 73 breeding pairs / occupied territories across a range of habitats; coastal, offshore island and inland river habitats (Dennis and Detmar, 2018). It has been noted there was a decline in previous territories since 2010, due to the following:

- Low fecundity (i.e. ability to produce offspring);
- High rates of nest failure; and
- Human-induced disturbance related to displacement of pairs (Jacobs 2020).

Disturbance during critical phases of breeding are known to result in nest failures and displacement to sub-optimal habitats. 33 territories are known from the Western Eyre Peninsula region where the

proposed Southern Launch Project site occurs. In this region however, there are only seven mainland territories (sparsely distributed) and 26 are located on offshore islands (Jacobs 2020).

Long-term studies of White-bellied Sea-Eagle's from Kangaroo Island that occupy a range of habitats identified a negative relationship between human activities and nest productivity outcomes (i.e. disturbed territories produced eggs less often, fewer young, and higher rates of nest failure than nests located in remote locations with less disturbance) (Jacobs 2020).

The White-bellied Sea-Eagle forms long-term pair bonds and selected nesting locations over long time periods. Favoured nest locations are often used by successive generations (Jacobs 2020). There are times within the breeding period that are more crucial than others (i.e. mid-May to mid-September as per literature from long-term studies and White-bellied Sea-Eagle experts (Dennis et al. 2011a, Dennis et al. 2012, Dennis et al. 2015).

In terms of territory density there is variation and this may be declining. On St. Peters Island there were 4 territories with primary nests spaced an average of 2.4 km apart, whereas on the north coast of Kangaroo Island where there were 10 territories, primary nests were spaced an average on 9 km apart (Jacobs 2020).

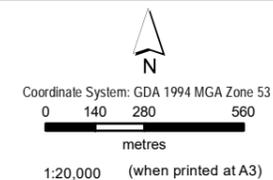
Sensitivities to these bird's disturbance are so well documented that there are long-established disturbance avoidance protocols (based on spatial and temporal) approach constraints that are applied to regular raptor surveys (Dennis and Detmar 2018). Recent surveys identified three abandoned nests on the Eyre Peninsula; two in National Parks with high levels of disturbance and one occupied by a Wedge-tailed Eagle (Dennis and Detmar 2018).

Whilst White-bellied Sea-Eagle's have regularly been reported in the Whalers Way region and flying overhead (Jacobs 2020). One pair was spotted during the AECOM 2020 baseline field survey west of Cape Carnot.

White-bellied Sea-Eagle's occupy a territory and nest on the offshore Liguanea Island and a recent territory and nest site has been established >5 km to the east of the launch sites (Dennis and Detmar 2018). The exact location of the mainland clifftop nest site remains undisclosed due to potential disturbances. During site surveys on the 26 November and 8 December 2020 by Larry Bennington a pair of White-bellied Sea-Eagle's circling inland coastal heath at Fishery Bay for a duration of 20 minutes prior to flying eastwards were observed. Another pair of White-bellied Sea-Eagle's were observed through a spotting scope overflying Liguanea Island and riding thermals to the south east of the island (Jacobs 2020). White-bellied Sea-Eagle's are regularly observed (Bebbington L. pers. com.) overflying the coastline at Whalers Way and well to the east and west of the site. White-bellied Sea-Eagle's are also regularly observed well inland preying on juvenile Cape Barren Geese and feeding on sheep carcasses or bathing in farm dams (Bebbington L. pers. obs.).

White-bellied Sea-Eagle's were not detected at the Project Area (just flying over), however breeding territory would be in proximity to the Project Area (given the regular fly overs) and although proposed (land-based) development are well outside the 2 km non-disturbance buffer zone (buffer distance as suggested in Dennis et al. 2011b, Dennis 2012), the bay and surrounds likely forms part of the foraging zone of the species.

Through the implementation of key mitigation options for avoiding impacts to White-bellied Sea-Eagle's detailed in the Whalers Way Eastern Osprey and White-bellied Sea-Eagle Detailed Assessment (Jacobs 2020), significant impacts to the species are unlikely.



- LEGEND**
- Project Area
  - Construction Zones
  - Southern Emu Wren

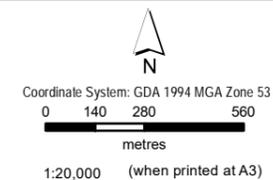


**Records for Southern Emu-wren**

**Southern Launch  
 Whalers Way**  
*Flora and Fauna Assessment*  
 Whalers Way, SA

**Figure  
 F6**

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**LEGEND**

- Project Area
- Western Whipbird (eastern)



**Records for Western Whipbird (eastern)**

Southern Launch Whalers Way  <i>Flora and Fauna Assessment</i>  Whaklers Way, SA	Figure <b>F7</b>
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### 6.4.2.2 State Listed Species

State listed threatened species that are known, likely or possible to occur as defined in Table 9 are discussed below.

#### Australian Bustard

Australian Bustard (*Ardeotis australis*) is likely to be a vagrant visitor to the Project Area when food resources are plentiful. There have been three historical records of the species at Whalers Way however there was no sightings or evidence of the Australian Bustard utilising the Project Area during the field surveys. This species has a wide habitat range and is unlikely to rely on the coastal habitat for foraging or breeding.

#### Black Falcon

The Project Area is right on the edge of the range (Pizzey and Knight 2007) for the Black Falcon (*Falco subniger*) which is known to occur within a wide range of habitats. It was not recorded during the field surveys however there are three historical records at Whalers Way. It has been seen in coastal habitats however is typically associated with water courses and woodlands. It is likely to be a vagrant visitor to the Project Area.

#### Cape Barren Goose

Cape Barren Goose (*Cereopsis novaehollandiae* (NC)) are frequently observed in open paddocks where they graze on tussock grasses, spear grass, herbs and succulents (Birdlife 2020). They roost out of reach of predators and lay eggs among tussocks of open grasslands on offshore islands (Birdlife 2020).

No Cape Barren Goose were recorded during the field survey however three records, totalling 105 individuals, have been recorded at Whalers Way. It is likely that this species inhabits the paddocks north of the Project Area but unlikely to use Whalers as habitat area.

#### Diamond Firetail

Diamond Firetail occurs in a wide range of Eucalypt dominated vegetation with a grassy understorey (DEH 2008). The largest populations are known from the Great Dividing Ranges with small pockets occurring near the coast (DEH 2008). They require a reliable water source within the vicinity of their foraging and breeding areas (DEH 2008).

This species was recorded at a water trough within the vicinity of the Project Area. It has been recorded at Whalers Way historically with one record of ten individuals. The Project Area does not support its favoured grassland habitat and is likely to represent an occasional visitor to any freshwater sources available.

#### Elegant Parrot

Elegant Parrot (*Neophema elegans*) are likely to be present during certain times of year when resources are available. This species occurs in a wide range of habitats including grasslands, shrublands, mallee, woodlands and thickets, bluebush plains, heathlands, saltmarsh and farmlands (Birdlife 2020). This species is relatively common in Mallee woodlands and has the ability to cover a wide range. The Elegant Parrot breeds in tree hollows which were largely absent in the Mallee Woodlands of the Project Area.

There is one historical record at Whalers Way. The species was not recorded during field surveys however there is suitable habitat present.

#### Painted Buttonquail

Painted Buttonquail (*Turnix varius*) prefers Woodlands with dense canopies over shrublands in temperate and eastern tropical forests and woodlands (Birdlife 2020). There are three historical records for the species at Whalers Way representing 23 individuals. It was not recorded during the field survey and the habitat is considered marginal.

#### Peregrine Falcon

Peregrine Falcon (*Falco peregrinus*) may nest on cliffs in Whalers Way and are likely to feed on pigeons that also utilise the cliffs for roosting areas. This species is relatively common in the region

and has a large home range. It was not recorded during the field survey and the habitat is considered marginal.

#### **Purple-gaped Honeyeater**

Purple-gaped Honeyeater (*Lichenostomus cratitius occidentalis*) is likely to utilise Whalers Way when foraging resources are available, this species is likely to come and go dependent on where resources are available at certain times of year. This species was not recorded during the field survey and the habitat is considered marginal.

#### **Rock Parrot**

Rock Parrot (*Neophema petrophila*) often occur along the coast, foraging on a range of food resources including samphire shrublands. During the field survey and targeted survey, the Rock Parrot was recorded throughout coastal shrublands.

#### **Sooty Oystercatcher**

Sooty Oystercatchers (*Haematopus fuliginosus*) are restricted to the coastal margins and are a non-breeding visitor to Australia. The four historical records of the species were observed to the east of the Project Area, at Fishery Bay. This species was not recorded during the field survey.

#### **Yellow-tailed Black Cockatoo**

Yellow-tailed Black Cockatoo (*Zanda (Calyptorhynchus) funerea whiteae*) has experienced a historical population decline over the last several decades and habitat loss, with its associated effects, is believed to be the principal cause. The Eyre Peninsula Yellow-tailed Black-Cockatoo has a seasonally and geographically split distribution across Eyre Peninsula. The birds breed during the warmer months (November-April) in the Lower Eyre Peninsula and migrate to north-western Eyre Peninsula for the winter. The summer breeding season is spent in a small area within the Koppio Hills approximately 40 km north west of Port Lincoln on the Lower Eyre Peninsula. Utilises sugar gum as a foraging resource. There are only planted examples in the Project Area which are unlikely to provide significant foraging habitat based on their small numbers and size.

### **6.4.3 Opportunistic Fauna Observations**

A total of 34 fauna species were recorded during the field survey. This included 28 bird species, four mammal species, and two reptile species.

One native mammal species was recorded throughout the Project Area being the Western Grey Kangaroo (*Macropus fuliginosus*). Three exotic mammal species listed as Declared Pests under the LSA Act were recorded:

- Domestic Cat (*Felis catus*) tracks were observed frequently;
- European Rabbit (*Oryctolagus cuniculus*), which is an introduced pest species common in all states, was widespread and common; and
- Red Fox (*Vulpes vulpes*) was observed from numerous scats.

Two reptile species were confirmed. The Shingleback Lizard (*Tiliqua rugosa*) is common to the Project Area habitat types and was commonly observed. The Mallee Heath Dragon (*Ctenophorus chapmani*) was common and widespread. Numerous skinks (not able to be identified) were noted.

Of the 30 bird species recorded one was a Declared Pest under the LSA Act, namely, the Common Starling (*Sturnus vulgaris*). Four of the bird species were associated with the cliffs in the south, and four were associated with inland vegetation. The remaining species were common and widespread.

A comprehensive species list is presented in Appendix G.

## 7.0 Assessment of Potential Impacts

Potential ecological impacts from the Project were informed by current knowledge of the required Project activities provided by Southern Launch (the proponent), who will ensure opportunities are considered to further avoid and minimise potential impacts such as clearing of native vegetation and habitat as far as practicable during detailed design. This section provides an overview and description of the potential ecological impacts that may occur as a result of the Proposal.

### 7.1 Overview of Potential Impacts

This section provides a review of the environmental aspects and potential ecological impacts of the Project as they relate to the terrestrial environment including native vegetation, flora, terrestrial birds, terrestrial mammals and terrestrial fauna habitats.

The Project activities in the tables below support a thorough assessment of individual and cumulative direct and indirect impacts (Table 12).

**Table 12 Description of Project Activities associated with Construction and Operation**

Phase	Project Activity	Description of Activities
Construction	Site Preparation	Vegetation clearing
		Topsoil stripping
		Excavation for the construction of a quarry then to be transformed into a 30 ML dam
		Construction of temporary site compounds including concrete batching plant
		Installation of hardstands, offices etc.
		Stockpiling of topsoil, gravel etc.
	Utility Construction	Excavation
		Trenching
		Installation of utilities and associated infrastructure
	Drainage	Culvert installation and stormwater drains
	Structures	Construction and installation of infrastructure and buildings associated with launch pad facilities including: <ul style="list-style-type: none"> <li>• Assembly Buildings (temporary and permanent);</li> <li>• Range Control Facilities;</li> <li>• Diesel and / or Hydrogen Fuel Cell Powered Generators;</li> <li>• Helicopter Pad(s)</li> <li>• Solar Arrays;</li> <li>• Water Tanks;</li> <li>• Water Capture and Treatment Systems;</li> <li>• Launch Pads;</li> <li>• Lightning Rods;</li> <li>• Anemometer Towers;</li> <li>• Engine Test Stands;</li> <li>• Propellant (Liquid, Hybrid and Solid) Storage;</li> <li>• Secure Block Houses;</li> <li>• Blast Walls;</li> <li>• Bunding (for Blast Wave Deflection);</li> <li>• Installation of Fibre Optic and Satellite Communication Systems;</li> <li>• Installation of High Voltage Power Lines; and</li> </ul>

Phase	Project Activity	Description of Activities
		<ul style="list-style-type: none"> <li>Excavation and construction of flame trench and the installation of a water deluge system.</li> </ul>
	Civil and Road Works	Construction of access roads
		Cutting construction
		Drainage controls
Operation	Rocket Launches	Launch of rockets at a frequency of once a week, for a duration of 1 minute
	Operational Maintenance	<ul style="list-style-type: none"> <li>Operations at the Launch complex supporting infrastructure, including buildings, dams and workshops;</li> <li>Ongoing vehicle movement within access roads and around launch pads.</li> </ul>

There are no facilities for fixed wing aircraft to land or take off from the Project Area. Fixed wing aircraft may be used to ensure hazard zone clearance down range, but that is more than 50 km south of the Project and therefore not considered in this Terrestrial Impact Assessment. The only perceived use for rotary wing aircraft is for casualty evacuation in a medical emergency and the Project is not planning to use drones.

#### 7.1.1 Habitat Loss and Degradation from Vegetation Clearing

The removal of vegetation resulting in habitat loss and degradation is likely to pose the largest risk of adverse impacts for terrestrial biodiversity arising from the Project. The impact may be direct in the form of vegetation and habitat clearance, or indirect, such as a reduction in flora and fauna diversity due to shortages in available habitat resources or habitat degradation in areas adjacent to direct impacts. Small-scale clearing within largely intact patches of vegetation can cause localised depletion of some species (Kutt et al. 2012). Habitat loss as a result of vegetation clearing is likely to occur during the construction phase activities. Habitats for threatened species are included in the likely receptors potentially impacted.

Vegetation clearing and habitat loss that cannot be avoided, particularly in high constraint areas, is likely to result in permanent impacts to threatened biodiversity receptors. This includes a reduction of feed availability for habitat-specialist fauna species which are dependent on native vegetation for food sources, such as Western Whipbird (eastern) and Southern Emu-wren (Eyre Peninsula) that forage actively, hopping through dense vegetation and taking food from reeds, foliage, twigs and other surfaces of shrubs. The potential effects associated with this impact include direct loss of breeding habitat and loss of foraging habitat which will in turn lead to greater pressure on remaining available habitat outside of the Project Area. The resulting increase in pressure on resource availability is likely to increase individual animal stress levels which may result in reduced breeding success, genetic isolation and population decline over time.

The Project will clear 23.76 ha of native vegetation in four discreet locations (Launch Site A, Launch Site B, Infrastructure Site D and Range Control Site E) and several access tracks detailed in Table 7 and illustrated in Figure 3. No threatened flora species listed under the EPBC Act and NPW Act are considered likely to occur within the Project Area or within close proximity. Refer to Section 8.0 and Appendix F for further details on vegetation to be cleared and the required SEB offset.

The vegetation provides suitable habitat for the following threatened fauna species protected under the EPBC Act and NPW Act:

- Australian Fairy Tern;
- Black Falcon;
- Cape Barron Goose;
- Diamond Firetail;

- Eastern Osprey;
- Elegant Parrot;
- Painted Buttonquail;
- Peregrine Falcon;
- Purple-gaped Honeyeater;
- Rock Parrot (known to occur);
- Southern Emu-wren (Eyre Peninsula);
- Western Whipbird (eastern);
- White-bellied Sea-Eagle; and
- Yellow-tailed Black Cockatoo.

Native vegetation extends further inland on the Whalers Way Peninsula estimated at 2,600 ha of which 95% is mapped as native vegetation. Vegetation and fauna habitat during the field surveys was observed as homogenous in the area. It is likely that the Whalers Way Peninsula and conservation reserves detailed in Section 5.2 contain suitable habitat for the threatened species listed above.

Specifically, there is a risk that some of the proposed clearing may pose a direct threat to the local viability of the ecosystems and potentially heavily impact upon individual threatened species, this is discussed further for Commonwealth listed species in Section 7.2.

#### **7.1.2 Fauna Species Injury or Mortality**

Fauna injury and/or death is a direct impact that may lead to a decline in population size and extent of fauna species. This potential impact is most likely to occur during vegetation clearing, earthworks, trenching and increased labour force in the fields (through the movement of vehicles) during construction, and from vehicle collision during operation.

Earthworks and clearing of native vegetation may lead to interaction of machinery with fauna species, including any of the threatened bird species listed in Section 7.1.1. This includes clearing vegetation that includes a nesting site, crushing or otherwise harming a fauna species with machinery.

The Project will result in increased vehicle movements that may cause injury or death to fauna by vehicle strike. Mammals, reptiles, and birds are all at risk of vehicle strike, particularly species that utilise roads for movement pathways. Threatened species such as Western Whipbird (eastern), Southern Emu-wren (Eyre Peninsula) and Rock Parrot that were recorded throughout the Project Area may be impacted as a result of increased vehicle activity.

Entrapment of wildlife in utility diversions (e.g. trenches) or other excavations associated with the Project (e.g. excavations for flame trench and/or water deluge system) may cause physical trauma to individual fauna. Open trenches for underground utilities, or other pits are known to be effective at trapping a wide variety of wildlife and often result in mortality. The Threatened bird species known to occur in the Project Area are mobile species that are likely to be able to fly out of any trench or excavation. As such, it is unlikely that wildlife entrapment would have a significant impact on these species.

#### **7.1.3 Disturbance to Breeding and Foraging Habitat**

Many fauna species have specific requirements for breeding and foraging. The two key threatened bird species recorded during field surveys (Southern Emu-wren (Eyre Peninsula) and Western Whipbird (eastern)) build nests out of twigs, barks and grass that is placed close to the ground in dense vegetation. Both species breed during September and October (spring) (Picket 2006 and DAWE 2020d).

Works associated with the Project will have both direct and indirect effect on specialist habitat. Direct impacts will include the clearance of 23.76 ha of suitable breeding and foraging habitat for fauna species while indirect impacts such as noise during construction works and rocket launch operations may affect where these species choose to nest and feed. Species which may be impacted due to the

disturbance of these habitat features include the following EPBC Act and NPW Act listed species with known breeding or foraging habitat within the Project Area:

- Australian Fairy Tern;
- Black Falcon;
- Cape Barron Goose;
- Diamond Firetail;
- Eastern Osprey;
- Elegant Parrot;
- Painted Buttonquail;
- Peregrine Falcon;
- Purple-gaped Honeyeater;
- Rock Parrot (known to occur);
- Southern Emu-wren (Eyre Peninsula);
- Western Whipbird (eastern);
- White-bellied Sea-Eagle; and
- Yellow-tailed Black Cockatoo.

These impacts are likely to be long term in relation to the removal of suitable habitat and may be short or long term in relation to operational noise depending upon individual species resilience.

#### **7.1.4 Displacement of Flora and Fauna Species from Invasion of Weed and Pest Species**

Weed and pest species have the potential to impact on terrestrial biodiversity as native species can become displaced through predation and competition with exotic biota. Pest species can also damage native vegetation by grazing and trampling.

Nine non-native species have been recorded within the Project Area, consisting of five weeds and four pest species. Of these, one weed species (Bridal Creeper) is a listed WONS and a Declared Weed under the LSA Act, and the four pest species are listed as Declared Pests under the LSA Act. Without appropriate management strategies, the Project activities have the potential to disperse weeds into areas of remnant vegetation where weed species are currently limited or occur in low densities.

Project activities also have the potential to introduce new weed species into the Project Area and surrounding area. The most likely causes of weed dispersal and introduction associated with the Project include earthworks, movement and disturbance of soil, and attachment of seed (and other propagules) to vehicles and machinery during all phases. Weed dispersal by vehicles along access tracks and roads is a key source of weed invasion (Birdsall et al 2012). Weed invasion is an indirect impact that may degrade the quality of habitats, potentially resulting in habitat loss.

Soil disturbance during construction may increase the risk of invasion from weed and/or pest species, which can further reduce habitat quality and compromise the integrity of adjacent areas of native vegetation.

Exotic flora species were observed as sparsely present during the baseline field survey. As the vegetation condition of the Project Area is of a relatively high quality with low weed invasion it is important to ensure exotic weed species are not spread and brought onto site during all phases of the Project. The potential for habitat modification from weed invasion resulting from the Project is highest where Project activities take place in areas of high quality vegetation condition, such as those identified as containing intact remnant vegetation that currently has low weed diversity and abundance.

Unmitigated Project activities have the potential to disperse pest (animal) species from the Project Area into the surrounding landscape, due to habitat removal, noise disturbance, and human presence during the construction and operation phases of the Project. Construction of access tracks and the

rocket launch pad facilities infrastructure through large patches of intact native vegetation may result in the introduction of pest species (particularly predators such as foxes and cats) into these areas. Unmitigated potential impacts of the displacement of native species through the invasion of non-natives may be temporary or permanent.

#### **7.1.5 Edge Effects**

Edge effects refer to the changes in environmental conditions (e.g. altered light levels, wind speed, temperature) that occur along the edges of habitats. These new environmental conditions along habitat edges can promote the growth of different vegetation types (including weed species), promote invasion by pest animals specialising in edge habitats, or change the behaviour of resident native animals (Moenting and Morris 2006). Edge zones can be subject to higher levels of predation by introduced mammalian and native avian predators. The distance of edge effect influences can vary and has been previously recorded from 50 m to greater than 1 km from an edge (Forman et al. 2000; Bali 2005).

Within the Project Area, the vegetation patches are large and have generally not been disturbed from previous clearance or edge effects. There are some areas that have had minor disturbance through the construction of access tracks for tourist activity in the Whalers Way. It is likely that the Project may create edge effects resulting in habitat degradation and a reduction of the habitat available for a range of species through the expansion of access tracks and clearance for the launch pads.

No threatened flora species listed under the EPBC Act and NPW Act are considered likely to occur within the Project Area of within close proximity.

Edge effects have the potential to adversely impact the following threatened fauna species known to be or identified as potentially occurring in the Project Area:

- Australian Fairy Tern;
- Black Falcon;
- Cape Barron Goose;
- Diamond Firetail;
- Eastern Osprey;
- Elegant Parrot;
- Painted Buttonquail;
- Peregrine Falcon;
- Purple-gaped Honeyeater;
- Rock Parrot (known to occur);
- Southern Emu-wren (Eyre Peninsula);
- Western Whipbird (eastern);
- White-bellied Sea-Eagle; and
- Yellow-tailed Black Cockatoo.

#### **7.1.6 Habitat Fragmentation**

Habitat fragmentation relates to the physical dividing up of a continuous habitat into separate smaller fragments (Fahrig 2002). The habitat situated between fragments is often artificial and less suitable to the species remaining within these fragments (Bennett 1990).

The landscape in which the Project is situated is relatively undisturbed with significant vegetation cover, with the only fragmentation in fauna habitat occurring through access tracks that have been constructed for tourist access to Whalers Way. The Project activities will contribute to fragmentation of fauna habitat by increasing the number and width of access tracks and clearing six discreet areas. Habitat fragmentation may impact threatened species, regionally significant vegetation, bioregional

corridors and wildlife refugia. This is due to the importance of connectivity, dispersal opportunities and habitat quality for species at a local scale.

Habitat fragmentation as a result of vegetation clearing for the Project is considered localised. The habitat in the local area is contiguous and provides ample connectivity across Whalers Way. It is unlikely that vegetation clearing will result in the inability of any species to become genetically isolated and lead to sub-populations in the local area.

The widening of tracks and the construction of the launch pads may lead to local fragmentation, however the majority of species at Whalers Way are mobile and are able to traverse the distance a track represents (refer to Figure 5). Fragmentation is therefore considered limited and unlikely to be considered significant.

#### **7.1.7 Barrier Effects**

Barrier effects occur where particular species are either unable or are unwilling to move between suitable areas of habitat due to the imposition of a barrier. This can include a habitat type that has become unsuitable or a physical barrier such as a fence. Species most vulnerable to barrier effects include those with limited dispersal abilities.

Various Project activities may create barrier effects, particularly those that may create a hard barrier that restricts fauna movement (e.g. cutting or embankments and fences). The Project includes exclusion fencing to prevent unauthorised entry to the launch pad facilities. The fences will also prevent the movement of fauna species, in particular large mammals (kangaroos, emus). It is unlikely that fencing required for the Project will prevent movement of the threatened birds that are known to occur in the Project Area.

Human activity and infrastructure are likely to create a barrier as many species are known to avoid areas of human activity resulting in indirect habitat loss. Human presence may affect species in different ways with some species displaying avoidance behaviour while others may habituate and become attracted to areas of human activity. Predators and prey may respond differentially to human activity, causing a disruption of community interaction and potentially disrupting ecological processes (Caro 2005).

Similarly, barrier effects may be experienced by native animals in the form of increased patrolling and predation by pest animals along barriers, such as a cleared corridor. Foxes and wild cats target these barrier areas as prey becomes more exposed and easier to detect and catch.

#### **7.1.8 Dust and Light Impacts**

Dust, and light are direct impacts that have the potential to occur as a result of the Project activities during all phases and may also have cumulative effects. The likelihood of potential impacts is anticipated to be greatest where the Project activities take place near vegetated areas and known habitat, during the construction and rehabilitation phases.

The Project will result in impacts from light spill into adjacent receiving environments (e.g. fauna habitat) due to the operation of plant and equipment throughout the construction phase of the proposal and installation of lighting on infrastructure required for the operation of the Project. Impacts associated with light spill may include direct impacts (e.g. increased susceptibility to predation from increased light) or indirect impacts related to altered foraging and habituation in areas exposed to increased lighting. Light impacts associated with construction will be temporary in nature, however operational lighting impacts will be long term and localised (e.g. infrastructure) or transient in nature (i.e. vehicle movement).

Ecological receptors affected by these potential impacts include all threatened fauna species listed under the provisions of the EPBC Act and/or NPW Act. These types of impacts are likely to be short in duration and localised.

#### **7.1.9 Noise and Vibration Impacts**

Noise and vibration have the potential to adversely affect wildlife and sensitive habitat located near construction activities. Noise impacts may include changes in behaviour and physical harm, which have the potential to adversely impact sensitive wildlife populations.

Birds have been identified as the primary noise-sensitive receptors for this Project however mammal and reptile species were also noted within the Project Area.

The potential of anthropogenic noise on birds are commonly identified as follows (Dooling & Popper 2007):

- Physiological effects, such as stress, avoidance and fright-flight responses;
- Damage to hearing from acoustic over-exposure; and
- Masking of important bioacoustics and communication signals, such as the ability to hear each other or predators, which may also lead to dynamic behavioural and population effects (Shannon, et al. 2016).

The range of hearing for mammals and reptiles and the consequent sensitivity to anthropogenic noise are not as well researched. However, behavioural and physical responses similar to those listed above have been noted in available literature.

A summary of the impacts to animal species has been provided in the following sections. The basis for these findings can be found in the report titled *Whalers Way Orbital Launch Complex - Environmental Assessment Report - Noise Assessment* (AECOM, December 2020).

All the threatened fauna species listed under the EPBC Act and NPW Act detailed in Table 9 are likely to be impacted by the impacts detailed below.

#### 7.1.9.1 Wildlife Response to Noise

In birds, hearing is the second most important sense after vision (Beason 2004). The noise from a rocket launch could elicit a startle response in birds located in the immediate area of the launch. Noise generated during launch activities have the potential to disturb birds, resulting in the potential loss of bird eggs, and abandonment of nesting, breeding or feeding areas (FAA 2009) and (SpaceX 2019).

High levels of disturbance, such as from aircraft operations, can cause sudden nest abandonment, which can lead to a potential loss of eggs or chicks through breakage, trampling, chilling and predation (Wilson, Culik, Danfeld, & Adelung 1991).

The response of seabirds to disturbance varies on the stage of breeding or growth:

- Non-breeding seabirds are more likely to flee, compared to breeding birds which are reluctant to abandon their eggs or chicks;
- Breeding birds tend to flee more readily when their chicks are larger, particularly after chicks begin crèching;
- Chicks in the crèche stage are more sensitive to helicopter noise and are more likely to stampede; and
- Birds in the moult phase are also more sensitive to helicopter operations.

Dooling & Popper (2016) recommend interim guidelines for potential effects to birds from different noise sources, presented in Table 13.

**Table 13 Recommended interim guidelines for potential effects from different noise sources**

Noise Source Type	Hearing Damage	Temporary Threshold Shift (TTS)	Masking
Single impulse (e.g., starter's pistol 6" from the ear)	140 dBA	NA	NA
Multiple impulse (e.g. jackhammer, pile driver)	125 dBA	NA	Ambient dBA
Mammals	110 dBA	NA	Ambient dBA
Non-strike continuous (e.g. construction noise)	None	93 dBA	Ambient dBA

### 7.1.9.2 Wildlife Impacts During Construction

Utility construction activities are expected to be the noisiest stage of the Project construction, with ground compaction expected to produce the highest level of noise from the site. Noise levels in excess of the those that have been established to protect birds from temporary hearing damage ( $L_{Aeq}$  93 dB) are predicted to be achieved at distances approximately 10 – 20 metres from the works.

Masking of communication signals may be impacted temporarily during construction. Ambient sound measured throughout the study area was as low as 38 dBA during the day and 30 dBA at night, meaning that construction noise could be up to 20 dB above the ambient level at approximately one kilometre from the proposed construction areas.

Continuous noise levels that are 20 dB above background (50 – 60 dB(A)) in the frequency region of bird hearing and communication can have a detrimental effect on the detection and discrimination of vocal signals by birds (Dooling & Popper, 2007).

Potential behavioural and/or physiological effects are noted as possible in any case where construction noise is audible. This includes both construction activities that produce short bursts of impulsive noise and the continuous noise produced by mobile and fixed machinery.

It would be impossible to reduce construction noise to an inaudible level, particularly for areas located within two kilometres of the works. However, construction noise could be minimised by limiting intensity and duration of high impact activities near sensitive wildlife area where possible.

Construction of the Project will be managed in accordance with a Construction Environmental Management Plan (CEMP) and Operational Environmental Management Plan (OEMP) to ensure that all impacts are reduced as far as practicable utilising management measures outlined.

### 7.1.9.3 Wildlife Impacts During Operation

#### *Supporting infrastructure*

The predicted noise level of 62 dB(A) at 25 m from the Project Area is below the continuous noise level threshold of 93 dB(A) for causing temporary threshold shift in birds. It is considered that the risk of operational noise impacts from general site facilities would be limited to the masking of communication signals and brief behavioural response.

#### *Rocket launches*

Noise from launches would temporarily alter the quiet setting of the natural environment for one to two minutes during launches and for up to 15 seconds during testing. These events have the potential to disturb nearby residents and have an adverse physiological or behavioural impact on the wildlife located in the local habitat.

The maximum instantaneous sound pressure level ( $L_{Amax}$ ) for the subsonic launch activities assuming the loudest rocket in each location has been shown in the noise contour maps Figure 8 and Figure 9. This assessment should be considered conservative as the noise levels produced by the smaller rockets (i.e. quieter) planned for use at the Southern Launch have not been considered for these worst-case scenarios.

Noise from launches and stationary rocket testing are predicted to temporarily alter the quiet setting of the natural environment with noise briefly above the measured ambient level at distances further than five kilometres from the launch.

The Southern Emu Wren, Western Whipbird (eastern) and other protected species that inhabit the areas close to the launch site are at greatest risk increased stress, adverse behaviour reactions and physiological impacts. Coastal species are predicted to generally be exposed to low levels of noise however a brief adverse behavioural response is likely.

No wildlife is predicted to be exposed levels above the permanent hearing damage threshold of 140 dB(A). This would be unlikely, as sound pressure levels of this magnitude are likely to be limited to the launch site only.

Information from the studies reviewed could not confirm whether long term behavioural changes would be caused by launch vehicles or if the birds in this area would habituate to the sound of launches and testing. Some birds have demonstrated the ability to habituate to repeated, regular and predictable

flights, such as king penguin studies in Hughes et al. (2008). While it has been studied that some birds can become accustomed to aircraft, others may become sensitised to aircraft noise and become more easily disturbed (Hoang, 2013).

Studies of terrestrial mammals have shown that noise levels of 120 dBA can damage mammals' ears, and levels at 95 dBA can cause temporary loss of hearing acuity (Wyle, 2003). It is likely that the possible impacts to mammals would be similar to birds noting that mammals would be unable to move away from the noise being produced as quickly and may be exposed to higher levels for longer.

As noted for human impacts, it is unlikely that there are feasible source controls available in addition to those already incorporated in the Southern Launch design. As the long-term impacts are unknown, it is recommended that a plan to monitor the behaviour of protected wildlife in response to noise be included within the CEMP and OEMP.

#### **7.1.9.4 Exposure to Shockwaves**

The potential impact from sonic booms has been determined by comparing the impact of other launch facilities with a similar planned azimuth, trajectory and rocket size.

Supersonic speeds are assumed to occur approximately three kilometres from the coast during vehicle ascent over the ocean. Sonic booms produced during vehicle ascent are typically directed in front of the vehicle and the entire boom footprint is usually some distance downrange of the launch site (SpaceX, 2020). The smaller rockets proposed for the Southern Launch facility are also relatively small which would limit the size of sonic boom being created.

Furthermore, impact assessments for suborbital rocket launch facilities in the United States (FAA, 2009) have concluded that sonic booms are less likely to contribute to other noise impacts associated with the launch if they occur over the ocean at a high altitude. Rocket landing events can often result in single or multiple sonic booms as vehicles return to subsonic speeds however this type of activity is not proposed by Southern Launch.

Hence, the overpressure produced by the sonic boom is not expected to exceed the assessment criteria of 133 dBL on land. The audible component of a sonic boom may sound similar to a single distant thunderclap that could result in a short-duration startle response.

#### **7.1.9.5 Underwater Impacts**

Acoustic energy from in-air noise does not effectively transfer across the sea surface meaning that most of the noise is reflected off the water surface especially if a sound wave hits the interface at shallow angles of incidence (Vella, et al., 2001).

Accordingly, underwater noise impacts were not considered significant environmental risk to marine species and were not assessed further.

#### **7.1.9.6 Ground Vibration**

The extent of ground and structural vibration produced by the acoustic environment near the launch vehicle is expected to be limited to the buildings supporting the launch.

#### **7.1.9.7 Audible Bird Scaring Devices (Scare Gun)**

The SA EPA *Environmental Noise Guidelines – Audible Bird Scaring Devices* (EPA 2007) allow for maximum accumulated peak level for impulsive noise devices of 118 dB. This level is determined by the location of the nearest human receptor. These devices generate approximately 120 dB and can be used multiple times throughout hours of 7am to 8pm. Primary producers set these devices to generate loud noise bursts for 6 to 10 (or more) bursts per day which results in potentially over 130 (or more) loud and sudden bursts of noise per day. Southern Launch's proposal involves one loud burst of noise every three weeks to encourage fauna in the immediate vicinity of the launch to move away from the area (e.g. priority for smaller threatened birds, Western Whipbird and Southern Emu wren).



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

PROJECT ID: 60627263  
 CREATED BY: LDE  
 LAST MODIFIED: EVANS, L. 2020 DEC 20 2020



**L<sub>Amax</sub> Noise Levels**

- 110 dBA (Temporary Threshold Shift)
- 125 dBA (Multiple Impulses Hearing Damage)
- 140 dBA Single Impulse Hearing Damage

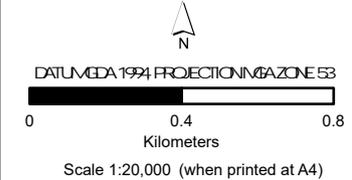
**Features**

- Construction Zones
- Southern Emu Wren
- Residential Locations
- Western Whipbird (eastern)

**CALCULATED L<sub>AMAX</sub> NOISE LEVELS FOR A ROCKET LAUNCH AT LAUNCH SITE A**

Client: Southern Launch  
 Whalers Way Orbital Launch Complex - Environmental Assessment Report: Noise Assessment

Figure  
8





Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User-Community

PROJECT ID: 60627263  
 CREATED BY: LDE  
 LAST MODIFIED: EVANS, L. 2020 DEC 20 2020

**AECOM**  
 www.aecom.com

DATUM: GDA 1994, PROJECTION: MGA ZONE 53

0 0.2 0.4 0.8  
 Kilometers  
 Scale 1:20,000 (when printed at A4)

**L<sub>max</sub> Noise Levels**

- 110 dBA (Temporary Threshold Shift)
- 125 dBA (Multiple Impulses Hearing Damage)
- 140 dBA (Single Impulse Hearing Damage)

**Features**

- Construction Zones
- Residential Locations
- Southern Emu Wren
- Western Whipbird (eastern)

**CALCULATED L<sub>MAX</sub> NOISE LEVELS FOR A ROCKET LAUNCH AT LAUNCH SITE B**

Client: Southern Launch

Whalers Way Orbital Launch Complex - Environmental Assessment Report: Noise Assessment

Figure 9

### 7.1.10 Dam and Detention Basins

As detailed in Section 2.1 detention basins will be located at Launch Site A and Launch Site B and a 30 megalitre capacity dam is to be located at Infrastructure Site D. There is the potential impact that these open water bodies will attract pest species such as cats, foxes, and native species (birds, reptiles and mammals) and increase the presence of weeds. The detention basins will be lined with a polymer lining and a 1800 mm chain mesh fence with three strands of barbed wire will be installed around all the three open water bodies. Weed control will be a regular mitigation measure during the construction and operational phase of the Project as detailed in Table 20. These mitigation measures will ensure pest species and native ground dwelling fauna species are prevented from entering the open water bodies.

The above does not preclude the attraction and risk of native bird species (species detailed in Section 6.4.2) utilising these water bodies as a water source and causing aggregation issues within the Project Area. If water within these water bodies is contaminated from the storage of stormwater from the deluge process and storage of firefighting water, there is a risk bird species that utilise these water bodies become sick, injured and or potential death.

Southern Launch has undertaken water quality analysis of the process of water deluge storage and firefighting water in the Water Quality Report prepared for the Project. The report indicates there is a low risk of contamination in the water to be stored in the three open water bodies. Further to this the water bodies will be covered with a geotextile tarp or shade cloth to detract bird species to these water bodies.

### 7.1.11 Irrigation

The major threat irrigation poses to the environment is increased salt content in the soil which leads to decline in nutrient in soils and loss of habitat for native flora and fauna species. Irrigation also modifies vegetation structure and composition, likely to facilitate weed invasion and may increase local herbivory. Irrigation for the Project is subject to the detailed design phase and an irrigation management plan and water quality monitoring program will be developed to manage irrigation for the Project.

All irrigation will occur within the Project Area footprints. Irrigated areas will be surrounded by gravel areas with a minimum buffer zone of 23 m from native vegetation at one point with most irrigation having a gravel/asphalt buffer zone of greater than 30 m from native vegetation.

The Project will limit the landscaping from a plant perspective using species growing in situ only where possible. Any disturbed topsoil from top 200 mm during construction should be stockpiled in low windrows until construction complete and then used to recover areas post hard landscaping to promote natural regeneration including sticks, litter and detritus. This material carries necessary seedbank, fungal and mycorrhizal material to allow for natural germination of indigenous species.

Through the implementation of these design considerations and the mitigation measures detailed in Table 20 the risks irrigation pose can be managed adequately.

### 7.1.12 Increased Fire Risk

An increase in fire frequency is likely to disrupt the life cycle of flora and fauna and often results in a change in vegetation structure which includes loss of fallen timber and stags and is often followed by an increase in shrub density. While many Australian flora species have developed mechanisms to cope with fire in the landscape, frequent fires will decrease the resilience of the plant communities. Some flora species may be burnt before they are mature enough to seed thus reducing the diversity of the vegetation community which in turn can further reduce its habitat quality. Excessively hot fires also have the potential to sterilise the ground by killing the seedbank and further altering the vegetation structure.

The loss of fallen timber and stags decreases habitat availability for many native species and is likely to increase stress and resource pressure on fauna species. The loss of these habitat features may also increase the risk of predation of species by both native and introduced fauna.

The Project may increase the risk of fire due to hot works during construction activities and the chance of sparks occurring off the rocket launches during times of hot and dry conditions.

Fire protection mitigation measures are detailed in Table 20.

### 7.1.13 Indirect Impacts

Potential indirect impacts the Project may have on terrestrial ecology values have been detailed above. Through progressed design buffers have been applied in the Project Area footprints of each facility and tracks to limit indirect impacts to vegetation, flora and fauna in the vicinity.

All vegetation within the Project Area has had an additional 5 m clearance buffer applied to the Project Area footprint for fire safety. The buildings and infrastructure are all located within minimum 5 m of the Project Area boundary, in some instances up to 20 m from the boundary dependant on form of batters.

All roads have a 3 m buffer applied to each side of the road however this may be utilised as 6 m on one side of the road as part of upgrades or alternatively as the buffer is stated, dependent on the bends in roads and terrain encountered. This is also provided to allow for the addition of power and water easements, the construction method and infrastructure type not finalised at this stage.

## 7.2 Matters of National Environmental Significance

The EPBC Act is administered by the DAWE and provides a legal framework for the protection and management of nationally and internationally important flora, fauna, ecological communities and heritage places, which are referred to as MNES. Specifically, the EPBC Act protects the following MNES:

- World heritage places;
- National heritage places;
- Wetlands of international importance;
- Listed threatened species and ecological communities;
- Migratory species;
- Commonwealth marine areas;
- The Great Barrier Reef Marine Park;
- Nuclear actions; and
- A water resource, in relation to coal seam gas development and large coal mining development.

The Project, so as to align with the EPBC Act, has the potential to result in a significant impact to five Threatened species and one Migratory species listed under the EPBC Act.

### 7.2.1 Threatened Flora

The West Coast Mintbush listed under the EPBC Act as Vulnerable was considered likely to occur in the Project Area post the desktop assessment and baseline field survey. This assessment was determined by its known range and recent records in the area. During the targeted spring survey the West Coast Mintbush was not recorded.

West Coast Mintbush is a prostrate shrub <50 cm high. It has red flowers that appear between September and December that are 15-25 mm long (DEWHA 2008).

The West Coast Mintbush is mostly restricted to the western half of Eyre Peninsula where it occurs on limestone outcrops in mallee vegetation, with one outlier population that occurs west of the Peninsula at Coorabie (DEWHA, 2008). There are several known records of this species near the Project Area.

Two vegetation associations represent suitable habitat for this species including:

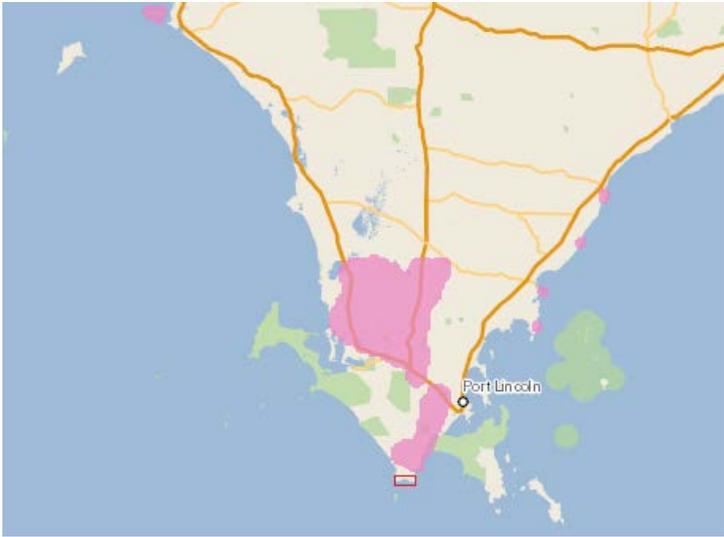
- Vegetation Association 3 Coastal White Mallee (*Eucalyptus diversifolia*) Low Mixed Mallee over sclerophyllous shrubs recorded on stable dunes where grey sandy loams overlay sheet limestone (8.36 ha); and
- Vegetation Association 4 Ridge Fruited Mallee (*Eucalyptus angulosa*) +/- Coastal White Mallee (*Eucalyptus rugosa*) Low Mixed Mallee on calcareous silty loam soils with a surface that formed a thick crust (1.2 ha).

There is limited information available for the West Coast Mintbush in the DEWHA (2008) conservation advice, the DAWE (2020b) publicly available database or NatureMaps. The significance assessment is restricted to available information and the results of the baseline and targeted surveys.

There is no National Recovery Plan for the species. The Project has been assessed against the Significant Impact Guidelines (DEWHA 2013), presented in Table 14.

**Table 14 Significant Impact Assessment for the West Coast Mintbush**

Significance Criteria	Assessment of Nature and Extent of Impacts
Possibility the action will lead to a long-term decrease in the size of an important population of a species.	<p><b>Unlikely</b></p> <p>No individuals of West Coast Mintbush have been recorded in the Project Area. A review of the extent of occurrence shows that the species occurs north of Whalers Way as shown in the inset below (DAWE 2020b) with the pink polygon representing its current known extent and the red box representing the vicinity of the Project Area.</p> <p>The nearest known record is 13 km northeast of the Project Area along Proper Bay Road near Sleaford Mere (DEW, 2020). It is therefore unlikely that there is an 'important population' within the Project Area.</p> <p>In the absence of known records within the Project Area, it is unlikely that an important population will be cleared.</p>
Possibility the action will reduce the area of occupancy of an important population.	<p><b>Unlikely</b></p> <p>The Project will result in clearing up to 9.56 ha of potentially suitable West Coast Mintbush habitat within the Project Area. No individuals have been recorded during baseline and targeted surveys are unlikely to be present. As such, the Project is unlikely to reduce an area of occupancy for this species.</p>
Possibility the action will fragment an existing important population into two or more populations.	<p><b>Unlikely</b></p> <p>The Project will clear 9.56 ha of potentially suitable habitat. This habitat was observed to extend beyond the Project Area and is considered locally common. The Project Area for the Project will comprise small areas used for the pads and associated infrastructure, and tracks. These are unlikely to be considered large enough to cause any fragmentation in the event that individuals and / or populations are recorded in the vicinity of the Project Area.</p>
Possibility the action will adversely affect habitat critical to the survival of a species.	<p><b>Unlikely</b></p> <p>West Coast Mintbush is not known to occur within the Project Area, with the nearest record 13 km northeast near Sleaford Mere. However suitable habitat has been mapped for 9.56 ha comprising mallee woodlands on limestone and calcareous soils.</p> <p>Critical habitat is not defined in the DEWHA (2008) conservation advice to the survival of the species is defined as areas around known occurrences of similar habitat.</p> <p>This is evident on the DAWE (2020b) occurrence map below with pink polygons representing the indicative distribution of the species based on best available knowledge. The red box represents the vicinity of the Project Area.</p>

Significance Criteria	Assessment of Nature and Extent of Impacts
	
<p>Possibility the action will disrupt the breeding cycle of an important population.</p>	<p><b>Unlikely.</b></p> <p>Important populations are defined as the known records as shown on ALA (2020) and NatureMaps (2020). The nearest population is 13 km from the Project Area and no indirect impacts are anticipated to occur.</p>
<p>Possibility the action will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.</p>	<p><b>Unlikely</b></p> <p>The Project is 13 km from the nearest known population. This population is not near the access road to Whalers Way. As such, this population will not be directly or indirectly affected by the Project.</p> <p>The Project will result in the removal of up to 9.56 ha of habitat considered suitable for the West Coast Mintbush. This habitat was observed as homogenous at Whalers Way, extending both north, east and west outside the Project Area. The clearing of a portion of this habitat is therefore not considered a significant impact given the extent of habitat available in the local and regional area.</p>
<p>Possibility the action will result in invasive species that are harmful to a critically endangered, endangered or vulnerable species' becoming established in the critically endangered, endangered or vulnerable species' habitat.</p>	<p><b>Unlikely</b></p> <p>The construction and operation of the Project will be managed in accordance with a CEMP and OEMP which will provide appropriate mitigation measures, measurable targets and contingency actions to prevent the introduction of invasive species in suitable habitat for the West Coast Mintbush.</p>
<p>Possibility the action will introduce a disease that may cause the species to decline.</p>	<p><b>Unlikely</b></p> <p>The CEMP and OEMP will include appropriate mitigation measures and measurable targets and contingency actions to prevent the introduction of a disease that may cause the species to decline or affect suitable habitat for this species in the surrounding area.</p>
<p>Possibility the action will interfere with the recovery of the species.</p>	<p><b>Unlikely</b></p>

Significance Criteria	Assessment of Nature and Extent of Impacts
	<p>There is no recovery plan for this species. The main threats to West Coast Mintbush include grazing, lack of recruitment, habitat fragmentation and clearance of habitat resulting from developments and road maintenance (DEWHA 2008).</p> <p>The Project will not exacerbate grazing, lack of recruitment or habitat fragmentation. Clearing of up to 9.56 ha of suitable habitat will occur. No records of the species are within the Project Area, and the habitat is homogenous at Whalers Way and extends beyond the Project Area.</p>

There is 9.56 ha of potentially suitable habitat present with the Project Area for the species. As suitable habitat for this species is homogenous at Whalers Way and extends beyond the Project Area, and that the species was not recorded during baseline surveys or the targeted spring survey has led to the conclusion that the Project is unlikely to have a significant impact on West Coast Mintbush.

### 7.2.2 Threatened Fauna

The PMST search identified 28 terrestrial fauna likely to occur within the vicinity of the Project. An assessment of likelihood of occurrence was undertaken for these species (Appendix E). Of the 28 threatened fauna species, two have been recorded within and in close proximity to the Project Area and one is likely to occur:

- Australian Fairy Tern (Vulnerable) – likely to occur;
- Western Whipbird (eastern) (Vulnerable) – known to occur; and
- Southern Emu-wren (Eyre Peninsula) (Vulnerable) – known to occur.

#### 7.2.2.1 Australian Fairy Tern

There have been two sightings of the Australian Fairy Tern within 5 km of the Project Area, one of which was on Red Banks Beach and was considered to be potentially nesting (DEW 2020). Red Banks Beach is approximately 1.3 km from the Project Area.

The main threats to the Australian Fairy Tern (DAWE 2020c) include:

- Predation by introduced mammals such as the Red Fox, domestic cats, Black Rats (*Rattus rattus*), and native birds such as Silver Gulls (*Larus novaehollandiae*), Pacific Gulls (*Larus pacificus*), Swamp Harrier (*Circus approximans*) and ravens (*Corvus* spp.);
- Disturbance by humans, dogs and vehicles, which can cause the direct destruction of nests or the desertion of nests;
- Increasing salinity in waters adjacent to Australian Fairy Tern colonies, which can lead to a collapse in the numbers of prey fish causing a decline in Australian Fairy Tern numbers;
- Irregular water management, which can result in water levels being too high, flooding nests, or too low allowing predators to walk across to breeding colonies; and
- Weed encroachment, which often leads to nest sites being overgrown by vegetation rendering them unsuitable for breeding.

The Project has been assessed against the Significant Impact Guidelines (DEWHA 2013), presented in Table 15.

**Table 15 Significant Impact Assessment of the Australian Fairy Tern**

Significance Criteria	Assessment of Nature and Extent of Impacts
Possibility the action will lead to a long-term decrease in the size of an important population of a species.	<p><b>Unlikely</b></p> <p>This species was sighted once near the Project Area in 2004, approximately 1.3 km from the Project Area.</p>

Significance Criteria	Assessment of Nature and Extent of Impacts
	<p>NatureMaps (DEW 2020) shows the nearest other location is the southern tip of Liguanea Island. Known records for this species are widely dispersed, however this may be a reflection of survey effort rather than occupancy.</p> <p>There is no breeding habitat within the Project Area. It is possible that the species breeds along the cliffs of Whalers Way, which is 2 km from the Project Area, however direct impacts from clearing of suitable habitat or construction activities are not anticipated to occur in this area.</p> <p>Impacts from noise and lighting may displace individual birds in the area. Noise generated during launch activities have the potential to disturb birds, resulting in the potential loss of bird eggs, and abandonment of nesting, breeding or feeding areas (FAA 2009) and (SpaceX 2019). These impacts are anticipated to be localised and of short duration therefore should not reduce the area of occupancy for an extended period in the local vicinity.</p> <p>Important populations for this species have not been defined therefore for the purpose of this assessment all breeding locations are considered important populations.</p> <p>This species is highly mobile and has a range that extends around majority of Australia's mainland. It is unlikely that the Project will result in a decrease in size of an important population.</p>
Possibility the action will reduce the area of occupancy of an important population.	<p><b>Unlikely</b></p> <p>The habitat of the Australian Fairy Tern extends along most of southern Australia's mainland. The Project will not have a direct or indirect impact on breeding or foraging habitat. The clearing of vegetation or indirect impacts associated with noise and vibration and lights are unlikely to reduce the area of occupancy significantly.</p>
Possibility the action will fragment an existing important population into two or more populations.	<p><b>Unlikely</b></p> <p>The Project will not have a direct or indirect impact on breeding or foraging habitat. It is unlikely that the Project will result in fragmentation of an important population.</p>
Possibility the action will adversely affect habitat critical to the survival of a species.	<p><b>Unlikely</b></p> <p>The baseline survey did not identify habitat that is critical to the survival of this species as defined by DEWPAC (2013).</p> <p>As such, the Project will not adversely affect habitat that is critical to the survival of this species.</p>
Possibility the action will disrupt the breeding cycle of an important population.	<p><b>Unlikely</b></p> <p>The species nests on coral shingle on continental islands or coral cays, on sandy islands and beaches inside estuaries, and on open sandy beaches (DAWE 2020c).</p>

Significance Criteria	Assessment of Nature and Extent of Impacts
	There is no suitable breeding habitat within or in close proximity to the Project Area, as such the Project will not impact on the breeding cycle.
Possibility the action will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	<b>Unlikely</b> The wide-ranging behaviour of this species and availability of extensive habitat in the region means that it is unlikely that the Project will affect habitat to the extent that the species is likely to decline.
Possibility the action will result in invasive species that are harmful to a critically endangered, endangered or vulnerable species' becoming established in the critically endangered, endangered or vulnerable species' habitat.	<b>Unlikely</b> Invasive fauna species identified as key threats (Red Fox, domestic cats) harmful to this species are already present in the Project Area and the local region. The Project will not influence the prevalence of invasive species provided active management occurs in keeping with operational phases of the Project.  The Project is unlikely to result in invasive species that are harmful to a critically endangered, endangered or vulnerable species' becoming established in the critically endangered, endangered or vulnerable species' habitat.
Possibility the action will introduce a disease that may cause the species to decline.	<b>Unlikely</b> There are no known diseases that affect this species defined in relevant information sources (DAWE 2020c; DEWHA 2013). The Project will not lead to the introduction of a disease that will affect the Australian Fairy Tern.
Possibility the action will interfere with the recovery of the species.	<b>Unlikely</b> There is no recovery plan for this species however the main threats were considered in this assessment including predation, disturbance of habitat, increasing salinity, irregular water management and weed encroachment. Lacking suitable foraging and breeding habitat in the area, the highest risk posed by the Project is noise impacts from the rocket launches This is not considered a main threat to the species. All indirect impacts including noise, lighting and weeds will be appropriately managed in accordance with a CEMP and OEMP.  Given the above, the Project will not impact the recovery of this species in the southern Eyre Peninsula region.

Based on the available information for the Australian Fairy Tern, including its preferred foraging and breeding habitat, and known records, it is unlikely that the Project will have a significant impact on this species.

#### 7.2.2.2 Western Whipbird (eastern)

There are three isolated regional populations of the Western Whipbird (eastern) in SA one of which is on the Eyre Peninsula (DAWE 2020d).

The habitat of the Western Whipbird (eastern) was observed as low Mallee, generally *Eucalyptus diversifolia* (Vegetation Association 3) and *Eucalyptus angulosa* low (Vegetation Association 4) Mallee.

This habitat is extensive and widespread in the Whalers Way area being the dominant cover for areas interacting with the Project Area particularly within low Mallee vegetation with an average height of 1.5 m and above.

Targeted surveys observed the Western Whipbird regularly by call within and near the Project Area. The Project Area includes 23.76 ha of suitable habitat for this species that will be required to be cleared for the Project.

The major threats to the Western Whipbird (eastern) (DAWE 2020d; DELWP 2016) are:

- Broad-scale clearing of mallee habitats;
- Extensive wildfires which leads to isolation and fragmentation and removal of suitable habitat; and
- Climate change resulting in increased risk of bushfires, heatwaves, floods and drought which may influence the availability of food resources particularly for populations that are already isolated by broad-scale clearing (DELWP 2016).

The Project has been assessed against the Significant Impact Guidelines (DEWHA 2013), presented in Table 16.

**Table 16 Significant Impact Assessment of the Western Whipbird (eastern)**

Significance Criteria	Assessment of Nature and Extent of Impacts
<p>Possibility the action will lead to a long-term decrease in the size of an important population of a species.</p>	<p><b>Potential</b></p> <p>The Project will require clearing of 23.76 ha of suitable habitat for this species on the southern Eyre Peninsula which supports the largest sub-population of the Western Whipbird (eastern).</p> <p>Targeted surveys observed the Western Whipbird regularly by call within and near the Project Area, and the species is likely to utilise the area for foraging and breeding.</p> <p>The Western Whipbird (eastern) has known populations in the nearby Coffin Bay National Park and Lincoln National Park that will not be affected by the Project. Following clearing for the Project, it is anticipated that the remaining vegetation will be able to support the population that currently resides in the area.</p> <p>Operational noise through the launching of rockets at a frequency of once every three weeks for a duration of 1 minute and 15 seconds will generate noise at a level that will likely impact the species up to 4-5 km from the launch site. The species is sensitive to discrete, unpredictable disturbances such as sudden loud noises that can cause physiological effects, such as stress, avoidance and fright-flight responses, damage to hearing from acoustic over-exposure, and masking of important bioacoustics and communication signals, such as the ability to hear each other or predators, which may also lead to dynamic behavioural and population effects.</p> <p>Although there is suitable habitat and known populations in nearby national parks the clearing of 23.76 ha of suitable habitat for the species and the potential operational indirect to the species, the Project has the potential to lead to a long-term decrease in the size of an important population of a species.</p>

Significance Criteria	Assessment of Nature and Extent of Impacts
<p>Possibility the action will reduce the area of occupancy of an important population.</p>	<p><b>Potential</b></p> <p>The southern Eyre Peninsula supports the largest known population of Western Whipbird (eastern) in Australia (Higgins &amp; Peter 2002).</p> <p>The Project will result in clearing 23.76 ha of suitable habitat for this species. This will result in direct habitat loss and potentially reduced capacity for the area to support this population.</p> <p>Impacts from noise and lighting may displace individual birds in the area. These impacts are anticipated to be localised and of short duration therefore should not reduce the area of occupancy for an extended period in the local vicinity.</p> <p>The clearance of vegetation therefore has the potential to reduce the area of occupancy of an important population.</p>
<p>Possibility the action will fragment an existing important population into two or more populations.</p>	<p><b>Unlikely</b></p> <p>As a sedentary bird that is only able to fly short distances, fragmentation is a key threat for this species. This is particularly relevant for clearing of wide corridors, large scale clearing, or removing small patches of habitat that resemble stepping stones in areas that are largely cleared.</p> <p>Clearing for the Project includes the clearance of three launch pads and vegetation along an existing track totalling 23.76 ha. These blocks occur within homogenous native vegetation that extends beyond the cleared areas in all directions.</p> <p>Given the above, the Project is unlikely to fragment an existing important population into two or more populations.</p>
<p>Possibility the action will adversely affect habitat critical to the survival of a species.</p>	<p><b>Potential</b></p> <p>The Project is located within the area known to support the largest sub-population of the Western Whipbird (eastern). All suitable habitat in the region is considered critical habitat, however this habitat is homogenous and considered locally common at Whalers Way and the surrounding Coffin Bay National Park and Lincoln National Park.</p> <p>Targeted surveys observed the Western Whipbird regularly by call within and near the Project Area, and the species is likely to utilise the area for foraging and breeding. No nesting was observed during targeted surveys, however surveys were not conducted during the nesting season of September to October when calling is more prevalent.</p> <p>Operational noise through the launching of rockets has the potential to impact the species behavioural patterns and force the species to abandon nests during nesting and breeding times.</p>

Significance Criteria	Assessment of Nature and Extent of Impacts
	<p>The Project is likely to affect critical habitat for this species through the direct clearing of approximately 23.76 ha of critical habitat.</p> <p>Although there are known populations and habitat for the species in the greater Whalers Way area and nearby national parks, the removal of 23.76 ha of critical habitat has the potential to adversely affect habitat critical to the survival of a species.</p>
<p>Possibility the action will disrupt the breeding cycle of an important population.</p>	<p><b>Potential</b></p> <p>The Project is located within the area known to support the largest sub-population of the Western Whipbird (eastern).</p> <p>Targeted surveys observed the Western Whipbird regularly by call within and near the Project Area, and the species is likely to utilise the area for foraging and breeding. No breeding was observed during the targeted survey. It should be noted that the survey was undertaken outside the known breeding period, therefore breeding may occur within or in close proximity to the Project.</p> <p>Operational noise through the launching of rockets at a frequency of once every three weeks for a duration of 1 minute and 15 seconds will generate noise at a level that will likely impact the species up to 4-5 km from the launch site. The species is sensitive to discrete, unpredictable disturbances such as sudden loud noises that can cause physiological effects, such as stress, avoidance and fright-flight responses, which may also lead to dynamic behavioural disrupt the breeding cycle of an important population.</p> <p>Any activity that disrupts the breeding of the largest sub-population of this species is likely to be significant. Therefore, the Project has the potential to have a significant impact on the breeding cycle of an important population.</p>
<p>Possibility the action will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.</p>	<p><b>Unlikely</b></p> <p>The Project will clear 23.76 ha of suitable habitat in an area where this species is known to occur. As detailed above, there is known habitat and records of the species in the greater Whalers Way area and nearby national parks.</p> <p>It is unlikely that the clearance of vegetation is likely to be of an extent that would cause the decline of the species due to the small area of proposed footprint in comparison to remaining vegetation. There is a large extent of suitable habitat within and surrounding the Project Area.</p>
<p>Possibility the action will result in invasive species that are harmful to a critically endangered, endangered or vulnerable species' becoming established in the critically endangered, endangered or vulnerable species' habitat.</p>	<p><b>Unlikely</b></p> <p>Invasive fauna species identified as key threats (Red Fox, domestic cats) to the Western Whipbird (eastern) are already present in the Project Area. The Project will not influence the prevalence of invasive species provided active management occurs in keeping with operational phases of the Project.</p>

Significance Criteria	Assessment of Nature and Extent of Impacts
	The Project is unlikely to result in invasive species that are harmful to a critically endangered, endangered or vulnerable species' becoming established in the critically endangered, endangered or vulnerable species' habitat.
Possibility the action will introduce a disease that may cause the species to decline.	<p><b>Unlikely</b></p> <p>Disease is not listed as one of the key threats for this species. A decline of vegetation condition through secondary impacts associated with pathogens such as <i>Phytophthora cinnamomi</i>, a water borne mould, has the potential to reduce the habitat quality. The habitat within the Project Area does not include flora species that are susceptible to this pathogen (i.e. Proteaceae).</p> <p>The Project is unlikely to will introduce a disease that may cause the species to decline.</p>
Possibility the action will interfere with the recovery of the species.	<p><b>Unlikely</b></p> <p>The recovery objectives for this species (DELWP, 2016) includes:</p> <ul style="list-style-type: none"> <li>• Retention of all existing subpopulations;</li> <li>• Reduce rate of decline;</li> <li>• Expand core populations; and</li> <li>• Initiate longer-term measures to ensure their persistence in south-eastern Australia.</li> </ul> <p>The population on the southern Eyre Peninsula will continue to occur in the region. The Project will implement measures that are likely to reduce the potential for wild bush fires in the local area. The expansion of core populations and longer-term measures to ensure persistence is beyond the scope of the Project.</p> <p>Given the above, the Project is unlikely to impact on the recovery of this species in the southern Eyre Peninsula region.</p>

The Project includes clearing 23.76 ha of Western Whipbird (eastern) habitat, with potential ongoing impacts from noise and lighting during operation. In consideration of the criteria, the Project has the potential to have a significant impact to the Western Whipbird (eastern).

### 7.2.2.3 Southern Emu-wren (Eyre Peninsula)

The Southern Emu-wren (Eyre Peninsula) is endemic to the southern tip of the Eyre Peninsula in SA. The Project includes clearing of 23.76 ha of suitable habitat for this species. Targeted surveys identified 18 individual birds, consisting of four pairs, one group of three and the seven singles.

The main identified threats to the Southern Emu-wren (Eyre Peninsula) (DotE 2013a) are:

- Bushfire causing widespread habitat loss;
- Land clearance/fragmentation due to poor dispersal ability;
- Predation by European Red Foxes (*Vulpes vulpes*) and likely also feral cats (*Stipiturus malachurus parimeda*);
- Climate change due to exposure to increase in frequency and intensity of fires;

- Grazing by kangaroos (*Macropus* spp.) and emus (*Dromaius novaehollandiae*); and
- Land development.

The potential for the Project to have a significant impact on the Southern Emu-wren (Eyre Peninsula) is summarised in Table 17.

**Table 17 Significant Impact Assessment for the Southern Emu-wren**

Significance Criteria	Assessment of Nature and Extent of Impacts
<p>Possibility the action will lead to a long-term decrease in the size of an important population of a species.</p>	<p><b>Likely</b></p> <p>The Project will result in clearing 23.76 ha of Southern Emu-wren (Eyre Peninsula) habitat within an area known to be populated by this species. The targeted surveys confirmed the presence of this species which is likely to utilise the area for foraging and breeding.</p> <p>The sub-population of Southern Emu-wren (Eyre Peninsula) at Whalers Way is considered one of five important populations to ensure the long-term survival of the species (DAWE 2020e). 18 individuals were recorded within the Project Area during the targeted survey and it is estimated the overall population is under 100 individuals in the Whalers Way area from Cape Wiles to Cape Carnot making the Whalers way Peninsula population tenuous to the impacts detailed above.</p> <p>Any mortality or reduction in available habitat through vegetation clearance or construction activities may lead to a long-term decrease in the size of an important population. The Project is likely to lead to a long-term decrease in the size of an important population of the Southern Emu-wren.</p>
<p>Possibility the action will reduce the area of occupancy of an important population.</p>	<p><b>Likely</b></p> <p>The Project will result in clearing 23.76 ha of critical habitat known to support foraging and likely breeding habitat for the Southern Emu-wren (Eyre Peninsula). It is uncertain what impacts the noise and lights would have on the ongoing occupancy of this species at Whalers Way.</p> <p>Operational noise through the launching of rockets at a frequency of once every three weeks for a duration of 1 minute and 15 seconds will generate noise at a level that will likely impact the species up to 4-5 km from the launch site. The species is sensitive to discrete, unpredictable disturbances such as sudden loud noises that can cause physiological effects, such as stress, avoidance and fright-flight responses, damage to hearing from acoustic over-exposure, and masking of important bioacoustics and communication signals, such as the ability to hear each other or predators, which may also lead to dynamic behavioural and population effects.</p> <p>The Project is therefore likely to reduce the area of occupancy of this species.</p>
<p>Possibility the action will fragment an existing important population into two or more populations.</p>	<p><b>Unlikely</b></p>

Significance Criteria	Assessment of Nature and Extent of Impacts
	<p>One of the key threats to Southern Emu-wren (Eyre Peninsula) is fragmentation (Pickett 2002; DotE 2013a). Habitat fragmentation as a result of vegetation clearing for the Project is considered localised. The habitat in the local area is contiguous and provides ample connectivity across Whalers Way. The widening of tracks and the construction of the launch pads may lead to local fragmentation for the species, however the species is relatively mobile and is able to traverse the distance a track represents.</p> <p>Given the above, the clearing of 23.76 ha of habitat for the Project is unlikely to fragment an existing important population into two or more populations.</p>
<p>Possibility the action will adversely affect habitat critical to the survival of a species.</p>	<p><b>Likely</b></p> <p>The Project Area has been mapped suitable habitat for the Southern Emu-wren (Eyre Peninsula). The Whalers Way population is considered to be one of the five populations that is considered to be important for the long-term survival and recovery of the Southern Emu-wren (Eyre Peninsula). Habitat critical to the survival of the Southern Emu-wren (Eyre Peninsula) includes all suitable habitat where there are known records, including the 23.76 ha that will be cleared for the Project.</p> <p>The Project is likely to adversely affect habitat critical to the survival of a species.</p>
<p>Possibility the action will disrupt the breeding cycle of an important population.</p>	<p><b>Potential</b></p> <p>The species is widespread within the Lincoln and Coffin Bay National Parks as well as other privately held reserves however many of these are likely to be separate breeding populations.</p> <p>The targeted survey recorded 18 individual birds, consisting of four pairs, one group of three and the seven singles within the Project Area and it is estimated the overall population is under 100 individuals in the Whalers Way area from Cape Wiles to Cape Carnot making the Whalers way Peninsula population tenuous to the impacts detailed above.</p> <p>Operational noise through the launching of rockets at a frequency of once every three weeks for a duration of 1 minute and 15 seconds will generate noise at a level that will likely impact the species up to 4-5 km from the launch site. The species is sensitive to discrete, unpredictable disturbances such as sudden loud noises that can cause physiological effects, such as stress, avoidance and fright-flight responses and nest abandonment.</p> <p>The Project has the potential to have a significant impact on the breeding cycle of an important population of this species.</p>
<p>Possibility the action will modify, destroy, remove, isolate or decrease</p>	<p><b>Potential</b></p>

Significance Criteria	Assessment of Nature and Extent of Impacts
the availability or quality of habitat to the extent that the species is likely to decline.	<p>The sub-population of Southern Emu-wren (Eyre Peninsula) at Whalers Way is considered one of five important populations to ensure the long-term survival of the species (DAWE 2020e). 18 individuals were recorded within the Project Area during the targeted survey and it is estimated the overall population is under 100 individuals in the Whalers Way area from Cape Wiles to Cape Carnot making the Whalers Way Peninsula population tenuous to the impacts detailed above.</p> <p>Any mortality or reduction in critical habitat through vegetation clearance or construction activities has the potential to be of an extent that would cause the decline of the species.</p>
Possibility the action will result in invasive species that are harmful to a critically endangered, endangered or vulnerable species' becoming established in the critically endangered, endangered or vulnerable species' habitat.	<p><b>Unlikely</b></p> <p>The Project will not influence the prevalence of invasive species provided active management occurs in keeping with operational phases of the Project.</p> <p>The proponent will consider removal of feral species in the local area as part of an offsets package which may reduce the impact of invasive species at Whalers Way.</p>
Possibility the action will introduce a disease that may cause the species to decline.	<p><b>Unlikely</b></p> <p>Disease is not listed as one of the key threats for this species. The Project is not considered likely to act as a vector for any diseases or pathogens.</p> <p>The Project is unlikely to will introduce a disease that may cause the species to decline.</p>
Possibility the action will interfere with the recovery of the species.	<p><b>Unlikely</b></p> <p>There is no National Recovery Plan for this species. The Project is unlikely to impact on the recovery of this species.</p>

The Project is located at Whalers Way which supports a large population of the Southern Emu-wren (Eyre Peninsula), recognised for its size and importance (DAWE 2020e; Pickett 2016). Any clearing of vegetation or risk of increased mortality is likely to be considered a significant impact. There is potential for that indirect impacts from construction and operational activities may lead to behavioural changes which may disrupt the breeding cycle or cause further reduction in habitat availability.

In consideration of the criteria, the Project is likely to have a significant impact to the Southern Emu-wren (Eyre Peninsula).

### 7.2.3 Migratory Species

One Eastern Osprey was recorded near Cape Carnot during the baseline field survey two abandoned nests are located greater than 2 km from the Project Area where rocket launches are proposed. The nests are not currently active and have anecdotally not been active for the past five years, however this species is known to return to return to inactive nests.

The current main threat to the Eastern Osprey in Australia is loss, degradation or alteration of habitat for urban or tourism development (DAWE 2020f).

The Project has been assessed against the Significant Impact Guidelines (DEWHA, 2013), presented in Table 18.

Table 18 Significant Impact Assessment of the Eastern Osprey

Significance Criteria	Assessment of Nature and Extent of Impacts
<p>Possibility the action will lead to substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.</p>	<p><b>Unlikely</b></p> <p>No nesting pair is currently known from the Project Area; two abandoned nests that are &gt; 2km from the Project Area are near the site.</p> <p>There are no recent records (BDBSA or Birdlife data) for these nest locations, nor are they mentioned /shown in Detmar and Dennis (2018). In addition, recent surveys November and December 2020 (Larry Bebbington) did not observe recent activity at the nesting sites. Bebbington L. during 2020 surveys observed no recent (past 3+ years) nest building activities or fresh chalk at the abandoned Osprey nest sites and concluded that following attempts to rebuild in 2017, the nests have been abandoned due to human disturbance (Jacobs 2020).</p> <p>Whilst it is acknowledged that coastline habitat is important for the species, there are vast areas of coastline habitat available. The current coastline habitat (2km from the Project site) provides sub optimal habitat for potential Eastern Osprey given the cliff top tracks and viewing platform that are frequently used by the public at the unmanaged Heritage site.</p> <p>There will be no direct disturbance through vegetation clearance or construction activities to breeding or foraging habitat for the Eastern Osprey.</p> <p>The Project aims to reduce public access, particularly to the clifftop tracks and Eastern Osprey viewing area (above an abandoned nest site). Rather the Project will benefit the local population, by reducing the current level of human disturbance and it is anticipated that Osprey may return to the coastline.</p> <p>Based on this it is considered the Project is unlikely to substantially modify, destroy or isolate an area of important habitat.</p>
<p>Possibility the action will result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.</p>	<p><b>Unlikely</b></p> <p>There are no invasive species known to be harmful to the Eastern Osprey. As a big predatory bird that nests in trees or cliffs, predation by foxes and cats are unlikely.</p> <p>No additional invasive species harmful to this species will be introduced as a result of this Project.</p>
<p>Possibility the action will seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.</p>	<p><b>Unlikely</b></p> <p>The fragmentation of current breeding pairs along the Great Australian Bight suggests that disturbance to a nest may reduce their area of occupancy in SA which has already suffered sizeable contraction in range and size during the 20<sup>th</sup> century (DAWE 2020f).</p> <p>In Australia the species occurs in coastal and estuarine northern temperate and subtropical regions, with the isolated SA population considered to be on the extreme southern edge of the species preferred bioclimatic range (Dennis and Clancy 2014). The current SA population is considered to be unstable with a number of nest relocations and 'refugee' pairs relocating to start</p>

Significance Criteria	Assessment of Nature and Extent of Impacts
	<p>new territories. Multiple contributing factors are likely to be influencing the instability in the current distribution, including human disturbance (Detmar and Dennis 2018). It is acknowledged that there is potential for at least one Osprey territory to overlap the Project Area, however given the lack of known active nests it is unlikely a core nest territory occurs within 2 km of the Project Area. The Project is not considered to directly impact the habitat of local individuals of the species through vegetation clearance, but noise impacts are expected as detailed in Section 7.1.9.</p> <p>Construction noise and operations noise (non-launch) are not expected to have an impact on the Eastern Osprey (Section 7.1.9).</p> <p>Operations (launch) noise will peak for approximately 60 seconds, every 3 weeks (0.005% of the time). This noise is generated whilst the launch vehicle ignites, lifts off and then moves a significant distance from the launch pad. The noise maximum will be between 130-140dB, up to 80m from the launch pad. It should be noted that this noise level is a worst case scenario and is expected to be generated by the largest vehicles. Southern Launch expects the majority of vehicles will generate much lower levels of noise. This noise will be mitigated by a water deluge and flame trench, which reduce the noise level by approximately 5-10dB. Noise levels from Launch Site A would dissipate to 100dB (nest site 2), 95dB (nest site 1 and northern end of Liguana Island); noise levels from Launch Site B would dissipate to 105 dB (nest site 2) and 98db (nest site 1), &lt; 95 dB (Liguana Island). Potential impacts up to 5 km may cause brief behavioural response to Eastern Osprey.</p> <p>A noise gas gun will be used to 'scare' any fauna that are near the immediate area prior to launch. This mitigation measure will reduce the number of fauna in the immediate noise zone close to the launch pad.</p> <p>In summary, whilst there is potential for at least one pair to utilise the habitat near the site, the SA population is already in decline, the project location does not have a known nesting pair and the specific location is not key to the whole SA population. Potential impacts are related to noise disturbance, noting that an active nest persist at the nearby busy Port Lincoln Marina (27 km away) and that the noise impacts that may occur for the Southern Launch operations would occur at infrequent and irregular intervals at the project site. Noise impacts would be most significant to an individual nesting pair (if located within 2 km of the launch pads) during the critical breeding period. In addition, the launch pad and other infrastructure location are not within the line of site of a known nesting pair. Based on this it is considered that project is unlikely to seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species, in this case Eastern Osprey.</p>

Based on the available information for the Eastern Osprey, including its preferred foraging and breeding habitat, and known records, it is unlikely that the Project will have a significant impact on this species.

### **7.3 State Matters**

This section provides an impact assessment on terrestrial biodiversity values, and address these in context of DIT's formal development assessment guidelines for the Project. The impact assessment is detailed in Table 19 and includes cross-references to sections in the report where these have already been addressed to avoid duplication.

Table 19 Assessment Guidelines Compliance

Terrestrial Biodiversity		Justification
<p>A Fauna and Flora Assessment and Management Plan, (including a Native Vegetation Clearance Data Report) prepared by an Accredited Consultant approved by the Native Vegetation Council. The assessment should undertake a survey of the vegetation and fauna (including EPBC Act Listed threatened species and communities), detail compliance with the mitigation hierarchy and describe the means by which the significant environmental benefit would be achieved. The Report should identify any changes required to the Native Vegetation Heritage Agreement currently in place for the site.</p>		<p>This technical report is a Flora and Fauna Assessment and does not include a Management Plan. Mitigation measures to be considered in a flora and fauna management plan are detailed in Section 8.0.</p> <p>The Native Vegetation Clearance Data Report (Ecosphere 2020) is provided in a separate deliverable to this technical report, that details compliance with the mitigation hierarchy and describe the means by which the significant environmental benefit would be achieved.</p>
<p><b>Assessment Requirement 2: The proposed development is located on land which currently holds significant stands of native vegetation within the Coastal Conservation zone.</b></p>		
2.1	<p>Describe the location, condition and significance of native vegetation on the subject site, including individual species and communities. Include reference to areas that have Heritage Agreements under the <i>Native Vegetation Act 1991</i> and any proposed alterations to or implications for the Heritage Agreement.</p>	<p>The location, condition and significance of native vegetation located within the Project Area has been detailed in Section 6.2 and Section 6.3.</p>
2.2	<p>Describe the location, condition and significance of native vegetation species and communities that may need to be cleared or disturbed during both the construction and maintenance phases. This should include clearing for all buildings, structures, hazardous zones and access arrangements.</p>	<p>The location, condition and significance of native vegetation required to be cleared within the Project Area has been detailed in Section 6.2 and the potential impacts discussed in Section 7.1.</p> <p>The Project will require clearing 23.76 ha of native vegetation for construction including launch pads, access tracks and associated laydown areas. The Project Area has been refined during the design phase to reduce the amount of native vegetation to be cleared in areas of lower condition rating as far as practicable.</p> <p>The clearance of 23.76 ha will be offset through a biodiversity offset program developed in accordance with NVC outlined in Table 20 and Section 8.2.</p> <p>Construction and operation of the Project will be managed in accordance with a CEMP and OEMP to ensure that all impacts are reduced as far as practicable utilising management measures outlined in Table 20.</p>

Terrestrial Biodiversity		Justification
2.3	Describe the potential impacts on native vegetation fragmentation and the ability of communities or individual species to recover, regenerate or be rehabilitated during all phases of development.	Section 7.1 details the potential impacts on native vegetation fragmentation. Once native vegetation is cleared, there is minimal opportunity for individual species and communities to naturally regenerate and recover.  Therefore the clearance of native vegetation will require an offset through a biodiversity offset program developed in accordance with NVC outlined in Table 20 and Section 8.2.
2.4	Identify the habitat value of native vegetation and the potential for habitat fragmentation during both construction and maintenance (and decommissioning). Include a description of the effects of any fragmentation that may occur over the life of the project.	Section 6.4.1 details the fauna habitats present with the Project Area.  Section 7.1.6 details the potential impacts on habitat fragmentation during both construction and operation phases of the Project.
2.5	Detail any likely changes in remaining vegetation surrounding the launch pads, which may be impacted by the proposed operations. Mitigation measures should be documented to minimise the impact on remaining species and communities in the immediate vicinity of the launch pads.	Section 7.1.5 and Section 7.1.7 detail the potential impacts the Project will have on edge effects and barrier effects.  Native vegetation not to be cleared for the Project will be protected and managed in a CEMP and OEMP that will include management measures proposed in Table 20.
2.6	Outline any compensatory activities proposed, making reference to guidelines produced by the Native Vegetation Council.	The clearance of native vegetation will require an offset through a biodiversity offset program developed in accordance with NVC outlined in Table 20 and Section 8.2.
2.7	Identify the potential impact of fire on native vegetation, and the effects of fire risk management processes during both construction and operation.	Section 7.1.10 details the potential impact of fire on native vegetation.  Fire risk management processes are to be incorporated into a CEMP and OEMP with mitigation measures proposed in Table 20.
2.8	Describe the location, extent, condition and significant of native vegetation species and communities in the marine environment within the impact area of spent (discarded) launch vehicles.	This is discussed in the Marine Biodiversity Technical Report.
<b>Assessment Requirement 3: The proposed development will be constructed on land but will also operate in the airspace and over adjoining waters with potential impacts on terrestrial and marine habitats which support significant populations of native fauna.</b>		
3.1	Describe the location, extent, condition and significance of native terrestrial and marine fauna populations, including individual species	The location, extent, condition and significance of native terrestrial fauna populations is detailed in Section 6.4 and Section 7.2.

Terrestrial Biodiversity		Justification
	and communities in the surrounding area, including on land, cliffs and in adjoining waters, including Liguanea Island.	Marine fauna is discussed in Marine Biodiversity Technical Report.
3.2	Describe the nature and extent of the impacts likely to affect native terrestrial and marine fauna species and populations during both construction and operation. Describe the ability of communities and individual species to recover, especially threatened or significant species (including those listed under the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i> and <i>National Parks and Wildlife Act 1972</i> ). Specifically consider the impact of marine debris.	<p>The nature and extent of the impacts likely to affect native terrestrial fauna species and populations during both construction and operation is detailed in Section 7.0</p> <p>It is expected there will be direct impacts to State listed fauna species through the clearance of 23.76 ha suitable habitat and indirect impacts from noise during operations of rocket launches.</p> <p>Direct impacts to State listed species are to be offset through a biodiversity offset program developed in accordance with NVC outlined in Table 20 and Section 8.2. Indirect impacts detailed in Section 7.0, will be managed through the implementation of a CEMP and OEMP to ensure that all impacts are reduced as far as practicable utilising management measures outlined in Table 20.</p> <p>The ability of communities and individual species to recover, especially threatened species listed under the EPBC Act and NPW Act is discussed in Section 7.0 and Section 7.2 more specifically for EPBC Act listed species.</p> <p>Marine fauna is discussed in Marine Biodiversity Technical Report.</p>
3.3	Identify the effect of the proposal on terrestrial habitat fragmentation including the ability of populations or individuals to recover during both construction and operation.	This is detailed in Section 7.1.6 and Section 7.2.
3.4	Identify the potential impact of fire and explosion on native fauna, and the effects of fire risk management processes during both construction, operation and maintenance.	This is detailed in Section 7.1.10 and Section 8.0.
3.5	Identify the potential impact of noise and vibrations on terrestrial, coastal and marine native fauna, and the mitigation and monitoring strategies during both construction and maintenance.	<p>This is detailed in Section 7.1.9 and Section 8.0</p> <p>Marine fauna is discussed in Marine Biodiversity Technical Report.</p>
3.6	Detail appropriate buffer distances that would be required between proposed development (including coastal access points) and threatened terrestrial and marine species, including feeding areas, nesting sites and roosting sites.	<p>This is detailed in Section 8.0.</p> <p>Marine fauna is discussed in Marine Biodiversity Technical Report.</p>

Terrestrial Biodiversity		Justification
3.7	Outline measures to avoid, minimise, mitigate and monitor the effects on native fauna, including any compensatory activities.	This is detailed in Section 8.0.
<b>Assessment Requirement 10: The proposed development has the potential for the spread of introduced or nuisance plants and animals and soil pathogens such as Phytophthora.</b>		
10.1	Identify the potential for the introduction or dispersal of new pest or nuisance plant and animal species, and soil pathogens and the associated implications for native species and habitat.	Section 7.1.4 details the potential for the introduction or dispersal of new pest or nuisance plant and animal species, and soil pathogens and the associated implications for native species and habitat.
10.2	Identify the potential for increased distribution and abundance of existing pest or nuisance plants, and soil pathogens and the associated implications for terrestrial and coastal environments.	Section 7.1.4 details the potential for increased distribution and abundance of existing pest or nuisance plants, and soil pathogens and the associated implications for terrestrial and coastal environments.
10.3	Outline the mitigation measures and their effectiveness in reducing or avoiding the introduction or spread of pest or nuisance plant and animal species.	Weeds and pests will be managed through the implementation of a CEMP and OEMP that details mitigation measures proposed in Table 20.

## 8.0 Management and Mitigation

### 8.1 Mitigation measures

The mitigation hierarchy as devised by the NVC (NVC 2017) has been applied during the design of the Project. This included reducing the footprint as far as practicable to avoid clearing native vegetation and implementing a CEMP and OEMP to manage direct and indirect impacts.

In order to avoid (where possible), manage and mitigate project risks and potential impacts during all phases of the Project mitigation measures have been proposed in Table 20. These proposed mitigation measures respond to Project specific issues and opportunities, address legislative requirements, and incorporate industry standard practice. The measures have been presented separately for each phase of the Project.

These proposed mitigation measures have been segregated by implementation phase:

- Detailed design;
- Pre-construction;
- Construction;
- Post Construction rehabilitation of disturbed areas from construction activities where not required for ongoing operations such as temporary laydown areas, hardstands etc. Land will be returned to a post-disturbance condition that is safe, stable, non-polluting and able to sustain the proposed land use with only minor maintenance required into perpetuity; and
- Operation.

Table 20 Proposed Mitigation Measures

Delivery Phase	Aspect	Proposed Mitigation Measures
Detailed design	Minimisation of impacts to ecology - flora and fauna values	<ul style="list-style-type: none"> <li>Portions of the Project are located within existing access tracks and wherever possible, have been aligned to be co-located with existing access tracks to limit the amount of native vegetation and fauna habitat to be cleared. Tracks will be formalised initially into gravel roads and upgraded to asphalt in the future, which will minimise the generation of dust and potential impacts to surrounding vegetation and fauna habitat.</li> </ul>
		<ul style="list-style-type: none"> <li>The size of the Project Area has been reduced in size from 70.58 ha to 23.76 ha through design considerations, in particular the re-design of Infrastructure Site D to position the footprint into more degraded vegetation. Southern Launch will undertake detailed design and/or construction planning to minimise the construction footprint and avoid impacts to vegetation as far as practicable.</li> </ul>
		<ul style="list-style-type: none"> <li>Disturbance footprints will be limited to those areas required to construct and operate the works, as practical for safety, especially in regard to the clearing of native vegetation.</li> </ul>
		<ul style="list-style-type: none"> <li>As Detailed Design progresses it will define temporary and permanent storm water, erosion and sediment/pollution control measures in a Soil Erosion and Drainage Management Plan (SEDMP), that complies with regulatory requirements. Temporary and permanent measures will be appropriate to the site conditions, responding to environmental receptors, climatic zone and seasonal factors. The SEDMP will also establish and specify the monitoring and performance objectives for handover on completion of construction.</li> </ul>
		<ul style="list-style-type: none"> <li>Fencing around the Launch Sites A and B, Infrastructure Site D and Range Control Site E as detailed in Section 2.1 and Section 7.1.10 will be incorporated into the design to minimise risk to fauna and channel fauna toward safe movement opportunities. A 1800 mm chain mesh fence with three strands of barbed wire will be installed to ensure threatened bird species can't fly through or get caught in the fencing.</li> </ul>
		<ul style="list-style-type: none"> <li>Firebreaks incorporated along fences to protect and mitigate one of the primary threats to EPBC listed species present.</li> </ul>
		<ul style="list-style-type: none"> <li>All buildings and facilities are sited within the Project Area to achieve suitable clearance from vegetation for fire mitigation purposes. The siting of all buildings and facilities within the Project Area footprint achieves the minimum fire clearance requirements under the National Construction Code.</li> <li>Assembly building, Fuel Pad and Oxidiser pad will have firefighting services as per legislation.</li> </ul>
		<ul style="list-style-type: none"> <li>The Project will be designed to only support micro-lift and small-lift rocket vehicles not requiring the development of large infrastructure that may have a greater impact on the surrounding environment.</li> </ul>
		<ul style="list-style-type: none"> <li>Where necessary and possible geo-barriers will be employed to limit the potential damage from a spill or leak of liquids.</li> </ul>

Delivery Phase	Aspect	Proposed Mitigation Measures
		<ul style="list-style-type: none"> <li>• The proposed detention basins and dam will be lined with a polymer lining, a 1800 mm chain mesh fence with three strands of barbed wire will be installed around all the three open water bodies and they will be covered with a geotextile tarp or shade cloth to detract bird species, and keep pest species and native ground dwelling fauna species out of the open water bodies.</li> <li>• The CEMP and OEMP will require the inclusion of any Commonwealth and State approval conditions stipulated for vegetation clearing with regards to fauna management. This may include a trapping program, presence of wildlife spotters onsite during clearing, and clearing being undertaken from disturbed areas toward undisturbed areas to encourage fauna to move away from the clearing operation.</li> <li>• The CEMP and OEMP to be prepared for this Project will incorporate mitigations measures proposed in this table, and further progressed mitigation measures that are developed as the Project progresses through approval pathways.</li> </ul>
	Weeds and pests	<ul style="list-style-type: none"> <li>• A Weeds and Pests Sub-plan will be developed as a component of the CEMP and OEMP in accordance with the Development Act, the NV Act and relevant LSA board recommendations.</li> <li>• The Weeds and Pests Sub-plan will ensure weed control methods for threatened species will be done in accordance with the relevant Recovery Plan for the species (i.e. the Western Whipbird (eastern) National Recovery Plan).</li> </ul>
	Water quality	<ul style="list-style-type: none"> <li>• Stormwater is to be captured on each launch pad site and no stormwater is to leave any site. Launch Site A, Launch Site B and Range Control Site E will have swales along the site boundaries. Infrastructure Site D has a large catchment area and it is planned to install a dam (possibly 30 ML) to supply the site's water needs. The dam would be the quarry site to supply engineered road materials.</li> <li>• Initially, all water needs will be supplied by water trucked onto the individual sites and stored in 25,000L on site. Once the dam is constructed, water would be supplied in each site's stormwater detention basin from Infrastructure Site D via direct pumped mains. This water would then be used for deluge, fire and irrigation.</li> </ul>
	Noise	<ul style="list-style-type: none"> <li>• A water deluge system and flame trench has been included in the design to mitigate noise impacts, which reduce the noise level by approximately 5-10dB.</li> </ul>
	Post construction - rehabilitation	<ul style="list-style-type: none"> <li>• A Rehabilitation Management Sub-plan will be developed for the Project, as a component of the CEMP and OEMP. As a minimum it will establish the following: <ul style="list-style-type: none"> <li>- Location-specific objectives for rehabilitation of temporarily disturbed areas, reinstatement and/or stabilisation</li> <li>- Timeframes for rehabilitation and/or reinstatement/stabilisation works to be achieved</li> <li>- Details of the actions and responsibilities to progressively rehabilitate, regenerate, and/or revegetate areas, consistent with the agreed objectives</li> </ul> </li> </ul>

Delivery Phase	Aspect	Proposed Mitigation Measures
		<ul style="list-style-type: none"> <li>- Include rehabilitation requirements such as:               <ul style="list-style-type: none"> <li>▪ Tyning and ripping of base and sub-base material;</li> <li>▪ Application of soil ameliorants;</li> <li>▪ Topsoiling and/or compost blanket;</li> <li>▪ Stabilisation and rehabilitation (e.g. planting and or seeding).</li> </ul> </li> <li>- Consideration for maintenance or performance issues of rehabilitation e.g. vegetation that does not grow and obscure signals or impact the longevity of rail infrastructure</li> <li>- Procedures, timeframes, measurable performance objectives and responsibilities for monitoring the success of rehabilitation and/or reinstatement/stabilisation areas</li> <li>- Where temporary construction facilities are required, land shall be returned to a stable condition that complies with the conditions of applicable regulatory approvals.</li> </ul>
	Offsets	<ul style="list-style-type: none"> <li>• Restriction of the Project Area as far as practical, to that required to safely and efficiently construct and operate the Project. In doing so, avoid areas of MNES, NPW Act listed receptors and their associated habitat, where possible, thereby minimising significant adverse residual impacts to these matters.</li> <li>• A biodiversity and native vegetation offset strategy will be developed in consultation with the NVC (SA) and the DAWE (Commonwealth), only if required.</li> </ul>
Pre-construction/ Construction	Native vegetation and flora	<ul style="list-style-type: none"> <li>• All contractors are to be briefed on clearing requirements and restrictions (including fines) to prevent over-clearing of these areas.</li> <li>• Clearing extents will be limited to the area of the permanent and temporary works, avoiding impacts to native vegetation and habitats as far as practicable.</li> <li>• Ensure all necessary permits and approvals are in place prior to the commencement of construction.</li> <li>• Topsoil stockpiles will be a maximum of 3 m in height to avoid heat sterilisation of the seed bank. Further information will be detailed in the SEDMP.</li> <li>• Topsoil stockpiles will be managed to maintain the viability of soil seed banks for flora species. Further information will be detailed in the SEDMP.</li> <li>• Use vegetation clearing methods that encourage natural regeneration of rootstock, minimise land disturbance and maintain soil stability.</li> <li>• Vegetation clearing to be undertaken in a sequential manner to allow fauna present sufficient time and space to move out of the area of their own accord, rather than being forcefully moved.</li> </ul>

Delivery Phase	Aspect	Proposed Mitigation Measures
		<ul style="list-style-type: none"> <li>• Apart from initial earthworks to construct access tracks and hardstand areas, ensure all vehicles and construction equipment always utilise dedicated access tracks and hardstands within the Project Area and do not travel outside of these areas.</li> <li>• Construct windrows (small soil berms) on the edge of access tracks and hardstands to delineate the boundary and prevent vehicles and construction equipment damaging vegetation beyond the construction impact zone.</li> <li>• Ensure all physical flora control measures, such as windrows, signage and exclusion barriers/bunting are checked and maintained on a regular basis (weekly as a minimum).</li> <li>• Where construction work (e.g. excavation) is required beneath the canopy of a tree, ensure that it is carried out carefully and by hand to avoid damage by equipment</li> <li>• This is to be guided by best practice and, where relevant, as per Tree Protection Zones detailed in <i>AS4970 2009 Protection of Trees on Development Sites</i>.</li> <li>• Cease work immediately in relevant areas if any previously unknown threatened flora species are encountered.</li> <li>• Display a fact sheet on threatened flora species on site notice boards and in lunchrooms.</li> <li>• Do not disturb the ground beneath the canopy of any tree that is not in the approved clearance footprint and ensure that vehicles, construction equipment, materials or waste are not located beneath the canopy of any tree.</li> </ul>
	Fauna	<ul style="list-style-type: none"> <li>• Scheduling of clearing activities will be done to avoid breeding seasons as far as reasonably practical. Where this is not practical, and where breeding sites are identified within the corridor during pre-clearance surveys, a suitably qualified person will provide mitigation measures for hazardous zones/ relocation requirements relevant to the specific species identified.</li> <li>• Any required fauna fencing will be installed in accordance with the fencing strategy which will be finalised and documented in the detailed design.</li> <li>• A suitably qualified ecologist to complete a site survey prior to the commencement of clearing to identify and mark high-value fauna habitat trees which are not to be removed with flagging tape (or other appropriate marking method), trees that are not to be felled without the presence of a spotter-catcher (where clearing cannot be avoided and the tree is an identified habitat trees), and to identify habitat features suitable for relocation to no disturbed areas immediately adjacent to the disturbance footprint.</li> <li>• Display a fact sheet on expected fauna on site notice boards and in lunch rooms, in particular threatened species such as the Western Whipbird (eastern) and Southern Emu-wren (Eyre Peninsula).</li> </ul>

Delivery Phase	Aspect	Proposed Mitigation Measures
		<ul style="list-style-type: none"> <li>• Install signage and exclusion barriers/bunting around areas of known fauna habitat prior to the commencement of any construction works in or within 200 m of these areas. This includes identify and fence or mark buffer areas around protected species nests that are known in the area.</li> </ul>
		<ul style="list-style-type: none"> <li>• Check all vegetation (trees, bushes, shrubs and grassland) for fauna, immediately prior to any vegetation removal or clearing and grubbing works.</li> </ul>
		<ul style="list-style-type: none"> <li>• Construct windrows (small soil berms) on the edge of access tracks and hardstands to delineate the boundary and prevent vehicles and construction equipment damaging habitat beyond the construction impact zone.</li> </ul>
		<ul style="list-style-type: none"> <li>• All trenches will be closed / backfilled as soon as possible and will not remain open for more than 48 hours, where possible.</li> </ul>
		<ul style="list-style-type: none"> <li>• All trenches and excavations will have an escape route (e.g. soil ramp) to allow entrapped fauna to escape, where practicable.</li> </ul>
		<ul style="list-style-type: none"> <li>• All trenches and excavations will be checked for trapped fauna first thing in the morning and again in the afternoon prior to works finishing for the day and any trapped fauna will be released.</li> </ul>
		<ul style="list-style-type: none"> <li>• All cable junction pits (which may be required to stay open for extended amounts of time) will be covered and/or fenced off to prevent inadvertent trapping of fauna.</li> </ul>
		<ul style="list-style-type: none"> <li>• If any threatened fauna species are observed during construction, work will cease in the immediate vicinity of the sighting until it has relocated, or it has been removed by a suitably qualified spotter-catcher. The fauna spotter-catcher will provide a suitable record to the Site Supervisor.</li> </ul>
		<ul style="list-style-type: none"> <li>• Any fauna that require relocation shall be relocated using appropriate animal hygiene. These include: <ul style="list-style-type: none"> <li>- Wash hands between handling of different animals;</li> <li>- Handling of frogs will be done with the use of disposable and pre-rinsed vinyl gloves. Do not handle multiple individuals wearing the same gloves; and</li> <li>- Animals are to be immediately bagged in a suitably sized calico bag or plastic zip lock bag for amphibians. Do not reuse bags or use a single bag for multiple individuals.</li> </ul> </li> </ul>
		<ul style="list-style-type: none"> <li>• Any fauna which are relocated will be documented throughout the course of construction and operation. This record will include: <ul style="list-style-type: none"> <li>- Species;</li> <li>- Location found;</li> <li>- Location of relocation area; and</li> <li>- Condition of the animal.</li> </ul> </li> </ul>

Delivery Phase	Aspect	Proposed Mitigation Measures
		<ul style="list-style-type: none"> <li>• Ensure all physical fauna control measures, such as windrows, sediment fencing, signage and exclusion barriers/bunting are checked and maintained on a regular basis (weekly as a minimum).</li> </ul>
		<ul style="list-style-type: none"> <li>• Speed limits to be reduced in the areas close to Launch Site A and Launch Site B to limit the likelihood of vehicle strike with wildlife.</li> </ul>
		<ul style="list-style-type: none"> <li>• If fauna is accidentally killed, in particular Western Whipbird, Southern Emu wren or Rock Parrot bodies are collected, reported to DEW and frozen for the SA Museum.</li> </ul>
	Weeds and pests	<ul style="list-style-type: none"> <li>• The Weeds and Pest Sub-plan, as a component of the CEMP and OEMP, will be implemented (refer above).</li> </ul>
		<ul style="list-style-type: none"> <li>• Undertake a weed survey within and immediately adjacent to the construction impact zone prior to construction commencing, to understand existing weed conditions and potential impacts (e.g. spread) during construction.</li> </ul>
		<ul style="list-style-type: none"> <li>• Remove or destroy all WONS and Declared and/or environmental weeds located within the construction impact zone, prior to construction commencing.</li> </ul>
		<ul style="list-style-type: none"> <li>• Undertake weed control such as (but not limited to) slashing, spraying, or physical removal, prior to the weeds setting seed. Ensure weed control methods within threatened species habitat areas are in accordance with the relevant National Recovery Plan for the species.</li> </ul>
		<ul style="list-style-type: none"> <li>• Display a fact sheet on Declared and environmental weeds known to occur within the construction impact zone, on site notice boards and in lunch rooms.</li> </ul>
		<ul style="list-style-type: none"> <li>• Ensure all vehicles and construction equipment are clean and free of soil material containing weed seed or propagules, prior to arriving on site. If vegetative material or earth is present, ensure that the equipment is taken away and washed down at an appropriate facility to prevent vegetative material or earth potentially containing weed seeds being brought into the site.</li> </ul>
		<ul style="list-style-type: none"> <li>• Install a designated wash-down bay to clean vehicles and construction equipment during construction works and prior to leaving site.</li> </ul>
		<ul style="list-style-type: none"> <li>• Ensure all earthmoving equipment is clean and free of soil material prior to commencing earthworks within known threatened species habitat.</li> </ul>
		<ul style="list-style-type: none"> <li>• Ensure all fill materials (e.g. sand, aggregate) imported to site are sourced from weed and pathogen free sites.</li> </ul>
		<ul style="list-style-type: none"> <li>• Locate stockpiles of clean, weed free soil or fill material away from areas of weed infestation.</li> </ul>

Delivery Phase	Aspect	Proposed Mitigation Measures
		<ul style="list-style-type: none"> <li>If stockpiling of weed infested material is required, ensure it is stored on a constructed hardstand and separated from clean, weed free materials.</li> </ul>
		<ul style="list-style-type: none"> <li>If soil or fill material stockpiles become infested with weeds, undertake weed control (spray with herbicide) as soon as practicable and at least 10 – 14 days prior to moving material.</li> </ul>
		<ul style="list-style-type: none"> <li>Store construction vehicles and equipment on constructed hardstands, away from areas of weed infestation.</li> </ul>
		<ul style="list-style-type: none"> <li>Ensure construction compounds are kept neat and tidy at all times, to prevent pest animals from inhabiting the area.</li> </ul>
		<ul style="list-style-type: none"> <li>Ensure food waste is placed in enclosed / covered bins, to prevent pest animals from accessing it.</li> </ul>
		<ul style="list-style-type: none"> <li>Report and record rabbit / hare / fox / feral cat sightings.</li> </ul>
	Noise	<ul style="list-style-type: none"> <li>Locate haul routes and construction laydown areas away from sensitive receptors.</li> </ul>
		<ul style="list-style-type: none"> <li>Use off-site construction or other alternative processes that eliminate or lessen resulting noise.</li> </ul>
		<ul style="list-style-type: none"> <li>Avoid blasting.</li> </ul>
		<ul style="list-style-type: none"> <li>Limit construction activities to daytime unless they are unavoidable.</li> </ul>
		<ul style="list-style-type: none"> <li>Plan for quieter working methods, i.e. bored piles rather than driven piles.</li> </ul>
		<ul style="list-style-type: none"> <li>Consider using site structures as a method of acoustic screening.</li> </ul>
	Water Quality	<ul style="list-style-type: none"> <li>A noise gas gun will be used to ‘scare’ any fauna that are near the immediate area prior to launch in accordance with SA EPA <i>Environmental Noise Guidelines – Audible Bird Scaring Devices</i> (EPA 2007). This mitigation measure will reduce the number of fauna in the immediate noise zone close to the launch pad.</li> </ul>
Post Construction	Rehabilitation of disturbed areas	<ul style="list-style-type: none"> <li>Water in the basins will be tested (every 6 months) to ensure that the water meets the standard where it presents no risk to animals or other contamination issues. If there is evidence of contamination, the water will be treated to remove that contamination.</li> </ul>
		<ul style="list-style-type: none"> <li>All disturbed land will be rehabilitated to achieve stable and sustainable conditions of soil cover and vegetation.</li> </ul>
		<ul style="list-style-type: none"> <li>Identify stockpile locations for retaining soil and vegetation for rehabilitation purposes.</li> </ul>
		<ul style="list-style-type: none"> <li>Topsoil and vegetation temporarily disturbed to support the construction of temporary laydown areas, hardstands and utilities trenching activities will be temporarily stockpiled separately to subsoil material and will be utilised to support the reestablishment of the soil profile and rehabilitation of these locations. Soil and</li> </ul>

Delivery Phase	Aspect	Proposed Mitigation Measures
		<p>vegetation removed for these activities will be supported to remain along the length of the disturbance footprint where the placement of the excavated material does not impact on remnant areas.</p> <ul style="list-style-type: none"> <li>• Selected logs and branches from the cleared trees (where not otherwise habitat features) are to be stockpiled in designated stockpile areas for use in rehabilitation in areas with existing tree cover (where practicable, e.g. where the action of stockpiling does not create a fire risk).</li> <li>• Original stockpiled materials are to be utilised to reinstate the natural soil profile in disturbed areas, being:               <ol style="list-style-type: none"> <li>1. Subsoil;</li> <li>2. Topsoil; and</li> <li>3. Vegetation (where available).</li> </ol> </li> <li>• The areas disturbed for construction but not forming part of the operational footprint, will be re-profiled to original or stable contours, re-establishing surface drainage lines and other land features. Site specific stabilisation measures will be necessary to prevent slumping or erosion. Erosion and sediment control is to be completed in accordance with the SEDMP. Where practicable, temporary erosion control measures will be left in place until bare soil has stabilised, and other natural material dragged over as cover until vegetation cover has re-established etc.</li> <li>• Revegetation is to occur through natural regeneration as well as through assisted planting to create a vegetated buffer between the disturbance footprint and adjacent values. Plantings (tube stock and seed) to consist of native species analogous to adjacent vegetation community.</li> <li>• All rehabilitation works to be consistent with bushfire and operational safety requirements.</li> </ul>
Operation	Minimisation of impacts to ecology - flora and fauna values	<ul style="list-style-type: none"> <li>• Manage visitors to the site through formalisation of tracks and signage as well as rubbish management.</li> <li>• Engage with LSA bodies to join region wide initiatives.</li> </ul> <p>Bush fire risks will be mitigated through the installation of Southern Launch firefighting equipment at every launch event. Initial firefighting capabilities during rocket launch attempts will be augmented by local Country Fire Service (CFS) crews. Sufficient water will be located onsite to successfully control and contain any unexpected fire. There will also be a fire truck on site during launches.</p> <ul style="list-style-type: none"> <li>• Annual investigations into the effect rocket launch activities have on the local fauna and flora with subsequent recommendations on the best methods to protect the regional fauna and flora. Southern Launch is currently in negotiations with University of Adelaide and University of SA with a view to sponsoring 1 or 2 PhD candidates to undertake their thesis on the Project site in respect of impacts on flora/fauna. This study/s will take approximately 4 years. This will result in a strong understanding of the</li> </ul>

Delivery Phase	Aspect	Proposed Mitigation Measures
		impacts of operations on local flora/fauna. In respect of baseline information - the detailed studies already undertaken on the Project site as part of the Development Approval process forms that baseline.
	Flora	<ul style="list-style-type: none"> <li>• Display a fact sheet on threatened flora species West Coast Mintbush on site notice boards and in lunchrooms.</li> <li>• Do not disturb the ground beneath the canopy of any tree that is not in the approved clearance footprint and ensure that vehicles, construction equipment, materials or waste are not located beneath the canopy of any tree.</li> <li>• Maintenance activities and refuelling must be carried out a minimum of 50 m from vegetation and waterways, with appropriate interception measures in place to avoid impacts to waterways, aquatic habitats, and groundwater.</li> </ul>
	Fauna	<ul style="list-style-type: none"> <li>• Any fauna that require relocation shall be relocated using appropriate animal hygiene. These include: <ul style="list-style-type: none"> <li>- Wash hands between handling of different animals;</li> <li>- Handling of frogs will be done with the use of disposable and pre-rinsed vinyl gloves. Do not handle multiple individuals wearing the same gloves; and</li> <li>- Animals are to be immediately bagged in a suitably sized calico bag or plastic zip lock bag for amphibians. Do not reuse bags or use a single bag for multiple individuals.</li> </ul> </li> <li>• Any fauna which are relocated will be documented throughout the course of construction and operation. This record will include: <ul style="list-style-type: none"> <li>- Species;</li> <li>- Location found;</li> <li>- Location of relocation area; and</li> <li>- Condition of the animal.</li> </ul> </li> <li>• Ensure all physical fauna control measures, such as windrows, sediment fencing, signage and exclusion barriers/bunting are checked and maintained on a regular basis (weekly as a minimum).</li> <li>• If any fauna needs to be destroyed under a Permit to Destroy Wildlife to reduce their impacts on wind farm infrastructure, destruction will be humane and comply with the <i>Animal Welfare Act 1985</i> and codes of practice.</li> <li>• Speed limits to be reduced in the areas close to Launch Site A and Launch Site B to limit the likelihood of vehicle strike with wildlife.</li> <li>• If fauna is accidentally killed, in particular Western Whipbird, Southern Emu wren or Rock Parrot bodies are collected, reported to DEW and frozen for the SA Museum.</li> </ul>

Delivery Phase	Aspect	Proposed Mitigation Measures
	Weeds and pests	<ul style="list-style-type: none"> <li>Prevent establishment of new weed species and/or infestations during the operational phase by implementing standard hygiene practices when bringing equipment, vehicles and other materials which have the potential to harbour weed seed or propagules, onto the site (e.g. for maintenance purposes) and by practicing minimal disturbance methods.</li> </ul>
		<ul style="list-style-type: none"> <li>Conduct an annual survey to identify and monitor the location, extent and abundance of weed species, particularly WONS and Declared weed species.</li> </ul>
		<ul style="list-style-type: none"> <li>Control pest animal species (especially rabbits, foxes and feral cats) that may proliferate as a result of site activities. Ensure rabbit control is in accordance with the <i>Threat abatement plan for competition and land degradation by rabbits</i> (DotEE 2016).</li> </ul>
		<ul style="list-style-type: none"> <li>Ensure waste is unable to be accessed by pest animals.</li> </ul>
	Noise	<ul style="list-style-type: none"> <li>Use earth bunds to reduce noise during rocket take-off.</li> </ul>
		<ul style="list-style-type: none"> <li>Use site structures as a method of acoustic screening for noisy equipment.</li> </ul>
		<ul style="list-style-type: none"> <li>Implementation of a water deluge and flame trench, which reduce the noise level by approximately 5-10dB.</li> </ul>
		<ul style="list-style-type: none"> <li>Locate launch sites as far away from residential and other sensitive areas as possible.</li> </ul>
		<ul style="list-style-type: none"> <li>Development of a stakeholder engagement plan with procedures for notifying residents of all planned launch events in advance.</li> </ul>
		<ul style="list-style-type: none"> <li>Develop a noise monitoring and reporting program to verify noise impacts of rocket launches.</li> </ul>
	Water Quality	<ul style="list-style-type: none"> <li>The captured deluge water and firefighting water will be tested after every launch. If it meets the required quality standard, it will be pumped into the water detention basins. If it does not, it will be pumped into trucks and taken off site to be disposed of in a manner that meets legislative requirements</li> </ul>
		<ul style="list-style-type: none"> <li>Water in the basins will be tested (every 6 months) to ensure that the water meets the standard where it presents no risk to animals or other contamination issues. If there is evidence of contamination, the water will be treated to remove that contamination.</li> </ul>
	Offsets	<ul style="list-style-type: none"> <li>Ensure all monitoring, auditing and reporting requirements detailed in the biodiversity and native vegetation offset strategy are implemented during the operation phase of the Project.</li> </ul>

## 8.2 SEB Offset calculation

A SEB is required for approval to clear under Division 5 of the *Native Vegetation Regulations 2017*. The NVC must be satisfied that as a result of the loss of vegetation from the clearance that a SEB will result in a positive impact on the environment that is over and above the negative impact of the clearance.

The SEB obligation is quantified by multiplying the geographical area in hectares by the Unit Biodiversity Score (UBS) (refer to Section 4.1.2.1 for how UBS is determined to give a total biodiversity score). The total maximum area of clearance is 23.76 ha.

The individual hectares represented by each vegetation association is multiplied by the UBS, resulting in subsequent points of loss and overall hectare requirement. Table 21 below shows the outcome of the bushland assessment sheets and resulting calculation of a SEB offset amount of 1312.94 SEB points in total.

The overall SEB requirement for this Project currently stands at \$915,078.45 plus an administration fee of \$50,329.31. The total SEB payment as calculated is \$965,407.77. Southern Launch will provide a SEB in the form of an inground offset provided by SEB credit providers within the region.

Table 21 SEB Calculations

Project Area	Veg Assoc	Native Species Diversity Score	TEC Score	Threatened Plant Score	Threatened Fauna Score	UBS	Area (ha)	Total Biodiversity Score	Loss	Loadings	Reductio	SEB Points Req	SEB Payment	Admin Fee
Launch Site A	1	24	1	0	0.1	74.53	3.34	248.93	1			261.38	\$182,171.07	\$10,019.41
Launch Site A	2	18	1	0	0.1	60.51	0.23	13.92	1			14.61	\$10,184.90	\$560.17
Launch Site A	3	22	1	0	0.1	66.23	1.54	101.99	1			107.09	\$74,640.97	\$4,105.25
Launch Site B	1	16	1	0	0.1	51.65	0.58	29.96	1			31.45	\$21,923.01	\$1,205.77
Launch Site B	6	24	1	0	0.1	70.84	0.4	28.34	1			29.75	\$20,736.73	\$1,140.52
Launch Site B	3	24	1	0	0.1	53.43	4.06	216.93	1			227.77	\$158,749.74	\$8,731.24
Site B-D track	1	22	1	0	0.1	51.65	0.1	5.17	1			5.42	\$3,779.83	\$207.89
Site B-D track	3	12	1	0	0.1	55.71	0.62	34.54	1			36.27	\$25,277.07	\$1,390.24
Infra Site D	1	22	1	0	0.1	62.72	0.29	18.19	1			19.10	\$13,310.85	\$732.10
Infra Site D	3	12	1	0	0.1	38.97	1.41	54.95	1			57.70	\$40,211.60	\$2,211.64
Infra Site D	5	12	1	0	0.1	30.66	4.92	150.85	1			158.39	\$110,392.38	\$6,071.58
Site D Northern Access	2	18	1	0	0.1	55.89	0.11	6.15	1			6.46	\$4,499.13	\$247.45
Site D Northern Access	3	12	1	0	0.1	50.23	0.22	11.05	1			11.60	\$8,087.00	\$444.79

Project Area	Veg Assoc	Native Species Diversity Score	TEC Score	Threatened Plant Score	Threatened Fauna Score	UBS	Area (ha)	Total Biodiversity Score	Loss	Loadings	Reductio	SEB Points Req	SEB Payment	Admin Fee
Range Control Site E	4	20	1	0	0.1	57.41	0.75	43.06	1			45.21	\$31,510.16	\$1,733.06
WWRA	1	24	1	0	0.1	72.38	0.63	45.60	1			47.88	\$33,370.36	\$1,835.37
WWRA	2	18	1	0	0.1	55.89	0.40	22.36	1			23.47	\$16,360.48	\$899.83
WWRA	3	16	1	0	0.1	51.89	0.51	26.46	1			27.79	\$19,366.70	\$1,065.17
WWRA	6	14	1	0	0.1	45.86	0.45	20.64	1			21.67	\$15,102.48	\$830.64
WWRA	4	18	1	0	0.1	53.55	3.20	171.36	1			179.93	\$125,403.97	\$6,897.22
						<b>Total</b>	<b>23.76</b>	<b>1250.4217</b>				<b>1312.94</b>	<b>\$915,078.45</b>	<b>\$50,329.31</b>

## 9.0 Conclusion

The terrestrial biodiversity assessment included a desktop assessment, baseline field survey, targeted fauna survey and quantifying the total biodiversity score and SEB score.

A summary of the terrestrial biodiversity assessment is presented below:

- No TECs were likely to occur and none were recorded. Seven vegetation associations were described and mapped.
- 33 flora species listed under the EPBC Act and/or NPW Act were identified in the desktop assessment. None were recorded during the baseline survey and targeted spring survey. The EPBC and NPW listed West Coast Mintbush has suitable habitat present in the Project Area.
- A total of 112 fauna species listed under the EPBC Act and/or NPW Act were identified in the desktop assessment. This included 45 marine species (fish, whales, dolphins) which were not further considered as part of this terrestrial assessment. Seventeen of these species (all bird species) were known or likely to occur. During the baseline field survey five of these were recorded and further one species was recorded during the targeted survey including:
  - Diamond Firetail, Vulnerable NPW Act (recorded during baseline field survey);
  - Eastern Osprey, Migratory and marine EPBC Act, Endangered NPW Act (one was recorded near Cape Carnot during the baseline field survey);
  - Western Whipbird (eastern), Vulnerable EPBC Act, Endangered NPW Act (recorded by call and sight during baseline field survey and targeted survey);
  - Rock Parrot, Rare NPW Act (recorded during baseline field survey and targeted survey);
  - Southern Emu-wren (Eyre Peninsula); Vulnerable EPBC Act, Endangered NPW Act (18 individual birds were sighted during the targeted survey, consisting of four pairs, one group of three and seven singles); and
  - White-bellied Sea-Eagle, Marine EPBC Act, Rare NPW Act (one pair recorded during baseline field survey).
- Three fauna habitats were defined and mapped. This habitat is likely to be utilised by all 17 threatened fauna species identified as known or likely to occur. A review of habitat complexity and fauna foraging behaviour identified seven of these fauna species are more likely to depend on this habitat.

An impact assessment was completed for the Project. The potential impacts the Project will have on flora and fauna values include:

- Habitat loss and degradation from vegetation clearing;
- Fauna species injury or mortality;
- Disturbance to breeding and foraging habitat;
- Displacement of species from invasion of weed and pest species;
- Edge effects;
- Habitat fragmentation;
- Barrier effects;
- Dust and light;
- Noise; and
- Increased fire risk.

The Project will require clearing of 23.76 ha of native vegetation that includes habitat that may be considered critical for two fauna species, including the Western Whipbird (eastern) and the Southern Emu-wren (Eyre Peninsula).

Significant impact assessments were completed for EPBC listed species with the potential to occur within the Project Area. The significant impact assessments determined the Project is unlikely to have a significant impact on the West Coast Mintbush, Australian Fairy Tern and Eastern Osprey, has the potential to have a significant impact on the Western Whipbird (eastern), and is likely to have a significant impact on the Southern Emu-wren (Eyre Peninsula).

Given the above assessment outcomes, it is recommended that the Project is referred under the EPBC Act to DAWE.

The desktop assessment and field survey identified 11 State listed threatened bird species that may utilise the area. There are potential impacts from construction and operation activities to these species, particularly the Rock Parrot that was recorded during the targeted survey. Impacts to State listed species are not expected to be major and can be managed through a CEMP and OEMP.

The clearance of 23.76 ha of native vegetation equates to 1312.94 SEB points, which results in a \$915,078.45 offset plus an administration fee of \$50,329.31 to the NVC under the SA NV Act. Southern Launch will provide a SEB in the form of an inground offset provided by SEB credit providers within the region.

Southern Launch will implement management measures detailed in a CEMP and OEMP to avoid, minimise or mitigate impacts on terrestrial flora and fauna values. Where impacts to native vegetation, threatened flora and fauna species cannot be avoided by the Project, they will be offset through State and or Commonwealth requirements.

## 10.0 Limitations Statement

AECOM has prepared this report in accordance with the usual care and thoroughness of the consulting profession for the use of Southern Launch and only those third parties who have been authorised in writing by AECOM to rely on this Report.

It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this Report.

It is prepared in accordance with the scope of work and for the purpose outlined in the contracts dated 14 February 2020, 28 May 2020 and 26 November 2020.

The methodology adopted and sources of information used by AECOM are outlined in this the Report.

Where this Report indicates that information has been provided to AECOM by third parties, AECOM has made no independent verification of this information except as expressly stated in the Report. AECOM assumes no liability for any inaccuracies in or omissions to that information.

This Report was prepared between February and December 2020, and is based on the conditions encountered and information reviewed at the time of preparation. AECOM disclaims responsibility for any changes that may have occurred after this time.

This Report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. This Report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

Where conditions encountered at the site are subsequently found to differ significantly from those anticipated in this report, AECOM must be notified of any such findings and be provided with an opportunity to review the recommendations of this report.

Except as required by law, no third party may use or rely on this Report unless otherwise agreed by AECOM in writing. Where such agreement is provided, AECOM will provide a letter of reliance to the agreed third party in the form required by AECOM.

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It is the responsibility of third parties to independently make inquiries or seek advice in relation to their particular requirements and proposed use of the site.

## 11.0 References

AECOM 2020. Whalers Way Orbital Launch Complex - Environmental Assessment Report - Noise Assessment.

Atlas of Living Australia (ALA), 2020. Open access to Australia's biodiversity data. Available at: [ala.org.au](http://ala.org.au).

Bali, R. 2005. Discussion Paper – Compensating for Edge Effects, Ecosense Consulting for the NSW Roads and Traffic Authority, Sydney.

Barrett, G., A. Silcocks, S. Barry, R. Cunningham & R. Poulter 2003. *The New Atlas of Australian Birds*. Melbourne, Victoria: Birds Australia.

Beason, R. C. 2004. What can birds hear? *21st Vertebrate Pest Conference* (pp. 92-96). Visalia, California: University of California, Davis.

Blakers, M., S.J.J.F. Davies & P.N. Reilly 1984. *The Atlas of Australian Birds*. Melbourne, Victoria: Melbourne University Press.

Birdlife, 2020. Birdlife Australia. Online resource <http://birdlife.org.au/>.

Birdsall, J.L., McCaughey, W. and Runyon, J.B. 2012. Roads Impact the Distribution of Noxious Weeds More Than Restoration Treatments in a Lodgepole Pine Forest in Montana, U.S.A, *Restoration Ecology*, vol. 20, no. 4, pp. 517 – 523.

Brandle R, 2010. Biological Survey of the Eyre Peninsula South Australia. Department for Environment and Heritage, South Australia.

Bureau of Meteorology (BOM), 2020. Climate Data Online. Online resource accessed 25-Mar-2020 <http://www.bom.gov.au/climate/data/>

Carpenter, G., A. Black, D. Harper & P. Horton, 2003. Bird Report, 1982-1999. *South Australian Ornithologist*. 34:93-151.

Coffin, A.W. 2007. From roadkill to road ecology: A review of the ecological effects of roads, *Journal of Transport Geography*, vol. 15, no. 5, pp. 396 – 406.

Conn, BJ 1986, *Prostanthera* in Jessop, J & Toelken, HR (eds) 1986, *Flora of South Australia*, Government Printer, Adelaide, pp. 1209-1219, viewed 5 May 2008, <<http://www.flora.sa.gov.au/cgi-bin/texhtml.cgi?form=speciesfacts&family=Labiatae&genus=Prostanthera&species=calycina>>.

Dennis TE and Clancy G P (2014). The status of the Osprey (*Pandion haliaetus cristatus*) in Australia. *Journal of Raptor Research* 48: 408-414.

Dennis, T.E. 2007a. Distribution and status of the Osprey (*Pandion haliaetus*) in South Australia. 107:294-299.

Dennis TE, Detmar SA, Brooks AV and Dennis HM 2011a. Distribution and status of White-bellied Seaeagle, *Haliaeetus leucogaster*, and Eastern Osprey, *Pandion cristatus*, populations in South Australia. *The Journal of The South Australian Ornithological Association Inc.* V37 (Part 1).

Dennis TE, McIntosh RR and Shaughnessy PD 2011b. Effects of human disturbance on productivity of White-bellied Sea-Eagles (*Haliaeetus leucogaster*). *Emu* 111:179-185.

Dennis TE, Detmar S and Patterson C 2015. The White-bellied Sea Eagle as a key indicator species by which to measure the health and stability of coastal biodiversity in South Australia. Prepared for KINRMB 2014, updated 2015).

Dennis TE, Fitzpatrick GJ and Brittain RW 2012. Phases and Duration of the White-bellied Sea-Eagle *Haliaeetus leucogaster* breeding season in South Australia and the implications for habitat management. *Corella* 36:63-68.

Dennis TE and Detmar SA 2018. A review of White-bellied Sea Eagle distribution and population stability over time in South Australia. November 2018. In *South Australian Ornithologist* Pp.55-71.

Department of Agriculture, Water and the Environment (DAWE), 2020a. Protected Matters Search Tool. Online resource accessed 14-Feb-2020 <https://www.environment.gov.au/epbc/protected-matters-search-tool>

Department of Agriculture, Water and the Environment (DAWE), 2020b. Species Profiles and Threats Database. Online resource accessed 24-Mar-2020 <https://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>

Department of Agriculture, Water and the Environment (DAWE) 2020c. Species Profile and Threats Database - Australian Fairy Tern - *Sternula nereis nereis* Available at [http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=82950](http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=82950)

Department of Agriculture, Water and the Environment (DAWE) 2020d. Species Profile and Threats Database – for Mallee Whipbird - (*Psophodes leucogaster leucogaster*). Available at [https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=64448](https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=64448)

Department of Agriculture, Water and the Environment (DAWE), 2020e. Species Profile and Threats Database - Southern Emu-wren (Eyre Peninsula) (*Stipiturus malachurus parimeda*) —. Available at [https://environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=26006](https://environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=26006)

Department of Agriculture, Water and the Environment (DAWE 2020f). Species Profile and Threats Database - Eastern Osprey - *Pandion cristatus*. Available at [https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=952](https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=952)

Department for Environment and Heritage (DEH), 2006. Threatened Species of the South Australian Murray-Darling Basin Western Whipbird (eastern subspecies) *Psophodes nigrogularis leucogaster* Fact Sheet.

Department for Environment and Heritage, 2008. Adelaide and Mount Lofty Ranges South Australia Threatened Species Profile – *Stagonopleura guttata*. Biodiversity Conservation Unit, Adelaide Region.

Department for Environment and Water (DEW) 2017. Southern South Australia Soil Group Map, Department of Environment Water and Natural Resources, SA.

Department for Environment and Water (DEW), 2020a. Biological Database of South Australia (BDBSA) for threatened flora and fauna species listed under the South Australian *National Parks and Wildlife Act 1972* (NPW Act). [http://www.environment.sa.gov.au/Science/Information\\_data/Biological\\_databases\\_of\\_South\\_Australia](http://www.environment.sa.gov.au/Science/Information_data/Biological_databases_of_South_Australia).

Department for Environment and Water (DEW), 2020b. NatureMapss Vegetation Mapping. Online resource accessed 15/02/2018 at <http://spatialwebapps.environment.sa.gov.au/NatureMapss/?locale=en-us&viewer=NatureMapss>

Department of Planning, Transport and Infrastructure (DPTI) 2020. Terrestrial Biodiversity Assessment Guidelines for Whalers Way Orbital Launch Complex.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) 2011. Approved Conservation Advice for *Sternula nereis nereis* (Fairy Tern). Canberra, ACT: Department of Sustainability, Environment, Water, Population and Communities. Available from: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/82950-conservation-advice.pdf>

Department of the Environment, Land, Water and Planning (DELWP), 2016. National Recovery Plan for the Mallee Emu-Wren *Stipiturus mallee*, Red-lored Whistler *Pachycephala rufogularis*, Western Whipbird *Psophodes nigrogularis leucogaster*.

Department of the Environment, Water, Heritage and the Arts (DEWHA), 2008. Approved Conservation Advice for *Prostanthera calycina* (West Coast Mintbush). Canberra: Department of the Environment, Water, Heritage and the Arts. Available from: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/9470-conservation-advice.pdf>.

Department of the Environment, Water, Heritage and the Arts (DEWHA), 2013. Significant Impact Guidelines 1.1 – Matters of National Environmental Significance, Department of the Environment, Water, Heritage and the Arts.

Department of the Environment (DotE) 2013a. Conservation advice for Southern Emu-wren (Eyre Peninsula) (*Stipiturus malachurus parimeda*) —. Available from [https://environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=26006](https://environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=26006)

Department of the Environment (DotE), 2013b. Approved Conservation Advice for *Pleuropappus phyllocalymmeus* (silver candles). Canberra: Department of the Environment. Available from: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/21123-conservation-advice.pdf>

Department of the Environment and Energy (DotEE) 2016. Threat abatement plan for competition and land degradation by rabbits. Available from <https://www.environment.gov.au/system/files/resources/bf9352c2-35ae-4a80-8828-96de630731a9/files/tap-rabbit-2016.pdf>

Doolling, R. J., & Popper, A. N. 2007. *The effects of highway noise on birds*. Sacramento, CA: California Department of Transportation Division of Environmental Analysis.

Ecosphere 2020. Native Vegetation Clearance – Southern Launch Whalers Way Data Report.

EPA 2007. SA EPA Environmental Noise Guidelines – Audible Bird Scaring Devices.

Fahrig, L. 2002. Effect of habitat fragmentation on the extinction threshold: a synthesis, *Ecological Applications*, vol. 12, no. 2, pp. 346 – 351.

Federal Aviation Administration (FAA). 2009. *Final Programmatic Environmental Impact Statement for Streamlining the Processing of Experimental Permit Applications*.

Forman, R.T.T., Sperling, D., Bissonette, J.A., Clevenger, A.P., Cutshall, C.D., Dale, V.H., Fahrig, L., France, R., Goldman, C.R., Heanue, K., Jones, J.A., Swanson, F.J., Turrentine, T. and Winter, T.C. 2000. *Road Ecology. Science and Solutions*. Island Press, Washington.

Garnett, S., ed. 1993. *Threatened and Extinct Birds of Australia. RAOU Report 82*. Melbourne: Royal Australasian Ornithologists Union, and Canberra: Australian National Parks and Wildlife Service.

Garnett, S.T. & G.M. Crowley 2000. *The Action Plan for Australian Birds 2000*. Canberra, ACT: Environment Australia and Birds Australia. Available from: <http://www.environment.gov.au/biodiversity/threatened/publications/action/birds2000/index.html>.

Geological Survey of South Australia, 2017. Lincoln Sheet – Digital Edition. Department of State Development, SA.

Higgins PJ, Peter JM, (Eds). 2002. *Handbook of Australian, New Zealand and Antarctic Birds. Volume 6. Pardalotes to Spangled Drongo*. Oxford University Press, Melbourne.

Hoang, T. 2013. A literature review of the effects of aircraft disturbance on seabirds, shorebirds and marine mammals. (*Presented to NOAA, Greater Farallones National Marine Sanctuary and The Seabird Protection Network*).

Hughes. R., Inouye. B.D., Johnson, M.T., Underwood. N, and Vellend. M. 2008. Ecological consequences of genetic diversity. *Ecology Letters*, vol 11, issue 6, pp. 609-623.

Interim Biogeographic Regionalisation for Australia (IBRA), 2012. Interim Biogeographic Regionalisation for Australia, Version 7. Department of the Environment and Energy, Canberra.

International Union for Conservation of Nature (IUCN), 2001. *Categories & Criteria (version 3.1)*. Online resource accessed 7/03/2018 at [http://www.iucnredlist.org/static/categories\\_criteria\\_3\\_1](http://www.iucnredlist.org/static/categories_criteria_3_1).

Jacobs 2020. Whalers Way Eastern Osprey and White-bellied Sea Eagle Detailed Assessment.

Kutt, A.S., Vanderduys, E.P., Ferguson, D. and Mathieson, M. 2012. Effect of small-scale woodland clearing and thinning on vertebrate fauna in a largely intact tropical savanna mosaic, *Wildlife Research*, vol. 39, no. 4, pp. 366 – 373.

Loyn, R.H., Runnalls, R.G., Forward, G.Y. and Tyers, J. 1983. Territorial bell miners and other birds affecting populations of insect prey, *Science*, vol. 221, pp. 1411 – 1412.

Maguire G. S. 2005. Behavioural Ecology of the Southern Emu-wren (*Stipiturus malachurus*) Phd thesis. Department of Zoology, University of Melbourne.

McNamara, D. 1966. The Western Whipbird on Eyre Peninsula. *South Australian Ornithologist*. 24:93.

Moenting, A.E. and Morris, D.W. 2006. Disturbance and habitat use: is edge more important than area?, *Oikos*, vol. 115, no. 1, pp. 23 – 32.

Northern Agricultural Catchments Council (NACC), 2020. Threatened Species of the Week: *Sternula nereis nereis* (Australian Fairy Tern). Available at: <https://www.nacc.com.au/threatenedspecies-week-sternula-nereis-nereis-australian-fairy-tern/>.

Native Vegetation Council 2017. Guide for applications to clear native vegetation Under the Native Vegetation Act 1991 and Native Vegetation Regulations 2017. Native Vegetation Management Unit, Govt. of South Australia.

Native Vegetation Council, 2019. Bushland Assessment Manual, Native Vegetation Management Unit, Govt. of South Australia.

NatureMaps, 2020. Enviro Data SA. Online resource: <https://data.environment.sa.gov.au/NatureMapss/Pages/default.aspx>.

Pickett M, 2002. Status Review and Action Plan for the Eyre Peninsula Southern Emu-wren i *malachurus parimeda*. Southern Eyre Birds Inc. and National Parks and Wildlife, South Australia.

Pickett, M. 2003. Status and Distribution of the Eyre Peninsula Southern Emu-wren at the Proposed Cathedral Rocks Windfarm Site. Unpublished report prepared for Hydro Tasmania, Hobart.

Pickett, M. 2004a. Recovery Planning for the Eyre Peninsula Southern Emu-wren - 2004 Survey. Unpublished report prepared for the Department for Environment and Heritage, South Australia.

Pickett, M. 2004b. Draft Recovery Plan for the Eyre Peninsula Southern Emu-wren (*Stipiturus malachurus parimeda*) 2005 - 2009. Unpublished draft prepared for the Department for Environment and Heritage, South Australia.

Pickett, M. 2004c. Eyre Peninsula Southern Emu-wren and Western Whipbird Monitoring at the Cathedral Rocks Wind Farm Heritage Agreement Area - Spring 2004. Unpublished report prepared for Hydro Tasmania, Hobart.

Pickett, M. 2005. Eyre Peninsula Southern Emu-wren and Western Whipbird Monitoring at the Cathedral Rocks Wind Farm Heritage Agreement Area - Spring 2005. Unpublished report prepared for Hydro Tasmania, Hobart.

Pickett M, 2006. Habitat Management Guidelines for the Eyre Peninsula Southern Emu-wren. Port Lincoln, South Australia. Department of Environment and Heritage, Port Lincoln South Australia.

Pizzey G, Knight F, 2007. The Field Guide to the Birds of Australia. Harper Collins Publishers, Sydney Australia.

Radford A, Morley E, Jones G, 2012. The Effects of Noise on Biodiversity (NO0235). Department for Environment Food and Rural Affairs, United Kingdom.

Rogers, C. 2003. Bird report 2001. *South Australian Ornithologist*. 34:57-69.

Rowden, P., Steinhardt, D. and Sheehan, M. 2008. Road crashes involving animals in Australia, *Accident Analysis and Prevention*, vol. 40, no. 6, pp. 1865 – 187

SARIG, 2020. South Australian Resources Information Gateway. Online resource: <https://map.sarig.sa.gov.au/>.

Shannon, G., McKenna, M. F., Angeloni, L. M., Crooks, K. R., Frstrup, K. M., Brown, E., . . . Wittemyer, G. 2016. A synthesis of two decades research documenting the effects of noise on wildlife. *Biological Reviews*, 91:982-1005.

SpaceX. 2019. Draft Environmental Assessment for the SpaceX Starship and Super Heavy Launch Vehicle at Kennedy Space Centre (KSC).

Threatened Species Scientific Committee (TSSC), 2015. Conservation Advice *Halobaena caerulea* blue petrel. Canberra: Department of the Environment. Available from: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/1059-conservation-advice-01102015.pdf>

Threatened Species Scientific Committee (TSSC), 2016a. Conservation Advice *Limosa lapponica baueri* Bar-tailed godwit (western Alaskan). Canberra: Department of the Environment. Available from: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/86380-conservation-advice-05052016.pdf>

Threatened Species Scientific Committee (TSSC), 2016b. Conservation Advice *Limosa lapponica menzbieri* Bar-tailed godwit (northern Siberian). Canberra: Department of the Environment. Available from: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/86432-conservation-advice-05052016.pdf>

Threatened Species Scientific Committee (TSSC), 2019. Conservation Advice *Botaurus poiciloptilus* Australasian Bittern. Canberra, ACT: Department of the Environment and Energy. Available from: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/1001-conservation-advice-18012019.pdf>.

Vella, G., Rushforth, I., Mason, E., Hough, A., England, R., Styles, P., . . . Thorne, P. (2001). *Assessment of the effects of noise and vibration from offshore wind farms on marine wildlife*. Centre for Marine and Coastal Studies Ltd (CMACS).

VicFlora, 2020. Flora of Victoria. Online resource. <https://www.rbg.vic.gov.au/>

Way SL, van Weenen J, 2008. Eyre Peninsula Yellow-tailed Black-Cockatoo (*Calyptorhynchus funereus whitei*) Regional Recovery Plan. Department for Environment and Heritage, South Australia.'

Wilson RP, Culik WB, Danfeld R, Adelung D (1991) People in Antarctica-how much do Adélie penguins *Pygoscelis adeliae* care? *Polar Biol* 11:363–370

Wyle. 2003. *Noise Basics and the Effect of Aviation Noise on the Environment*. USA: Wyle.

# Appendix A

Targeted Survey for  
Southern Emu-wren  
(Eyre Peninsula) and  
Western Whipbird  
(eastern)



**ECOSPHERE**

Ecological Solutions

# Broadscale Distribution and Status of the Eyre Peninsula Southern Emu-wren (*Stipiturus malachurus parimeda*) and Western Whipbird (eastern) (*Psophodes leucogaster leucogaster*) at Whalers Way, June 2020

**11 September 2020**

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# 1 Introduction

Southern Launch are an Adelaide-based company who are proposing to construct an orbital launch facility at Whalers Way on the southern tip of the Eyre Peninsula in South Australia. The Southern Launch Project has both State and Federal support in constructing and delivering space technologies and facilities within South Australia, and Whalers Way has been identified as a suitable location. The Southern Launch project consists of the design and delivery of two separate types of facilities, and includes supporting infrastructure such as road upgrades, installation of transmission lines and various tourist facilities. The current proposal has planned for the design and construction of various infrastructure to support three (3) launch facilities (The Project site, Figure 1). The design scope will include provision of infrastructure, design review and delivery support to ensure compliance with all Australian legislative requirements. The Project site will need to be prepared to accept the facility including appropriate supporting infrastructure.

Whalers Way is a parcel of land which is largely intact native remnant coastal Mallee vegetation that has been managed by the Theakstone family since 1887. In 1969 Robert Theakstone commenced work to secure the 1,052 hectares of privately owned land as a Historic Reserve and Wilderness Sanctuary, to which it remains to this day under Heritage Agreement (HA 148). Whalers Way primary land use is as a tourist destination, whereby access to the site is gained by paying a fee and deposit for a key to the main gate with the deposit refunded upon return of the key.

In April 2020, AECOM Australia undertook a desktop and onsite broad ecological assessment on behalf of Southern Launch (AECOM 2020).

## 1.1 Objectives

The findings of the desktop assessment highlighted the need to gather more information regarding the presence and distribution for nationally conservation significant avian species, Western Whipbird (eastern) (*Psophodes leucogaster leucogaster*) and the Southern Emu-wren Eyre Peninsula subspecies (subsp.) (*Stipiturus malachurus parimeda*), both of which have historical observations and suitable habitat within and surrounding the Project site. Ecosphere Ecological Solutions Pty Ltd (Ecosphere) was engaged by AECOM on behalf of Southern Launch to review and update information currently held on these species.

The specific objectives of survey were to:

- 
- Review existing information related to the previous records and presence of critical habitat within the Project site
  - undertake on ground broadscale surveys to verify the presence and extent of Western Whipbird and Southern Emu-wren
  - report on the findings of the on ground survey.

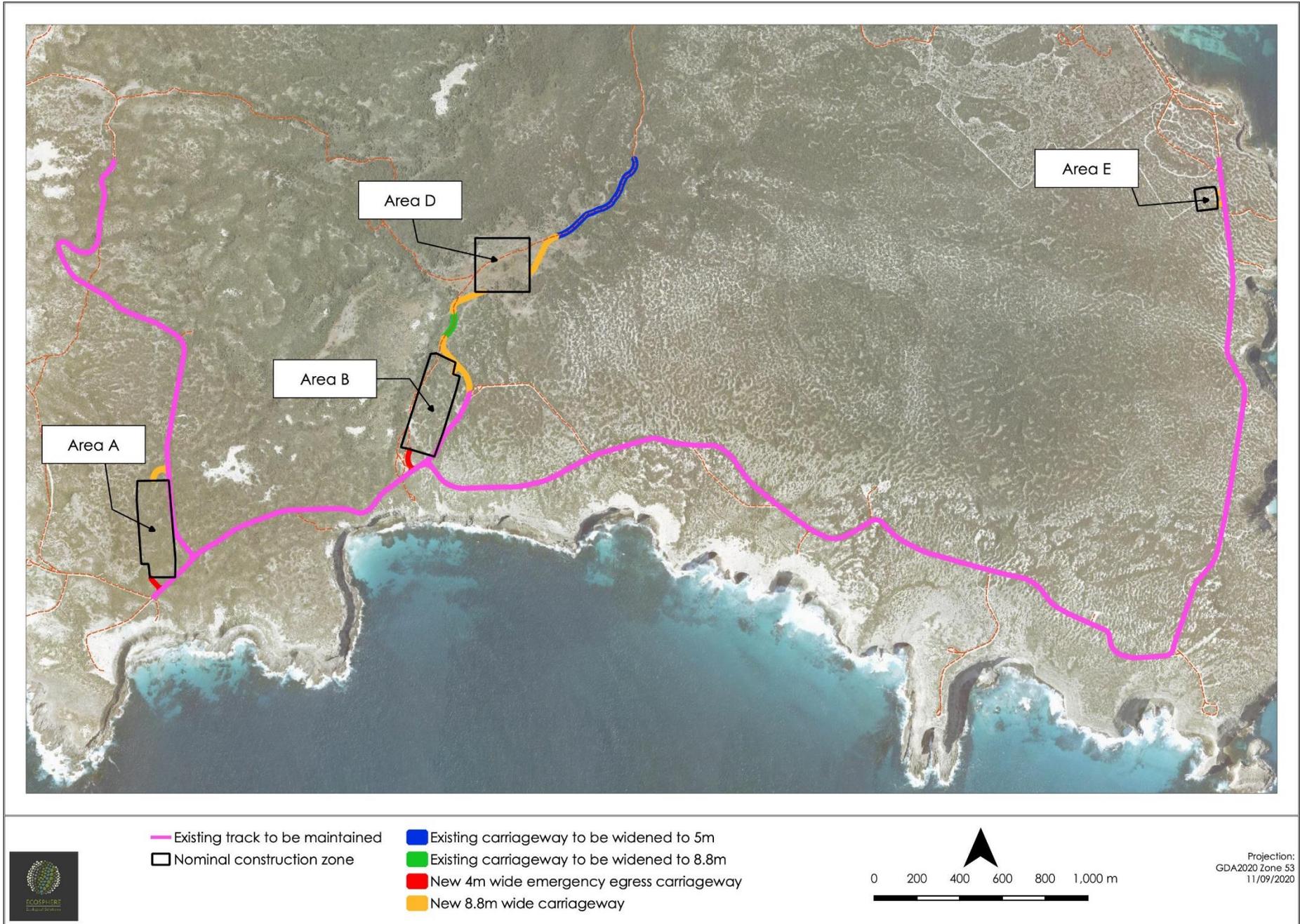


Figure 1. Location of the Project site with previous vegetation mapping extent.

## 2 Background

### 2.1 Southern Emu Wren.

The Southern Emu Wren (Eyre Peninsula) (*Stipiturus malachurus parimeda*) is listed as nationally Vulnerable under the *Environment Protection and Biodiversity Conservation Act (1999)* and Endangered under the *National Parks and Wildlife Act (1972)*. Known records for this species exist within and surrounding the Project site (Figure 2), however, the presence, size and extent of populations present within the area has not been recently thoroughly assessed and required an additional on-ground survey to provide an accurate and up-to-date assessment of the current presence and distribution.

According to the species conservation advice (DotE 2013 and references therein), the common *Stipiturus malachurus* (the Southern Emu-wren), family Maluridae, is a tiny bird with a long (10 cm) filamentous tail made up of six feathers, which is usually held upright. Male birds are grey-brown streaked black above, warm tawny brown below, with a distinctive blue chin and throat and some blue around the eyes; females are similar but lack the blue coloration. This species is shy and has a weak flight, preferring to spend most of its time low in dense cover.

The Endangered subspecies *Stipiturus malachurus parimeda* (Southern Emu-wren – Eyre Peninsula) is of moderate size but has very much paler upper parts and lower parts, compared to the other subspecies and nominate species (*S. malachurus*). The adult male has a pale crown and forehead, with brownish grey nape and sides of the neck. The chin and throat are light grey-blue. The adult female is also very pale, with brownish grey forehead, crown, nape and hindneck. The Southern Emu-wren – Eyre Peninsula is found only on the southern tip of the Eyre Peninsula, South Australia. The subspecies is currently known from eleven locations on the peninsula, all of which are likely to be fragmented and isolated (DotE 2013 and references therein).

All previous records within the Whalers Way Project site were recorded between 2002 to 2008, with a gap in assessment for the species in recent years. The Southern Emu-wren (Eyre Peninsula) assessments during this period had estimated the population to be around 1,000 individuals (DAWE and references therein).

The five important EPSEW sub-populations are recognized (Pickett 2006):

- MacLaren Point–Point Haselgrove
- Marble Range

- Merintha Ck–Kellidie Bay
- West Point
- Whalers Way (and environs)

## 2.2 Western Whipbird (eastern)

The Western Whipbird (eastern) (*Psophodes leucogaster leucogaster*) is listed as nationally Vulnerable under the Environment Protection and Biodiversity Conservation Act 1999 and Endangered under the National Parks and Wildlife Act 1972. Five previous official records were obtained in the Whalers Way area around 2004, and these were recorded by call only, i.e. individuals were not observed visually (Figure 2). Whalers Way required an on-ground survey to provide an up-to-date assessment of the current presence and distribution of the species.

The Western Whipbird (eastern) is approximately 20 to 25 cm long. It is a distinctive bird that is characterised by its short triangular crest, a short and stout bill, long and powerful legs, short wings and a graduated tail. It is typically mostly a grey to olive colour above, with a prominent white stripe on each cheek accompanied by a black throat and chin, and a broad white stripe down the centre of its breast and belly. The Western Whipbird (eastern) usually occurs singly or in pairs, though has been observed to sometimes occur in small groups of three or four birds. The Western Whipbird (eastern) typically moves short distances within the mid-upper canopy of Mallee habitat and spends some of its time partially at ground level. It has been noted that it lacks an ability to fly long ranges, and in fact the longest continuous flight of a Western Whipbird (eastern) was only 30 m (DAWE and references therein).

The Western Whipbird (eastern) occurs in three isolated regional populations in southern South Australia: the first on the southern Eyre Peninsula; the second on the south-western Yorke Peninsula; and the third in the Murray-Mallee region of south-eastern South Australia. The population on the Eyre Peninsula is restricted to sites around Coffin Bay National Park and Lincoln National Park (DAWE 2020 and references therein). Based on known records, the Eyre and Yorke Peninsula populations are estimated to consist of 250 or more birds each.

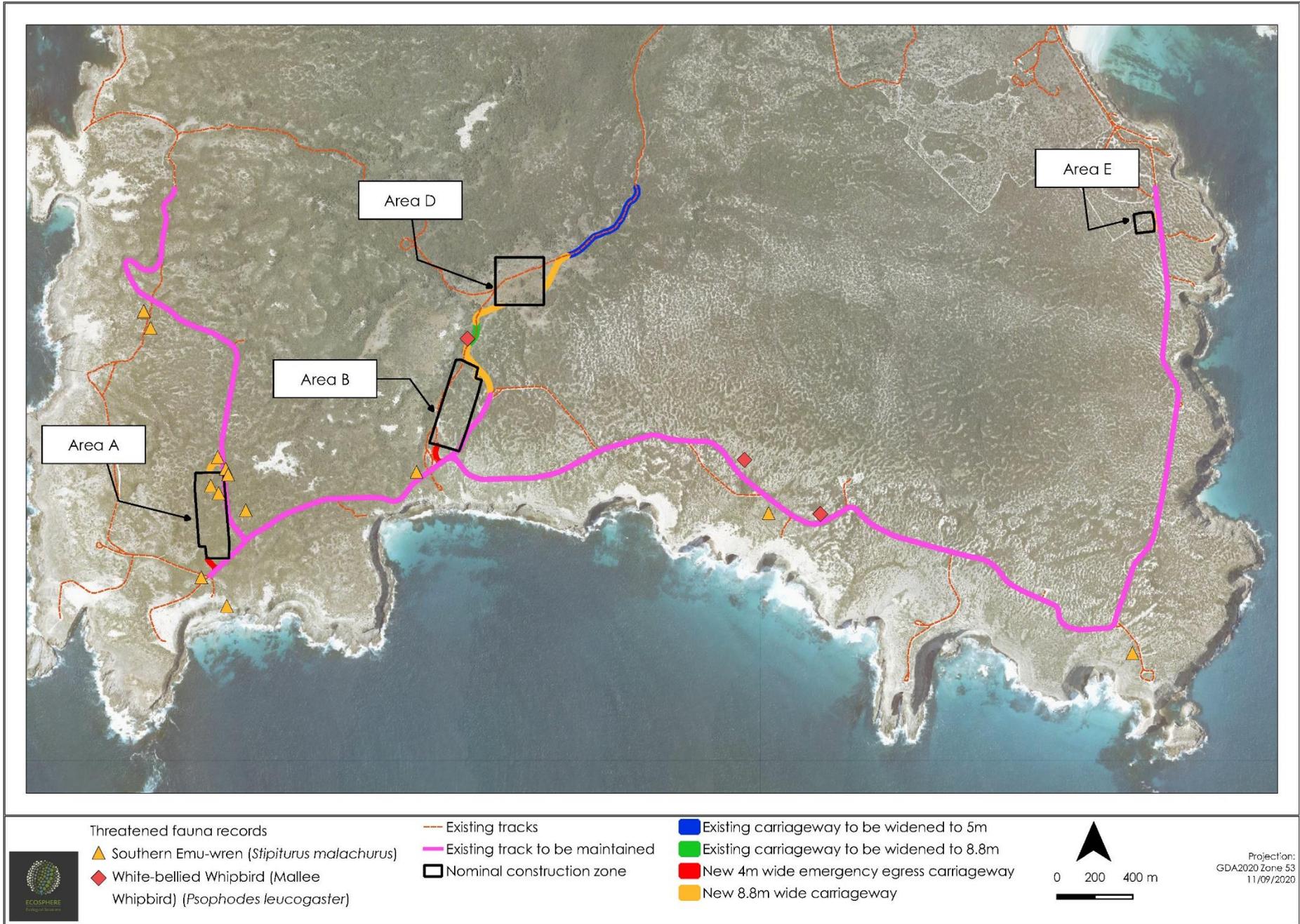


Figure 2. Locations of pre-existing records for Southern Emu-wren and Western Whipbird (eastern).

## 3 Methods

Nationally threatened avian survey methods were driven by the Guidelines for Detecting Birds Listed as Threatened under the *Environment Protection and Biodiversity Conservation Act 1999* (DEWHA 2010). The field survey was undertaken by Andrew Sinel and Rob Kelman from Ecosphere on 22-24 June 2020. The targeted species are resident and therefore expected to be present if occupying the habitat. Spring would be the ideal time to survey given males are expected to be actively guarding territories through this period however birds were still expected to be active and identifiable if present. The weather during the survey period was relatively good for avian surveys with moderate wind speeds and mild daytime temperatures for the time of year. The Port Lincoln weather station recorded the following daily observations for the survey period shown in Table 1 (BOM 2020).

Table 1. Port Lincoln weather station (5055) daily weather observations (survey period shaded).

Date	Day	Temps		Rain	9:00 AM		3:00 PM	
		Min	Max		Dir	Spd	Dir	Spd
21	Su	9.2	15.9	7	WSW	17	WSW	28
22	Mo	10.5	15.4	0.4	WSW	17	SSW	28
23	Tu	7.5		0.6	NW	17	WNW	17
24	We	6.1	17	0	NW	2	NNW	22
25	Th	9.1	18.2	0	WNW	17	W	20

This survey was performed under Permit to Undertake Scientific Research, Ongoing Projects Permit Number: E26879-1.

### 3.1 Southern Emu-wren survey

The Southern Emu-wren assessment was undertaken using broadscale assessment methodology, covering an area of approximately 350 hectares over 3 days. Linear transects within critical habitat were utilised where surveyors walked slowly through the habitat approximately 40m apart. The direction of travel was dependent on the time of day with the sun kept behind the surveyors. The overall assessment methodology was to actively target locations with pre-existing records in the first instance. Once these areas were confirmed as present/absent, other areas without records were targeted to 'fill gaps' where possible.

The Southern Emu-wren was targeted by listening for calls or by observing physical signs of the species. If a call or sighting was observed, judicious use of call playback applications was used to confirm the sighting where necessary, as advocated by the EPBC Survey Guidelines for the Southern Emu-wren (Eyre Peninsula) (DEWHA 2010). A hand held GPS unit was used to

record the location within 10 m, and where possible the number and sex of each individual was recorded.

### 3.2 Western Whipbird (eastern) survey

The assessment for the Western Whipbird (eastern) (*Psophodes leucogaster leucogaster*) was guided by the DEWHA broadscale assessment methodology. The preferred habitat for this species is difficult to walk through having a dense canopy cover of around 1.5-2m. Western Whipbirds (eastern) are typically difficult to observe by sight, however have a highly unique and unmistakable call, with calls often being able to be heard at distances of up to 800 m (DAWE and references therein). Western Whipbirds (eastern) are described as timid, elusive and cryptic, occupying dense habitat being heard rather than seen, their distinctive song usually the only indication of their presence. Detection by this method is determined as the best method for this species (DAWE and references therein). As a result, areas within the proposed Southern Launch infrastructure locations that were identified as having suitable habitat were targeted with records confirmed via call/song.

A hand held GPS unit was used to record the location, however, due to the difficulty in the observer getting in immediate proximity to the individual bird making the observed call, the mapping of the species has an accuracy of up to 100 m due to the inability in many cases to get within close range or calls ceasing as the surveyor approaches.

### 3.3 Limitations

Historical Western Whipbird and Southern Emu-wren species records were sourced from the BDBSA Supertable. The BDBSA only includes verified flora and fauna records submitted to DEW or partner organisations. It is recognised that drawing conclusions can be unreliable within areas that have been under represented in terms of biological studies. It is possible therefore, that records may occur within the Project site 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 give 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 findings and conclusions made by Ecosphere are based upon information in existence at the time of the survey.

The likelihood of detection of individuals is reduced outside of the peak periods of dawn and dusk. While these periods were utilised, surveys were conducted across the entire day. The ability to assess occurrences outside of peak periods may be reduced. Therefore, it is concluded that areas without direct observations are not necessarily absent.



The use of audio playback was used during this survey. Audio playback has been proven to have an impact on bird behaviour. Scientific literature suggests that responding to call-playback may incur energy costs, disrupt social systems, lead to pair separation or nest abandonment and cause stress. This disruption was kept front of mind and the audio playback method was used very judiciously by one surveyor only and only to confirm a brief sighting.

## 4 Results

### 4.1 Southern Emu-wren

The results of the Southern Emu-wren (*Stipiturus malachurus parimeda*) survey confirmed a total of 18 individuals in the Project site. Four pairs, one group of three and several individual observations were recorded (Table 2). The species was confirmed to occur in proximity to previous known locations (Figure 3). At least four locations were recorded as potentially new breeding pairs/groups, between Point du Bastion west to Blue Whale Bay (Figure 3). Another male was recorded west of Cape Carnot. A male Southern Emu-wren was captured by photograph near Groper Bay (Figure 4) where three individuals were recorded.

Table 2. Southern Emu-wren new observations recorded June 2020.

Name	Comment	Ind. Observed	UTM Zone 53H	
			Easting	Northing
WWSEW1	Near pre-existing Cape Carnot records	1M, 1F	557328	6133639
WWSEW2	Near pre-existing Cape Carnot records	1M	557334	6133535
WWSEW3	Near pre-existing Cape Carnot records	1F	557406	6133466
WWSEW4	Near pre-existing Cape Carnot records	1M, 1F	557477	6133947
WWSEW5	Near pre-existing Cape Carnot records	1M	557638	6134098
WWSEW6	Near pre-existing Point du Bastion record	1M	562434	6133039
WWSEW7	New record	1M	561617	6133309
WWSEW8	New record	1M,1F	561326	6133327
WWSEW9	New record	1M	560789	6133447
WWSEW10	New record in proximity to pre-existing record	1M, 1F	560561	6133729
WWSEW11	New record west of Cape Carnot	1M	556878	6133739
WWSEW12	Near pre-existing Groper Bay record	2M, 1F	558655	6134055

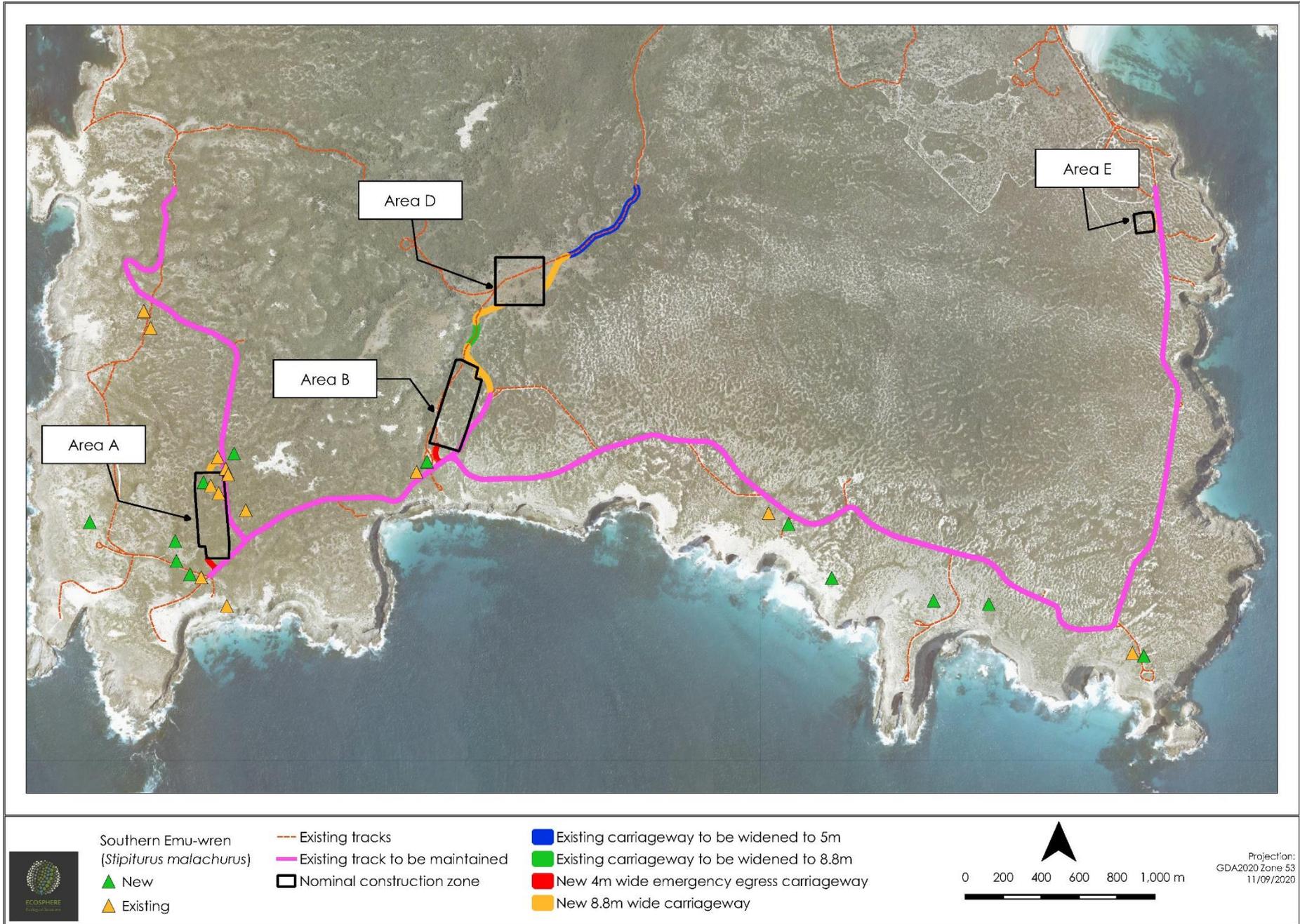


Figure 3. Locations of pre-existing records (amber) and new June 2020 records (green) for Southern Emu-wren.



Figure 4. Male Southern Emu-wren photographed near Groper Bay in coastal heath.  
Photo: Rob Kelman.

#### 4.1.1 Critical habitats

The critical habitat where pre-existing and updated/new observations occurred was Low Coastal Shrubland dominated by *Acrotriche patula* (Prickly Ground berry), *Beyeria lechenaultii* (Coastal Turpentine bush) (Vegetation association 1 in AECOM 2020) and *Callitris* sp. 'Limestone' (Native Pine) (Vegetation association 6 in AECOM 2020) with an average height of 500 mm. This often occurred with a tapestry of sparse (10-15%) cover of very low *Eucalyptus diversifolia* (Coastal White Mallee). This habitat was further enhanced if the shrubs present were 'wind hedged' into a very tight canopy cover enabling the individuals to move through the area without being sighted as in Figure 5 below where a dense canopy cover existed. No records were observed where the vegetation exceeded an average height of 1.5 m.



Figure 5. Southern Emu-wren critical habitat where pre-existing record confirmed at Point du Bastion.

#### 4.1.2 Distribution

Based on the availability of habitat it was expected that groups/individuals inhabit the entire coastal strip from Point du Bastion, west to Redbanks and beyond (Figure 5), linking with the Cathedral Rocks Wind Farm records which conforms with Pickett (2006). Almost all records



occurred within 200-800 m distance from the cliff edge although some records were as little as 115 m from the cliff edge and the average occurrence around 300 m from the cliff edge.

The large majority of the pre-existing records were in the Cape Carnot area and this was consistent with the current survey (Figure 3). This area has a lower elevation than the eastern section and is more exposed to prevailing south-westerly winds in winter and southerly winds in summer. As a result, the south-western corner of Whalers Way associated with Cape Carnot has the highest frequency and broadest geographical section of critical habitat.

#### 4.1.3 Current Status

Based on the broadscale assessment where records were spaced at an average of 300-400 m intervals on average, each containing on average 2 individuals, over the approximately 7.5 km length of the coastal strip and allowing for missed records and areas of higher density, it would be difficult to acknowledge that many more than 100 mature individuals inhabit the Whalers Way area in total.

It is unknown how effectively males are able to disperse within Whalers Way however one male Southern Emu-wren near Point du Bastion was observed traversing the access road of 8 m width, and demonstrated the ability to fly approximately 10-12 m on that occasion.

## 4.2 Western Whipbird (eastern)

The occurrence of Western Whipbird (eastern) (*Psophodes leucogaster leucogaster*) within the Project site was relatively widespread (Figure 6). Seven individual records were recorded by GPS (Table 3) however the number of birds observed by call outweighed these records significantly. It was difficult to confirm unique records as the calls were frequent and carry a significant distance. Records were therefore spaced sufficiently to avoid multiple records of the same individual unless two birds could be clearly identified as individuals calling simultaneously. Attempts to obtain a photograph of the Western Whipbird were unrewarded with a single brief sighting of a bird crossing the road.

Table 3. Western Whipbird new observations recorded June 2020.

Name	Comment	Ind. Observed	UTM Zone 53H	
			Easting	Northing
WWWWB1	Two birds responding to each other's call	2 (song)	557618	6134086
WWWWB2	Single bird calling	1 (song)	557177	6134694
WWWWB3	Single bird calling near project site footprint	1 (song)	560317	6133916
WWWWB4	Single bird calling near project site footprint	1 (song)	560422	6134448
WWWWB5	Single bird calling recorded during SEW survey	1 (song)	560896	6133755
WWWWB6	Single bird calling near project site footprint	1 (song)	562470	6135285
WWWWB7	Single at road edge brief sighting	1 (sighting)	557241	6134935

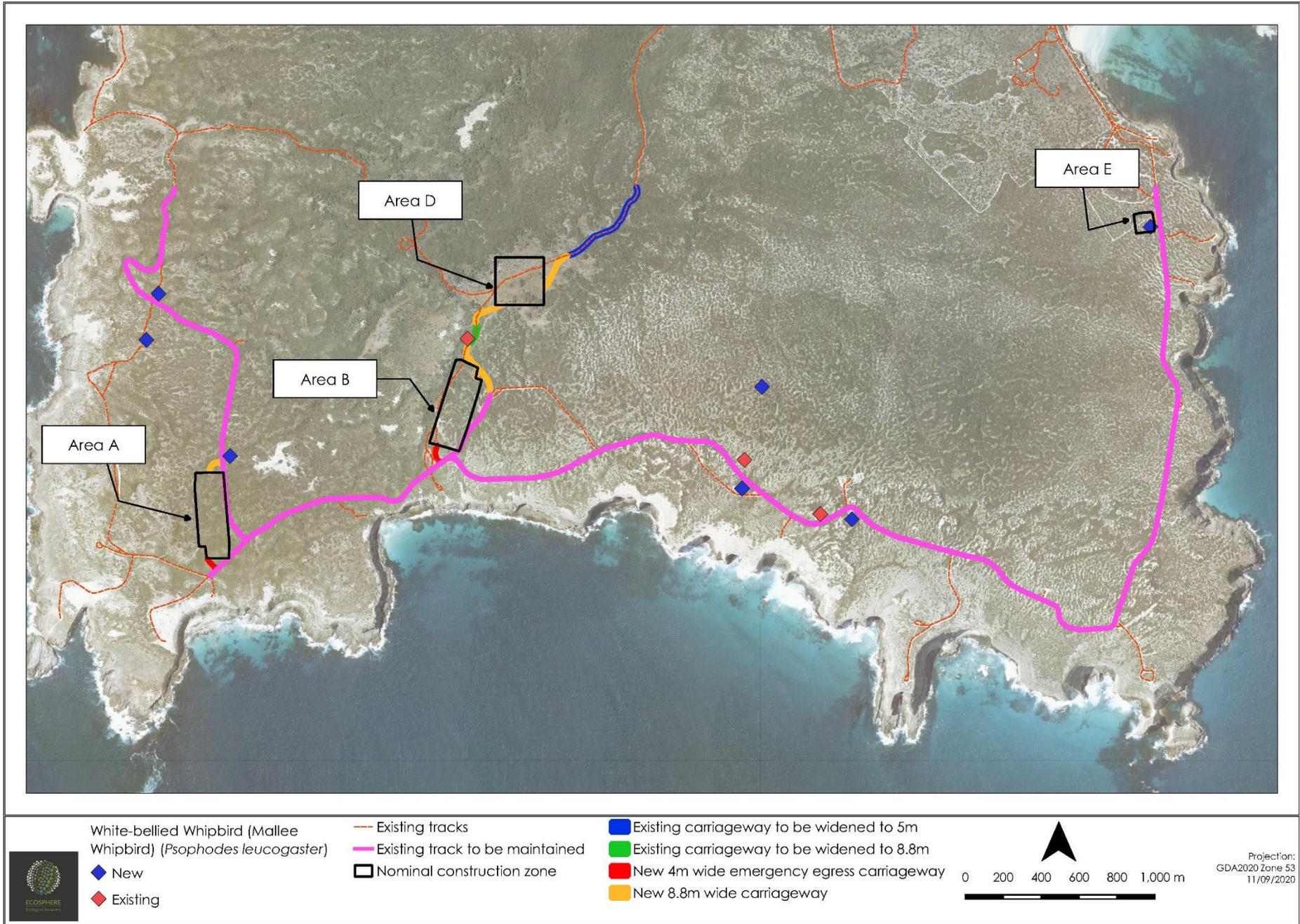


Figure 6. Locations of pre-existing records (red) and new June 2020 records (blue) for Western Whipbird.

#### 4.2.1 Critical habitats

The critical habitat of the Western Whipbird (eastern) within Whalers Way was confirmed as low Mallee, generally either mixed *Eucalyptus diversifolia* (Coastal White Mallee) or *Eucalyptus angulosa* (Ridge-fruited Mallee) (Vegetation associations 3 and 4 in AECOM 2020) with an average height of 1.5-2 m with an open understorey of low shrubs or patches broken by areas of low shrubland (Figure 7). Where records were observed, it was often difficult to traverse through the vegetation due to the density of the canopy.



Figure 7. Typical Low Mallee habitat where Western Whipbird was recorded at Whalers Way.

#### 4.2.2 Distribution

The Western Whipbird (eastern) was widely distributed across the Project site (Figure 6) and were recorded at all targeted infrastructure sites. Based on AECOM 2020, a generous proportion of the Project site footprint includes these vegetation associations. The Native Vegetation Floristic Areas -



NVIS - Statewide mapping data indicates that approximately 50% of the Project site is occupied by *Eucalyptus* mid Mallee woodland\Melaleuca shrub\Correa shrub (DEW 2011).

#### 4.2.3 Status

As it is unknown whether calls are made by numerous individuals or dominant birds moving over wide areas, it is difficult to estimate the populations of individual birds present. Based on the call frequency, it appeared that there were numerous birds, spread over a wide area.

## 5 Conclusion

The results of the survey confirmed the presence of both Southern Emu-wren and Western Whipbird within the Project site. It also confirmed that the pre-existing records remain current and consistent with the 2020 findings in terms of distribution and frequency.

The Southern Emu-wren is likely to inhabit all areas where critical habitat exists, accounting for the coastal strip from the cliff edge to an average of 300 +/- 150 m inland. The exception to this was the Cape Carnot area where records exist within a 1500 m radius of the Cape. The Cape Carnot area had the highest number and density of birds based on pre-existing and new records confirmed. Despite this, the critical habitat is poorly represented within Whalers Way as a percentage of the overall area.

Western Whipbird (eastern) was inconspicuous by physical presence but gave itself away by the distinctive call and vocal nature of the species. Western Whipbird was observed frequently during targeted surveys however it was not known whether this was single individuals calling across wide areas or numerous individual birds within smaller territories. This species was however recorded within the most dominant vegetation associations as mapped in AECOM (2020) and as described in the Native Vegetation Floristic Areas - NVIS – Statewide across the Project site.

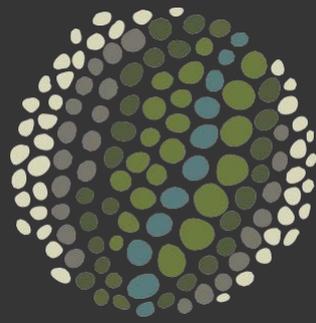
To further document and more accurately assess for the population extent and distribution of both species would require many weeks of field survey work which may result in significant disturbance and disruption to normal behaviour. What is inconclusive is the potential impacts of further fragmentation and disturbance that is associated with the construction, infrastructure upgrades and operation of the project. In the first instance, it is recommended that avoidance of all critical habitat for Southern Emu-wren is prioritised due to the low distribution and narrow band of habitat available. No recommendations are made with regard to the Western Whipbird due to the extensive nature of preferred habitat within Whalers Way based on Project site footprint mapping, NVIS mapping and personal observation.

## 6 References

- AECOM Australia (2020) Whalers Way Orbital Launch Complex Flora and Fauna Assessment and Preliminary Impact Assessment. Report to Southern Launch.
- Bureau of Meteorology (2020) Port Lincoln, South Australia June 2020 Daily Weather observations. <<http://www.bom.gov.au/climate/dwo/202006/html/IDCJDW5055.202006.shtml>>
- Department of Agriculture, Water and the Environment (DAWE) (2020) Species Profile and Threats Database *Psophodes leucogaster leucogaster* — Mallee Whipbird. SPRAT Profile Online resource viewed 1 July 2020. <[http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=81025](http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=81025)>
- Department of Agriculture, Water and the Environment (2020) Species Profile and Threats Database *Stipiturus malachurus parimeda* – Southern Emu-wren - Eyre Peninsula. SPRAT Profile Online resource viewed 1 July 2020. [http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=26006](http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=26006)
- Department for Environment and Water (2011) Native Vegetation Floristic Areas - NVIS - Statewide (Incomplete Version).
- Department of Environment Water Heritage and Agriculture (2010) 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 (DotE) (2013). Approved Conservation Advice for *Stipiturus malachurus parimeda* (Southern Emu-wren - Eyre Peninsula). Canberra: Department of the Environment.
- Pickett, M. (2006) Habitat Management Guidelines for the Eyre Peninsula Southern Emu-wren. Department for Environment and Heritage, PO Box 22 Port Lincoln SA 5606. October 2006.

# Appendix B

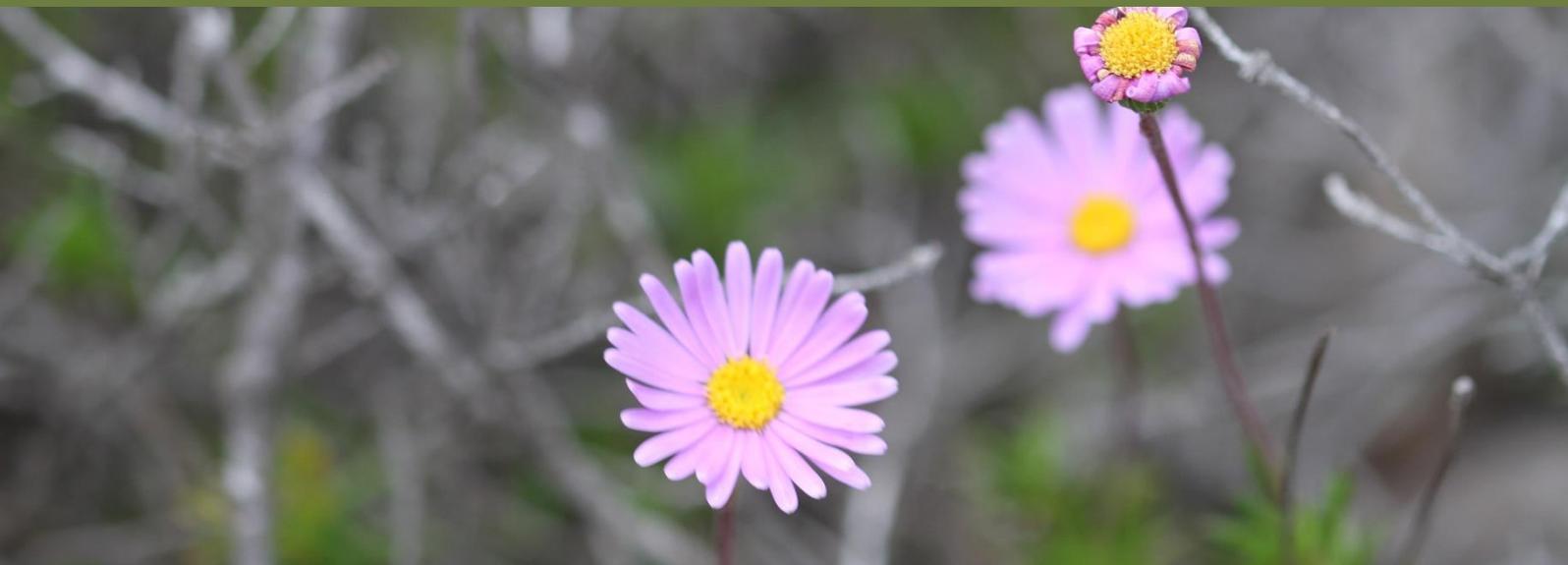
## Targeted Threatened Flora Species Assessment



**ECOSPHERE**  
Ecological Solutions

# **Southern Launch Whalers Way Project: targeted threatened flora species assessment, October 2020**

4 December 2020





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# 1 Introduction

Southern Launch are proposing to construct an orbital launch facility at Whalers Way on the southern tip of the Eyre Peninsula in South Australia. Whalers Way has been identified as a suitable location for the project which consists of the design and delivery of two separate types of facilities, and includes supporting infrastructure such as road upgrades, installation of transmission lines and various tourist facilities. The current proposal has planned for the design and construction of various infrastructure (The Project site, Figure 1).

Whalers Way is a parcel of land which is largely intact native remnant coastal Mallee vegetation that has been managed by the Theakstone family since 1887. In 1969 Robert Theakstone commenced work to secure the 1,052 hectares of privately owned land as a Historic Reserve and Wilderness Sanctuary, to which it remains to this day under Heritage Agreement (HA 148). Whalers Way primary existing land use is as a tourist destination.

In April 2020, AECOM Australia undertook a desktop and onsite broad ecological assessment on behalf of Southern Launch (AECOM 2020). This survey was undertaken outside of the peak period to determine the extent of the flora species richness resulting in the requirement for a spring survey assessment that would aid in better determining the full extent of available floristic diversity within the project site.

## 1.1 Objectives

The findings of the desktop assessment determined that species of either limited presence during the year such as ephemeral or seasonal herbaceous species such as orchids or alternatively species of an inconspicuous nature that are difficult to pinpoint when not in flower such due to morphological similarities with surrounding vegetation such as *Prostanthera calycina* (EP Mintbush).

The specific objectives of the targeted flora survey were to:

- Review existing information related to the previous records and presence of critical habitat within the Project site.
- undertake targeted surveys within all project footprints to determine the presence and extent of any threatened flora species.
- Undertake targeted threatened flora surveys within habitat areas outside the Project footprints which are most likely to support threatened flora species.
- Ground truth existing threatened flora records within Whalers Way generally to determine the presence of species, particularly those of more recent observations.

- 
- Report on the findings of any threatened species records within Whalers Way with a specific focus on project infrastructure footprints.

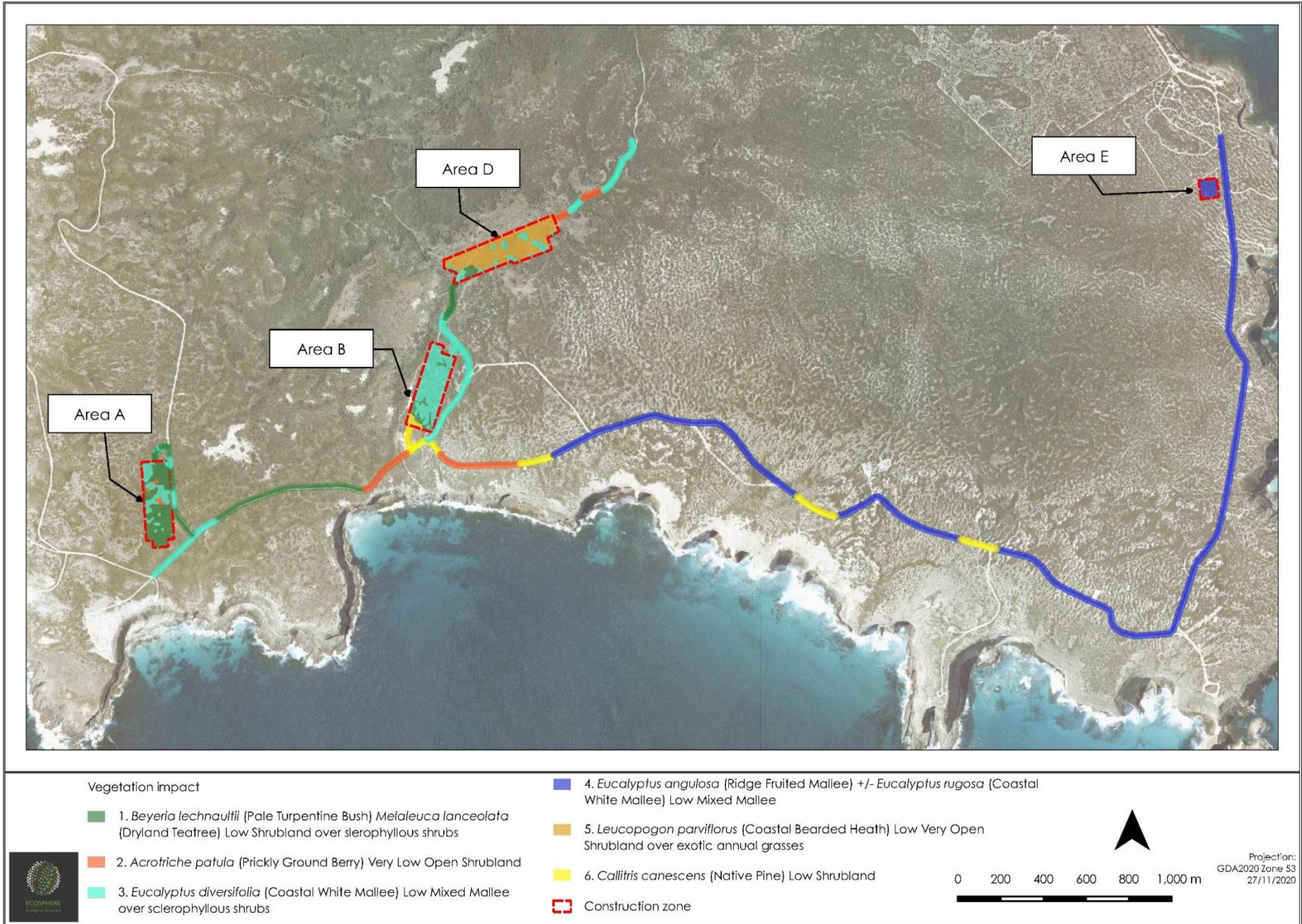


Figure 1. Location of the Whalers Way Project area with vegetation mapping.



## 2 Background

The baseline assessment found that the vegetation was relatively homogenous in compositions with two dominant mallee communities fringing coastal heath communities occupying the coast from adjacent to cliffs. Within the project footprint, most vegetation was limited to 3m or less in height with an overall average height of 1.5-2m. The canopy height was relatively consistent with proximity to the cliff edges and exposure to wind based on topography. Soils were largely sands over limestone of variable depth which dictated the mallee type present with *Eucalyptus diversifolia* occurring in the western extent of the Project areas and *Eucalyptus angulosa* dominant communities in the east.

As a result of the exposure to wind and salt spray communities were largely dominated by a high cover of few species with the exposure leading to few species able to fill the niche available within 1km of the coast. Faunal communities were consistent with that with specialised species observed in high abundance however species richness was relatively low, with again specialist niche availability suiting a small number of species. Areas north of the Project area are likely to have a higher species richness as a larger range of soil types and topographies present themselves.

## 3 Methods

The field survey was undertaken by Andrew Sinel and Matt Launer on 13-15th October 2020. Both Ecologists are highly experienced in threatened flora assessments and have both conducted numerous roadside threatened species assessments.

Infrastructure areas were assessed as a grid search with an approximately 10 metre intervals giving a 5m each side of the transect search. The desktop assessment guided the targeted survey with species that were considered likely to occur given highest order of priority with other additional herbaceous annual species not previously recorded added to flora species lists for the bushland assessments.

Access tracks were assessed with one surveyor covering each side as an up and back method with approximately 10m covered off on each side. The Whalers Way Road was assessed from a vehicle driven at walking pace along each side of the road.

Additional sites were assessed whereby areas of highest habitat preference were examined to determine if any threatened species were present within Whalers Way but potentially not within the Project area footprints. This was largely undertaken as cliff top surveys, swales with richer soil types, or areas of poorly represented vegetation communities such as *Melaleuca* ephemeral swales immediately north of the Project areas.

### 3.1 Desktop assessment

A desktop assessment was undertaken for the individual infrastructure locations with a 20 km buffer applied. The Baseline assessment undertook a standard 10 km buffer which is typically suitable to garner a cross section of species within the local area. The location and shape of the Whalers Way area means that buffers of 10 km have 75% of the area within a marine environment and not covering a wide range of terrestrial habitat types. An updated desktop assessment using a 20 km buffer enables a more thorough baseline in determining the extent of possible species utilising this habitat which can then further guide a targeted assessment.

# 4 Results

## 4.1 Desktop assessment

The additional desktop assessment returned 33 species of federal and state conservation significance with records within 20 km of the infrastructure sites. Five of these species were nationally threatened (Table 1). The EPBC protected matters search results added a further three species, (*Acacia pinguifolia*, *Caladenia tensa* and *Pleuropappus phyllocalymmeus*) which did not have historical records within 20 km.

Following the baseline surveys, and based on existing records and presence of habitat within the Project areas, four species were considered as likely occurring within the Project area, these were:

- *Acacia alcockii*
- *Caladenia bicalliata*
- *Hibbertia cinerea*
- *Prostanthera calycina*

An additional seven species were considered as possibly occurring within the Project area. These were:

- *Phyllanthus calycinus*
- *Poa fax*
- *Prasophyllum calcicola*
- *Prasophyllum occultans*
- *Sphaerolobium minus*
- *Stackhousia annua*
- *Thysanotus wangariensis*

Table 1. historical threatened flora records within 20km of infrastructure sites.

Species	AUS	SA	Data source	Most recent sighting	Species known habitat preferences	Likelihood of use for habitat – Comments
<i>Acacia alcockii</i> (Alcock's Wattle)		R	1	2009	Normally grows in sand over limestone in Mallee communities, sometimes with <i>Melaleuca</i> spp. Numerous records close to coastal fringe within Port Lincoln NP and Cathedral Rocks however not recorded during targeted flora survey in BDBSA location.	Likely – Record within Whalers Way however not recorded during baseline survey
<i>Acacia dodonaeifolia</i> (Hop-bush Wattle)		R	1	2017	Occurs with mallee habitat and also within open paddocks on hillsides and disturbed areas. Responds to fire and will grow densely following burns. Local records all around Tulka with exception of one record north of dunes at Wanna in similar habitat.	Unlikely – previous recent records within 10km however no suitable habitat occurs within Project area
<i>Acacia pinguifolia</i> (Fat leaved Wattle)	EN	E	5		Endemic to South Australia and has a widely separated distribution with disjunct populations located on Eyre Peninsula and Fleurieu Peninsula. Specimens from the southern Eyre Peninsula were collected from an undulating terrain with a westerly aspect, either on cream loam with clay subsoil, on red loam (calcareous), brown clay-loam on schist, brown clay loam on broken limestone, and pale grey sand over ironstone gravel. No records within 20km.	Unlikely – No previous records and no suitable habitat occurs within Project area
<i>Anthocercis anisantha</i> ssp. <i>anisantha</i> (Port Lincoln Ray-flower)		R	1	1995	Spinescent shrub to 3 m, leafy to almost leafless, pubescent with predominantly glandular or non-glandular hairs, rarely glabrous. Occurs in south-western W.A. and on the mainland and offshore islands in the Port Lincoln area, S.A. Usually grows in woodland or shrubland on undulating plains, associated with granite.	Unlikely – one record within 20km within PL NP and no suitable habitat present
<i>Asplenium trichomanes</i> (Common Spleenwort)		R	1	2002	Maidenhair spleenwort is a small fern in the spleenwort genus <i>Asplenium</i> . It is a widespread and common species, occurring almost worldwide in a variety of rocky habitats.	Unlikely – no suitable habitat occurs within Project area.
<i>Caladenia bicallata</i> ssp. <i>bicallata</i> (Western Daddy-long-legs)		R	1	1995	Occurs singly or in small clumps in calcareous sands or in leaf litter on limestone and chiefly coastal. Recorded from Fishery Bay to Cape Jervis on light brown sand growing near <i>Leucopogon parviflorus</i> , <i>Caladenia latifolia</i> and <i>Asparagus asparagoides</i> . Flowers from August to September	Likely – preferred habitat present and nearby records.
<i>Caladenia tensa</i>	EN		5	-	Bates (2009) considers this species to be widespread in SA from the west coast, throughout Eyre Peninsula and adjacent pastoral zone, the Flinders Ranges, rare in the Mt Lofty Ranges and more common in the Murray and upper south-east. The Greencomb Spider-orchid grows on red-brown sandy loams on rises in open woodland dominated by Yellow Gum ( <i>Eucalyptus leucoxydon</i> and Rottneest Island Pine ( <i>Callitris preissii</i> ).	Unlikely – no records within 20km and no suitable habitat occurs within Project area

Species	AUS	SA	Data source	Most recent sighting	Species known habitat preferences	Likelihood of use for habitat – Comments
<i>Drosera stricticaulis</i> (Erect Sundew)		V	1	1982	Erect, robust tuberous, perennial, herb, to 0.25 m high. Fl. pink, Jul to Oct. Sandy clay, loam. Along watercourses, granite outcrops. Sites where <i>D. stricticaulis</i> is known to occur are mainly erosional or plains landforms with sodosolic brown or red duplex or red loam soils over Precambrian rocks	Unlikely – No suitable habitat present
<i>Eucalyptus conglobata</i> ssp. <i>conglobata</i> (Port Lincoln Mallee)		R	1	2018	Occurs in dense Mallee scrub on fertile loam soils over limestone. Nearest record just within 20km and located on lower less exposed sites with orange and red loams.	Unlikely- no suitable habitat occurs within Project area
<i>Eucalyptus gillienii</i> (Mount Lindsay Mallee)		R	1	1958	Was known from only Mount Wooltarlinna and Birksgate Range in far north -west of the state. Unknown whether local records are planted specimens. Last record being 1958 suggests something may be awry with this record.	Unlikely, no recent records and no suitable habitat occurs within Project area
<i>Hibbertia cinerea</i> (Port Lincoln Guinea-flower)		R	1	2004	Decumbent habit with cane-like branches that scramble into other vegetation. Can be up to 2m high. Grows usually on sandy soil often with limestone outcrops in more or less coastal scrub to low mallee vegetation on the southern point of Eyre Peninsula, South Australia. Conservation status: Although restricted in its distribution <i>H. cinerea</i> is locally common and conserved in Lincoln National Park. Record within Whalers Way associated with few other records which appear to wrong coordinate.	Likely – Suitable habitat and records within Port Lincoln NP and north of Whalers Way
<i>Leucopogon clelandii</i> (Cleland's Beard-heath)		R	1	1985	Diffuse shrub, 13-30 cm high; stems and branchlets glabrous; leaves spreading to reflexed, broadly ovate, sometimes triangular or orbicular	Unlikely – No records in past 35 years.
<i>Lobelia heterophylla</i> (NC)		R	1	1995	Annual herbs with a distinct tap root and often with only one erect stem to 30 cm high, glabrous;	Unlikely - only the single unconfirmed record
<i>Myoporum parvifolium</i> (Creeping Boobiella)		R	1	1995	Prostrate mat-forming shrub usually less than 0.1 m tall. Known from coastal mallee habitat around Port Lincoln.	Unlikely - no suitable habitat present.
<i>Olax obcordata</i>		R	1	1967	The flowering period is September to October (Jessop ed 1986) and fruit develop and mature in December to January. South Australia Seed Conservation Centre (SCC) located populations of plants on Kangaroo Island. No plants have been located from the searches undertaken on Eyre Peninsula.	Unlikely – No records in past 40 years.
<i>Phyllanthus calycinus</i> (Snowdrop Spurge)		R	1	2015	Erect shrub, 0.2-1.2 m high. Fl. white-cream/pink, Jun to Dec or Jan. Often on sandy soils. Appears to be associated with <i>Acacia paradoxa</i> based on local records.	Possible – recent records but lack of associated <i>Acacia paradoxa</i>

Species	AUS	SA	Data source	Most recent sighting	Species known habitat preferences	Likelihood of use for habitat – Comments
<i>Pleuropappus phyllocalymmeus</i> (Silver Candles)	VU	V	5	-	On Eyre Peninsula, the species occurs in nine subpopulations with an extent of occurrence of 2900 km <sup>2</sup> . Occurs on sandy loams to clay loams or light clays Sites are sometimes gypseous. The species occurs on the margins of coastal saline lakes and depressions. On Eyre Peninsula the species predominantly occurs in shrubland and grassland.	Unlikely- no records within 20km and no suitable habitat present.
<i>Poa fax</i> (Scaly Poa)		R	1	1997	Known from dune mallee and gypsum plains and near-coastal sands (Vicflora 2020).	Possible – recent records within 5km and habitat present
<i>Prasophyllum calcicola</i> (Limestone Leek-orchid)		V	1	1995	Flowers September to early October. Flowering is not dependent on fire or disturbance. As the name calcicola' (growing in calcium rich soils) suggests, plants occur only in calcareous soils, either in leaf litter on travertine limestone, in calcareous sand or in red-brown loam over limestone, usually within a few kilometres of the sea, either in scrubby heath or under mallee, but uncommonly, usually as single plants or small groups widely spread.	Possible – Records within 20km and suitable habitat present.
<i>Prasophyllum fecundum</i> (Self-pollinating Leek-orchid)		R	1	2004	Mallee-Broombush or <i>Callitris</i> scrub in the more fertile terra-rossa soils, or in deep yellow sands, which have largely been cleared for farming so that only small, isolated populations of <i>P. fecundum</i> remain.	Unlikely – records within 20km but no suitable habitat present
<i>Prasophyllum goldsackii</i> (Goldsack's Leek-orchid)	EN	E	1	1982	Goldsack's leek orchid grows in hard terra rossa soil on the lower Eyre Peninsula and on the Yorke Peninsula. It is difficult to observe because the flowers rarely open and when they do open, appear withered.	Unlikely – No records in past 40 years.
<i>Prasophyllum occultans</i> (Hidden Leek-orchid)		R	1	1995	Plants occur singly or in small groups in well-grassed open forests. Habitats recorded include: mallee-broombush or in low scrub about rock, outcrops in the Lower North wheat-belt, on shallow soils over rock, including limestone, often with other Leek-orchids. near Native Pine woodland with mixed shrubs on sandy soil, along with <i>Prasophyllum occidentale</i> and <i>P. pallidum</i> .	Possible – record within Whalers HA, no suitable habitat within Project areas
<i>Prostanthera calycina</i> (West Coast Mintbush)	VU	V	1	1990	Occurs in association with <i>Eucalyptus diversifolia</i> Mallee. Records in nearby heritage agreements. Intensive targeted search for this species returned no individuals. Recorded <i>Prostanthera serpyllifolia</i> along coast fringe in similar preferred habitat. Definitely not recorded within project footprints.	Likely – Records within 20km and suitable habitat present.
<i>Pteris tremula</i> (Tender Brake)		R	1	2002	Fern species occurs in wet shaded gullies or gorges, sinkholes or in caves.	Unlikely - No suitable habitat present within Project area.

Species	AUS	SA	Data source	Most recent sighting	Species known habitat preferences	Likelihood of use for habitat – Comments
<i>Ptilotus beckerianus</i> (Ironstone Mulla Mulla)	VU	V	1, 5	1984	Occurs in the central and western regions of Kangaroo Island and in the southern part of Eyre Peninsula, from near Marble Range to a railway line near the Hyde Road and Lincoln Highway intersection, near Port Lincoln. The Ironstone Mulla Mulla occurs in association with several plant communities including Sugar Gum ( <i>Eucalyptus cladocalyx</i> ) open woodland, Drooping She-oak ( <i>Allocasuarina verticillata</i> ) woodland and Broombush ( <i>Melaleuca uncinata</i> ) shrubland on Eyre Peninsula. Previous personal knowledge of this species has seen it largely confined to gravelly soils around Wanilla on southern Eyre Peninsula. Very different habitat to that found within Project area.	Unlikely- no records within 20km and no suitable habitat present.
<i>Sphaerolobium minus</i> (Leafless Globe-pea)		R	1	1995	Rush-like shrub usually <50 cm high; stems terete, mostly leafless, sometimes with a few linear leaves. Sclerophyll forests, woodlands and heathlands	Possible- records within 20km, suitable habitat present.
<i>Spyridium bifidum</i> ssp. <i>bifidum</i> (Marble Range Spyridium)		V	1	2013	There is no literature available on the habitat preferences for this species however the author has recorded this species in high abundance south of Cummins in <i>Eucalyptus incrassata</i> Mallee associated with <i>Acacia pinguifolia</i> and <i>Daviesia pectinata</i> .	Unlikely, no suitable habitat present within Project area
<i>Spyridium leucopogon</i> (Silvery Spyridium)		R	1	1967	Small slender shrub; leaves narrow-linear, 3-6 mm long, 0.5-0.75 mm wide, more or less erect.	Unlikely – No records in past 40 years.
<i>Spyridium spathulatum</i> (Spoon-leaf Spyridium)		R	1	2018	Erect shrub, 1-2 m high; leaves spathulate, 5-15 mm long, more or less glabrous above, silky- or golden-pubescent below, margins recurved, apex mucronate	Unlikely – All records near Port Lincoln.
<i>Stackhousia annua</i> (Annual Candles)	VU	V	1	1995	Annual herb, may be confused with perennial <i>Stackhousia aspericocca</i> .	Possible, no records within 15km. Suitable habitat present
<i>Tecticornia lepidosperma</i>		R	1	1996	Decumbent to erect, robust shrub, 0.15-1.3 m high. Fl. Sep to Nov. Coastal & inland saline areas, tidal mud flats.	Unlikely - records within 20km however no suitable habitat present within Whalers Way
<i>Thelymitra epipactoides</i> (Metallic Sun-orchid)	EN	E	1, 5	2001	Occurs largely on fertile red loams ideally suited to cropping, hence the high levels of fragmentation, with most remnant populations occurring within road reserves and other easements such as rail, power and water corridors. It is likely the historical disturbance from grazing has all but destroyed any real chance of this species occurring within area.	Unlikely- No suitable habitat present within Project areas.

Species	AUS	SA	Data source	Most recent sighting	Species known habitat preferences	Likelihood of use for habitat – Comments
<i>Thysanotus nudicaulis</i>		E	1	1967	Perennial herb, rhizome small and more or less erect; roots swollen into tubers. Flowers purple, Nov to Dec. Sand, lateritic clay, sandy clay	Unlikely – No records in past 40 years.
<i>Thysanotus wangariensis</i> (Eyre Peninsula Fringe-lily)		R	1	1995	Perennial, with small (5-10 mm diam.) rhizome with stiff fibrous non-tuberous roots; plant leafless at maturity. Recorded within 10km, on limestone outcropping with <i>Eucalyptus angulosa</i>	Possible – records within previous 25 years, potentially suitable habitat.
<i>Wurmbea decumbens</i> (Trailing Nancy)		R	1	1991	Records at Lincoln national park where found growing on stony limestone ledges.	Unlikely – No records within 10km and no suitable habitat present within Project area.
<i>Xanthorrhoea semiplana</i> ssp. <i>tateana</i> (Tate's Grass-tree)		R	1	2018	Widespread throughout southern Eyre Peninsula, most often in association with Mallee / Banksia, <i>Hysterobaeckea</i> on inland consolidated white sand dunes and low rises. Species observed in road reserve not far from Fishery Beach. Record near Groper Bay associated with some other doubtful records and observation description does not match site location. No Yaccas present within coastal fringe of HA nor within Project areas. No Yaccas recorded within HA at all however may be present in northern sections as present on Fisheries Beach Road reserve.	Unlikely - not observed during the baseline assessment.

Source; 1- BDBSA, 2 - AoLA, 3 – NatureMaps 4 – Observed/recorded in the field, 5 - Protected matters search tool, 6 – others

Conservation status: Aus.: Australia (Environment Protection and Biodiversity Conservation Act 1999). SA: South Australia (National Parks and Wildlife Act 1972). Conservation codes: EN/E: Endangered. V: Vulnerable

## 4.2 Field assessment

Following detailed assessments of the project areas, road and access tracks and opportunistic searches, no threatened flora species were observed within the Project areas or within the general Whalers Way Project areas.

### 4.2.1 Likely species

Species considered likely to occur had a strong focus in targeted assessment. A summary of the findings of these is provided below.

#### *Acacia alcockii*

This species is a common component of mallee communities, particularly on the southern side of Port Lincoln where the shallow limestone outcrops associated with *Eucalyptus socialis* and *Eucalyptus conglobata* occur however there are numerous records on the south eastern corner of the Lincoln NP and further west of the Whalers Way area. The record located within Whalers Way near Groper Bay is thought to be incorrect coordinates with two other associated records; (*Eucalyptus gilleniei* and *Xanthorrhoea semiplana* ssp. *tatei*) not being present and the record description does not match the location. This species is more likely north of the Project area and remains likely to occur within the Whalers Way HA but unlikely within the Project area

#### *Caladenia bicalliata*

Only a few records on lower EP with one within 20km. The habitat description and locations of other records suggests that this species may be present somewhere in the wider Whalers Way area however no *Caladenia* of any species were observed during the targeted surveys. This species would remain as a targeted species in any other surveys within the area due to habitat preferences. Possible/Likely within wider Whalers Way. Unlikely within Project area.

#### *Hibbertia cinerea*

This species was targeted heavily during the survey, primarily due to *Hibbertia* species being flowering prolifically during the survey period. Consistently looking for morphological characteristics of this species as well as regular flower checks and stamen counts, no individuals of this species were observed within any project footprints or road areas. Other records in the regional area are associated with *Gahnia* sedgeland and away from the exposed coast so potentially unlikely within Whalers Way and not present within Project area.

### *Prostanthera calycina*

Another species heavily targeted due to flowering period aligning perfectly with survey making the species obvious if present. Following no observations within the Project areas, surveys along the cliff edge where they are commonly encountered in other areas on EP yielded *Prostanthera serpyllifolia* (Figure 2), a non-conservation significant member of the genus. Highly unlikely within Whalers Way.



Figure 2. *Prostanthera serpyllifolia* on cliff edge at Whalers Way.

#### 4.2.2 Possible species

##### *Phyllanthus calycinus*

Most records are located on the eastern side of the peninsula and while having similar habitat preferences of coastal mallee, most records indicate an association with species such as *Acacia paradoxa* (Kangaroo Thorn) which was not present within the Project areas. May have a presence in the northern extent of Whalers Way. Unlikely

##### *Poa fax*

Other records on lower EP have affinity with sand dunes making it unlikely this species is present within Whalers Way. Two records at Fishery Bay highlighted the species however the dune

habitat preference is very sparsely present within Whalers Way. Definitely not present within Project areas, unlikely within Whalers other than possibly Redbanks area on western side.

*Prasophyllum calcicola*

Recorded within Lincoln NP growing with *Eucalyptus diversifolia* and *Acacia rupicola*. Suggests this species may be present in northern extent of Whalers area but following field survey is very unlikely to be present within the Project areas adjacent the coast.

*Prasophyllum occultans*

Another *Prasophyllum* species preferring *Eucalyptus diversifolia* mallee however no *Prasophyllum* were recorded within the Project areas or within Whalers Way area associated with the project in general. Almost all areas had abundant presence of *Microtis* sp. (Onion Orchid, Figure 3) and *Acianthus* sp. (Mayfly Orchids) during the survey but no other evidence of orchid species was observed.



Figure 3. *Microtis* spp. present within Project area undergrowth.

*Sphaerolobium minus*

Described as preferring *Eucalyptus diversifolia* mallee on sandy loams however records are more associated with distance from exposed coastline and along roper Bay Road. No

observations made during field surveys despite flowering aligning with survey period. Highly Unlikely.

#### *Stackhousia annua*

The perennial species of *Stackhousia* was recorded within both *Eucalyptus angulosa* and *E. diversifolia* communities on numerous occasions during the survey (Figure 4) however no presence of the annual threatened species were observed.



Figure 4. *Stackhousia aspericocca* at Range control site E.

#### *Thysanotus wangariensis*

Described as occurring with *Eucalyptus angulosa* mallee, all records are well north of Project area and associated also with *Xanthorrhoea* and *Melaleuca*, not present within Project areas. Unlikely.



## 5 Conclusion

The nature of the Project areas and their proximity to the coast result in the landscape being particularly harsh and requiring tolerance of high salt load and highly alkaline soils. This leaves a very narrow pH band for nutritional requirements meaning species present are incredibly highly specialised. While most species assessed under this survey are tolerant of these conditions, looking over historical records show that the large majority are located on the eastern side of the peninsula. These areas are likely to have a far lower salt spray load and potentially lower wind velocity. The cliffs of the Whalers area potentially increase the wind velocity at the tops of the cliffs meaning these areas are subject to far harsher conditions than other surrounding areas.

While the vegetation is largely intact and of good condition, the diversity of flora species generally is low comparatively with other areas of intact vegetation on the Eyre Peninsula. The numbers of threatened species for an area of largely intact vegetation is surprisingly low, which if compared to an area such as the Koppio Hills, 40km north of the Project area, would likely return three times the number.

There is a low likelihood of threatened flora species being located within the project footprints with three surveys across the Whalers general Project areas over three seasons, including walking the entire Whalers coastal band during Southern Emu Wren surveys, not throwing up any surprises. If there are any threatened species present, it is likely that they occur in isolated pockets or as solitary individuals across the general Whalers Project areas or alternatively north of the Project areas where there is a far higher likelihood of threatened species occurring.

# Appendix C

## Protected Matters Search Tool



# EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 14/02/20 12:30:49

[Summary](#)

[Details](#)

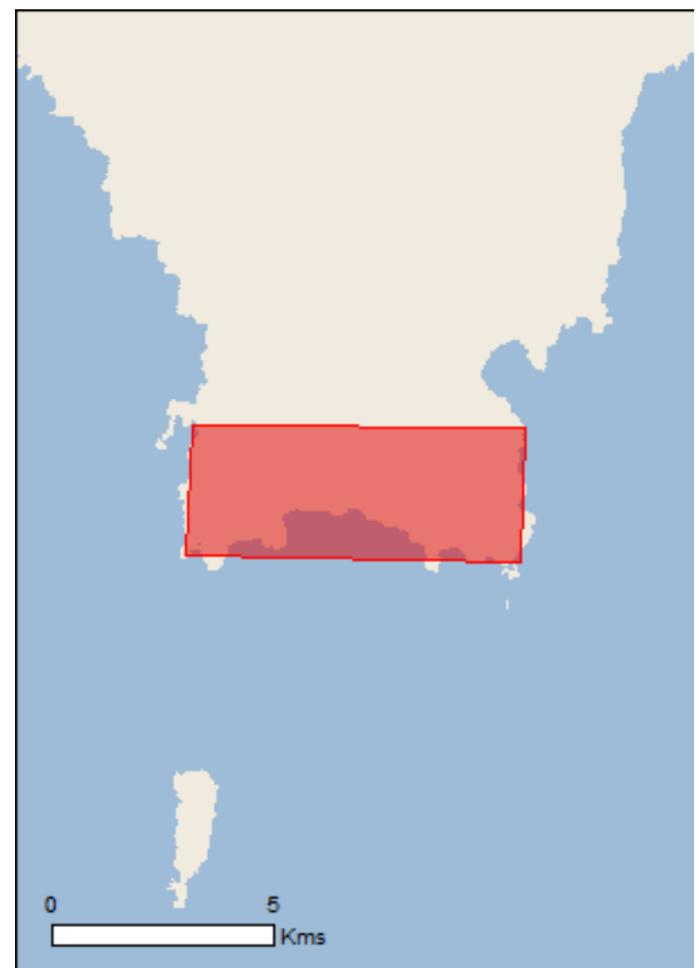
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

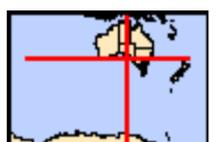
[Acknowledgements](#)



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

[Coordinates](#)

Buffer: 10.0Km



# Summary

## Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

<a href="#">World Heritage Properties:</a>	None
<a href="#">National Heritage Places:</a>	None
<a href="#">Wetlands of International Importance:</a>	None
<a href="#">Great Barrier Reef Marine Park:</a>	None
<a href="#">Commonwealth Marine Area:</a>	1
<a href="#">Listed Threatened Ecological Communities:</a>	None
<a href="#">Listed Threatened Species:</a>	44
<a href="#">Listed Migratory Species:</a>	45

## Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

<a href="#">Commonwealth Land:</a>	None
<a href="#">Commonwealth Heritage Places:</a>	None
<a href="#">Listed Marine Species:</a>	78
<a href="#">Whales and Other Cetaceans:</a>	14
<a href="#">Critical Habitats:</a>	None
<a href="#">Commonwealth Reserves Terrestrial:</a>	None
<a href="#">Australian Marine Parks:</a>	None

## Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

<a href="#">State and Territory Reserves:</a>	6
<a href="#">Regional Forest Agreements:</a>	None
<a href="#">Invasive Species:</a>	21
<a href="#">Nationally Important Wetlands:</a>	1
<a href="#">Key Ecological Features (Marine)</a>	2

# Details

## Matters of National Environmental Significance

### Commonwealth Marine Area

[\[ Resource Information \]](#)

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

#### Name

EEZ and Territorial Sea

### Marine Regions

[\[ Resource Information \]](#)

If you are planning to undertake action in an area in or close to the Commonwealth Marine Area, and a marine bioregional plan has been prepared for the Commonwealth Marine Area in that area, the marine bioregional plan may inform your decision as to whether to refer your proposed action under the EPBC Act.

#### Name

[South-west](#)

### Listed Threatened Species

[\[ Resource Information \]](#)

Name	Status	Type of Presence
<b>Birds</b>		
<a href="#">Botaurus poiciloptilus</a> Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Diomedea antipodensis</a> Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea epomophora</a> Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea exulans</a> Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea sanfordi</a> Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Halobaena caerulea</a> Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
<a href="#">Leipoa ocellata</a> Malleefowl [934]	Vulnerable	Species or species habitat likely to occur

Name	Status	Type of Presence within area
<a href="#">Limosa lapponica baueri</a> Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat may occur within area
<a href="#">Limosa lapponica menzbieri</a> Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
<a href="#">Macronectes halli</a> Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Pachyptila turtur subantarctica</a> Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Pedionomus torquatus</a> Plains-wanderer [906]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Pezoporus occidentalis</a> Night Parrot [59350]	Endangered	Extinct within area
<a href="#">Phoebastria fusca</a> Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Psophodes leucogaster leucogaster</a> Mallee Western Whipbird [81025]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Pterodroma mollis</a> Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
<a href="#">Rostratula australis</a> Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
<a href="#">Sternula nereis nereis</a> Australian Fairy Tern [82950]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Stipiturus malachurus parimeda</a> Southern Emu-wren (Eyre Peninsula) [26006]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Thalassarche cauta cauta</a> Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche cauta steadi</a> White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche impavida</a> Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche melanophris</a> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thinornis rubricollis rubricollis</a> Hooded Plover (eastern) [66726]	Vulnerable	Species or species

Name	Status	Type of Presence
habitat known to occur within area		
<b>Mammals</b>		
<a href="#">Balaenoptera borealis</a> Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Balaenoptera musculus</a> Blue Whale [36]	Endangered	Species or species habitat may occur within area
<a href="#">Balaenoptera physalus</a> Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Eubalaena australis</a> Southern Right Whale [40]	Endangered	Breeding known to occur within area
<a href="#">Megaptera novaeangliae</a> Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Neophoca cinerea</a> Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Breeding known to occur within area
<b>Plants</b>		
<a href="#">Acacia pinguifolia</a> Fat-leaved Wattle, Fat-leaf Wattle [5319]	Endangered	Species or species habitat may occur within area
<a href="#">Caladenia tensa</a> Greencomb Spider-orchid, Rigid Spider-orchid [24390]	Endangered	Species or species habitat likely to occur within area
<a href="#">Pleuropappus phyllocalymmeus</a> Silver Candles [21123]	Vulnerable	Species or species habitat may occur within area
<a href="#">Prostanthera calycina</a> West Coast Mintbush, Limestone Mintbush, Red Mintbush [9470]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Ptilotus beckerianus</a> Ironstone Mulla Mulla [3787]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Thelymitra epipactoides</a> Metallic Sun-orchid [11896]	Endangered	Species or species habitat known to occur within area
<b>Reptiles</b>		
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
<b>Sharks</b>		
<a href="#">Carcharodon carcharias</a> White Shark, Great White Shark [64470]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<b>Listed Migratory Species</b>		<b>[ <a href="#">Resource Information</a> ]</b>
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence

Name	Threatened	Type of Presence
<b>Migratory Marine Birds</b>		
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Ardenna carneipes</a> Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Breeding known to occur within area
<a href="#">Ardenna grisea</a> Sooty Shearwater [82651]		Species or species habitat may occur within area
<a href="#">Ardenna tenuirostris</a> Short-tailed Shearwater [82652]		Breeding known to occur within area
<a href="#">Diomedea antipodensis</a> Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea epomophora</a> Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea exulans</a> Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea sanfordi</a> Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Hydroprogne caspia</a> Caspian Tern [808]		Foraging, feeding or related behaviour known to occur within area
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
<a href="#">Macronectes halli</a> Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
<a href="#">Phoebastria fusca</a> Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Thalassarche cauta</a> Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche impavida</a> Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche melanophris</a> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche steadi</a> White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<b>Migratory Marine Species</b>		
<a href="#">Balaena glacialis australis</a> Southern Right Whale [75529]	Endangered*	Breeding known to occur within area
<a href="#">Balaenoptera borealis</a> Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Balaenoptera edeni</a> Bryde's Whale [35]		Species or species

Name	Threatened	Type of Presence
<a href="#">Balaenoptera musculus</a> Blue Whale [36]	Endangered	habitat may occur within area Species or species habitat may occur within area
<a href="#">Balaenoptera physalus</a> Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Caperea marginata</a> Pygmy Right Whale [39]		Foraging, feeding or related behaviour likely to occur within area
<a href="#">Carcharodon carcharias</a> White Shark, Great White Shark [64470]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
<a href="#">Lagenorhynchus obscurus</a> Dusky Dolphin [43]		Species or species habitat may occur within area
<a href="#">Lamna nasus</a> Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
<a href="#">Megaptera novaeangliae</a> Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Orcinus orca</a> Killer Whale, Orca [46]		Species or species habitat may occur within area
<b>Migratory Terrestrial Species</b>		
<a href="#">Motacilla cinerea</a> Grey Wagtail [642]		Species or species habitat may occur within area
<a href="#">Motacilla flava</a> Yellow Wagtail [644]		Species or species habitat may occur within area
<b>Migratory Wetlands Species</b>		
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat may occur within area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
<a href="#">Calidris alba</a> Sanderling [875]		Species or species habitat known to occur within area
<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area

Name	Threatened	Type of Presence
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat may occur within area
<a href="#">Calidris ruficollis</a> Red-necked Stint [860]		Species or species habitat known to occur within area
<a href="#">Charadrius veredus</a> Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
<a href="#">Gallinago hardwickii</a> Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
<a href="#">Limosa lapponica</a> Bar-tailed Godwit [844]		Species or species habitat may occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Pandion haliaetus</a> Osprey [952]		Breeding known to occur within area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

## Other Matters Protected by the EPBC Act

Listed Marine Species	[ Resource Information ]	
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
<b>Birds</b>		
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat may occur within area
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Ardea alba</a> Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
<a href="#">Ardea ibis</a> Cattle Egret [59542]		Species or species habitat may occur within area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
<a href="#">Calidris alba</a> Sanderling [875]		Species or species habitat known to occur within area
<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Endangered	Species or species

Name	Threatened	Type of Presence
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	habitat may occur within area Species or species habitat may occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat may occur within area
<a href="#">Calidris ruficollis</a> Red-necked Stint [860]		Species or species habitat known to occur within area
<a href="#">Catharacta skua</a> Great Skua [59472]		Species or species habitat may occur within area
<a href="#">Charadrius ruficapillus</a> Red-capped Plover [881]		Species or species habitat known to occur within area
<a href="#">Charadrius veredus</a> Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
<a href="#">Chrysococcyx osculans</a> Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
<a href="#">Diomedea antipodensis</a> Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea epomophora</a> Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea exulans</a> Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea sanfordi</a> Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Gallinago hardwickii</a> Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
<a href="#">Haliaeetus leucogaster</a> White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
<a href="#">Halobaena caerulea</a> Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
<a href="#">Larus pacificus</a> Pacific Gull [811]		Foraging, feeding or related behaviour known to occur within area
<a href="#">Limosa lapponica</a> Bar-tailed Godwit [844]		Species or species habitat may occur within area
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
<a href="#">Macronectes halli</a> Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within

Name	Threatened	Type of Presence area
<a href="#">Merops ornatus</a> Rainbow Bee-eater [670]		Species or species habitat may occur within area
<a href="#">Motacilla cinerea</a> Grey Wagtail [642]		Species or species habitat may occur within area
<a href="#">Motacilla flava</a> Yellow Wagtail [644]		Species or species habitat may occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Pachyptila turtur</a> Fairy Prion [1066]		Species or species habitat known to occur within area
<a href="#">Pandion haliaetus</a> Osprey [952]		Breeding known to occur within area
<a href="#">Phalacrocorax fuscescens</a> Black-faced Cormorant [59660]		Foraging, feeding or related behaviour likely to occur within area
<a href="#">Phoebetria fusca</a> Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Pterodroma mollis</a> Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
<a href="#">Puffinus carneipes</a> Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Breeding known to occur within area
<a href="#">Puffinus griseus</a> Sooty Shearwater [1024]		Species or species habitat may occur within area
<a href="#">Puffinus tenuirostris</a> Short-tailed Shearwater [1029]		Breeding known to occur within area
<a href="#">Rostratula benghalensis (sensu lato)</a> Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
<a href="#">Sterna caspia</a> Caspian Tern [59467]		Foraging, feeding or related behaviour known to occur within area
<a href="#">Thalassarche cauta</a> Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche impavida</a> Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche melanophris</a> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche steadi</a> White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thinornis rubricollis</a> Hooded Plover [59510]		Species or species habitat known to occur

Name	Threatened	Type of Presence within area
<a href="#">Thinornis rubricollis rubricollis</a> Hooded Plover (eastern) [66726]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
<b>Fish</b>		
<a href="#">Acentronura australe</a> Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area
<a href="#">Campichthys galei</a> Gale's Pipefish [66191]		Species or species habitat may occur within area
<a href="#">Filicampus tigris</a> Tiger Pipefish [66217]		Species or species habitat may occur within area
<a href="#">Heraldia nocturna</a> Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
<a href="#">Hippocampus abdominalis</a> Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area
<a href="#">Hippocampus breviceps</a> Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
<a href="#">Histiogamphelus cristatus</a> Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
<a href="#">Hypselognathus horridus</a> Shaggy Pipefish, Prickly Pipefish [66244]		Species or species habitat may occur within area
<a href="#">Hypselognathus rostratus</a> Knifesnout Pipefish, Knife-snouted Pipefish [66245]		Species or species habitat may occur within area
<a href="#">Kaupus costatus</a> Deepbody Pipefish, Deep-bodied Pipefish [66246]		Species or species habitat may occur within area
<a href="#">Leptoichthys fistularius</a> Brushtail Pipefish [66248]		Species or species habitat may occur within area
<a href="#">Lissocampus caudalis</a> Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
<a href="#">Lissocampus runa</a> Javelin Pipefish [66251]		Species or species habitat may occur within area
<a href="#">Maroubra perserrata</a> Sawtooth Pipefish [66252]		Species or species habitat may occur within area
<a href="#">Notiocampus ruber</a> Red Pipefish [66265]		Species or species habitat may occur within area
<a href="#">Phycodurus eques</a> Leafy Seadragon [66267]		Species or species habitat may occur within

Name	Threatened	Type of Presence area
<a href="#">Phyllopteryx taeniolatus</a> Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
<a href="#">Pugnaso curtirostris</a> Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
<a href="#">Solegnathus robustus</a> Robust Pipehorse, Robust Spiny Pipehorse [66274]		Species or species habitat may occur within area
<a href="#">Stigmatopora argus</a> Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
<a href="#">Stigmatopora nigra</a> Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
<a href="#">Stipecampus cristatus</a> Ringback Pipefish, Ring-backed Pipefish [66278]		Species or species habitat may occur within area
<a href="#">Urocampus carinirostris</a> Hairy Pipefish [66282]		Species or species habitat may occur within area
<a href="#">Vanacampus margaritifer</a> Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
<a href="#">Vanacampus phillipi</a> Port Phillip Pipefish [66284]		Species or species habitat may occur within area
<a href="#">Vanacampus poecilolaemus</a> Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
<a href="#">Vanacampus vercoi</a> Verco's Pipefish [66286]		Species or species habitat may occur within area

## Mammals

<a href="#">Arctocephalus forsteri</a> Long-nosed Fur-seal, New Zealand Fur-seal [20]		Breeding known to occur within area
<a href="#">Neophoca cinerea</a> Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Breeding known to occur within area

## Reptiles

<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area

## Whales and other Cetaceans

Name	Status	Type of Presence
<b>Mammals</b>		
<a href="#">Balaenoptera acutorostrata</a> Minke Whale [33]		Species or species habitat may occur within

[ [Resource Information](#) ]

Name	Status	Type of Presence area
<a href="#">Balaenoptera borealis</a> Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Balaenoptera edeni</a> Bryde's Whale [35]		Species or species habitat may occur within area
<a href="#">Balaenoptera musculus</a> Blue Whale [36]	Endangered	Species or species habitat may occur within area
<a href="#">Balaenoptera physalus</a> Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Caperea marginata</a> Pygmy Right Whale [39]		Foraging, feeding or related behaviour likely to occur within area
<a href="#">Delphinus delphis</a> Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
<a href="#">Eubalaena australis</a> Southern Right Whale [40]	Endangered	Breeding known to occur within area
<a href="#">Grampus griseus</a> Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
<a href="#">Lagenorhynchus obscurus</a> Dusky Dolphin [43]		Species or species habitat may occur within area
<a href="#">Megaptera novaeangliae</a> Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Orcinus orca</a> Killer Whale, Orca [46]		Species or species habitat may occur within area
<a href="#">Tursiops aduncus</a> Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
<a href="#">Tursiops truncatus s. str.</a> Bottlenose Dolphin [68417]		Species or species habitat may occur within area

## Extra Information

State and Territory Reserves	[ Resource Information ]
Name	State
Lincoln	SA
Sleaford Mere	SA
Unnamed (No.HA1291)	SA
Unnamed (No.HA148)	SA
Unnamed (No.HA1493)	SA
Unnamed (No.HA152)	SA

## Invasive Species

[ [Resource Information](#) ]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit, 2001.

Name	Status	Type of Presence
<b>Birds</b>		
<i>Alauda arvensis</i> Skylark [656]		Species or species habitat likely to occur within area
<i>Carduelis carduelis</i> European Goldfinch [403]		Species or species habitat likely to occur within area
<i>Columba livia</i> Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
<i>Passer domesticus</i> House Sparrow [405]		Species or species habitat likely to occur within area
<i>Streptopelia chinensis</i> Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
<i>Sturnus vulgaris</i> Common Starling [389]		Species or species habitat likely to occur within area
<i>Turdus merula</i> Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
<b>Mammals</b>		
<i>Canis lupus familiaris</i> Domestic Dog [82654]		Species or species habitat likely to occur within area
<i>Felis catus</i> Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
<i>Mus musculus</i> House Mouse [120]		Species or species habitat likely to occur within area
<i>Oryctolagus cuniculus</i> Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
<i>Rattus rattus</i> Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
<i>Vulpes vulpes</i> Red Fox, Fox [18]		Species or species habitat likely to occur within area
<b>Plants</b>		
<i>Asparagus asparagoides</i> Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
<i>Carrichtera annua</i> Ward's Weed [9511]		Species or species habitat may occur within area
<i>Chrysanthemoides monilifera</i> Bitou Bush, Boneseed [18983]		Species or species habitat may occur within

Name	Status	Type of Presence area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area

### Nationally Important Wetlands [\[ Resource Information \]](#)

Name	State
<a href="#">Sleaford Mere</a>	SA

### Key Ecological Features (Marine) [\[ Resource Information \]](#)

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

Name	Region
<a href="#">Ancient coastline at 90-120m depth</a>	South-west
<a href="#">Kangaroo Island Pool, canyons and adjacent shelf</a>	South-west

# Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

# Coordinates

-34.922461 135.621141,-34.922461 135.621313,-34.922461 135.621313,-34.923164 135.688089,-34.945259 135.687059,-34.943993 135.619596,-34.922461 135.621141

# Acknowledgements

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- [-Office of Environment and Heritage, New South Wales](#)
- [-Department of Environment and Primary Industries, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Department of Land and Resource Management, Northern Territory](#)
- [-Department of Environmental and Heritage Protection, Queensland](#)
- [-Department of Parks and Wildlife, Western Australia](#)
- [-Environment and Planning Directorate, ACT](#)
- [-Birdlife Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- [-Natural history museums of Australia](#)
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-South Australian Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence Forestry Corporation, NSW](#)
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- [-CSIRO](#)
- [-Australian Tropical Herbarium, Cairns](#)
- [-eBird Australia](#)
- [-Australian Government – Australian Antarctic Data Centre](#)
- [-Museum and Art Gallery of the Northern Territory](#)
- [-Australian Government National Environmental Science Program](#)
- [-Australian Institute of Marine Science](#)
- [-Reef Life Survey Australia](#)
- [-American Museum of Natural History](#)
- [-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [-Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- [-Other groups and individuals](#)

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.

# Appendix D

Likelihood of  
Occurrence - Flora

## Appendix D Likelihood of Occurrence - Flora

Species	Conservation Status		Data Source	Most Recent Sighting	Habitat	Desktop Assessment/ Baseline Survey- Likelihood	Post Targeted Survey - Likelihood
	EPBC Act	NPW Act					
<i>Acacia alcockii</i> (Alcock's Wattle)		R	1	2009	Normally grows in sand over limestone in Mallee communities, sometimes with <i>Melaleuca</i> spp. Numerous records close to coastal fringe within Port Lincoln National Park and Cathedral Rocks however not recorded during targeted flora survey in BDBSA location.	Likely – Record within Whalers Way however not recorded during baseline survey	Unlikely
<i>Acacia dodonaeifolia</i> (Hop-bush Wattle)		R	1	2017	Occurs with mallee habitat and also within open paddocks on hillsides and disturbed areas. Responds to fire and will grow densely following burns. Local records all around Tulka with exception of one record north of dunes at Wanna in similar habitat.	Unlikely – previous recent records within 10km however no suitable habitat occurs within Project Area	Unlikely
<i>Acacia pinguifolia</i> (Fat leaved Wattle)	EN	E	5		Endemic to SA and has a widely separated distribution with disjunct populations located on Eyre Peninsula and Fleurieu Peninsula. Specimens from the southern Eyre Peninsula were collected from an undulating terrain with a westerly aspect, either on cream loam with clay subsoil, on red loam (calcareous), brown clay-loam on schist, brown clay loam on broken limestone, and pale grey sand over ironstone gravel. No records within 20km.	Unlikely – No previous records and no suitable habitat occurs within Project Area	Unlikely

<i>Anthocercis anisantha</i> ssp. <i>anisantha</i> (Port Lincoln Ray-flower)		R	1	1995	Spinescent shrub to 3 m, leafy to almost leafless, pubescent with predominantly glandular or non-glandular hairs, rarely glabrous. Occurs in south-western W.A. and on the mainland and offshore islands in the Port Lincoln area, S.A. Usually grows in woodland or shrubland on undulating plains, associated with granite.	Unlikely – one record within 20km within Port Lincoln National Park and no suitable habitat present	Unlikely
<i>Asplenium trichomanes</i> (Common Spleenwort)		R	1	2002	Maidenhair spleenwort is a small fern in the spleenwort genus <i>Asplenium</i> . It is a widespread and common species, occurring almost worldwide in a variety of rocky habitats.	Unlikely – no suitable habitat occurs within Project Area	Unlikely
<i>Caladenia bicallata</i> ssp. <i>bicallata</i> (Western Daddy-long-legs)		R	1	1995	Occurs singly or in small clumps in calcareous sands or in leaf litter on limestone and chiefly coastal. Recorded from Fishery Bay to Cape Jervis on light brown sand growing near <i>Leucopogon parviflorus</i> , <i>Caladenia latifolia</i> and <i>Asparagus asparagoides</i> . Flowers from August to September.	Likely – preferred habitat present and nearby records	Unlikely
<i>Caladenia tensa</i> (Greencomb Spider-orchid)	E	-	5	-	Bates (2009) considers this species to be widespread in SA from the west coast, throughout Eyre Peninsula and adjacent pastoral zone, the Flinders Ranges, rare in the Mt Lofty Ranges and more common in the Murray and upper south-east. The Greencomb Spider-orchid grows on red-brown sandy loams on rises in open woodland dominated by Yellow Gum ( <i>Eucalyptus leucoxyton</i> and Rottneest Island Pine ( <i>Callitris preissii</i> ).	Unlikely – no records within 20km and no suitable habitat occurs within Project Area	Unlikely
<i>Drosera stricticaulis</i> (Erect Sundew)		V	1	1982	Erect, robust tuberous, perennial, herb, to 0.25 m high. Fl. pink, Jul to Oct. Sandy clay, loam. Along watercourses, granite outcrops. Sites where <i>D. stricticaulis</i> is known to occur are mainly erosional or plains landforms with sodosolic brown or red duplex or red loam soils over Precambrian rocks.	Unlikely – No suitable habitat present	Unlikely

<i>Eucalyptus conglobata</i> ssp. <i>conglobata</i> (Port Lincoln Mallee)		R	1	2018	Occurs in dense Mallee scrub on fertile loam soils over limestone. Nearest record just within 20km and located on lower less exposed sites with orange and red loams.	Unlikely- no suitable habitat occurs within Project area	Unlikely
<i>Eucalyptus gillenii</i> (Mount Lindsay Mallee)		R	1	1958	Was known from only Mount Wooltarlinna and Birksgate Range in far north -west of the state. Unknown whether local records are planted specimens. Last record being 1958 suggests something may be awry with this record.	Unlikely, no recent records and no suitable habitat occurs within Project area	Unlikely
<i>Hibbertia cinerea</i> (Port Lincoln Guinea-flower)		R	1	2004	Decumbent habit with cane-like branches that scramble into other vegetation. Can be up to 2m high. Grows usually on sandy soil often with limestone outcrops in more or less coastal scrub to low mallee vegetation on the southern point of Eyre Peninsula, SA. Conservation status: Although restricted in its distribution <i>H. cinerea</i> is locally common and conserved in Lincoln National Park. Record within Whalers Way associated with few other records which appear to wrong coordinate.	Likely – Suitable habitat and records within Port Lincoln NP and north of Whalers Way	Unlikely
<i>Leucopogon clelandii</i> (Cleland's Beard-heath)		R	1	1985	Diffuse shrub, 13-30 cm high; stems and branchlets glabrous; leaves spreading to reflexed, broadly ovate, sometimes triangular or orbicular.	Unlikely – No records in past 35 years	Unlikely
<i>Lobelia heterophylla</i> (NC)		R	1	1995	Annual herbs with a distinct tap root and often with only one erect stem to 30 cm high, glabrous.	Unlikely - only the single unconfirmed record	Unlikely
<i>Myoporum parvifolium</i> (Creeping Boobialla)		R	1	1995	Prostrate mat-forming shrub usually less than 0.1 m tall. Known from coastal mallee habitat around Port Lincoln.	Unlikely - no suitable habitat present	Unlikely

<i>Olax obcordata</i>		R	1	1967	The flowering period is September to October (Jessop ed 1986) and fruit develop and mature in December to January. SA Seed Conservation Centre (SCC) located populations of plants on Kangaroo Island. No plants have been located from the searches undertaken on Eyre Peninsula.	Unlikely – No records in past 40 years	Unlikely
<i>Phyllanthus calycinus</i> (Snowdrop Spurge)		R	1	2015	Erect shrub, 0.2-1.2 m high. Fl. white-cream/pink, Jun to Dec or Jan. Often on sandy soils. Appears to be associated with <i>Acacia paradoxa</i> based on local records.	Possible – recent records but lack of associated <i>Acacia paradoxa</i>	Unlikely
<i>Pleuropappus phyllocalymmeus</i> (Silver Candles)	V	V	5	-	On Eyre Peninsula, the species occurs in nine subpopulations with an extent of occurrence of 2900 km <sup>2</sup> . Occurs on sandy loams to clay loams or light clays Sites are sometimes gypseous. The species occurs on the margins of coastal saline lakes and depressions. On Eyre Peninsula the species predominantly occurs in shrubland and grassland.	Unlikely- no records within 20km and no suitable habitat present	Unlikely
<i>Poa fax</i> (Scaly Poa)		R	1	1997	Known from dune mallee and gypsum plains and near-coastal sands (Vicflora 2020).	Possible – recent records within 5km and habitat present	Unlikely
<i>Prasophyllum calcicola</i> (Limestone Leek-orchid)		V	1	1995	Flowers September to early October. Flowering is not dependent on fire or disturbance. As the name calcicola (growing in calcium rich soils) suggests, plants occur only in calcareous soils, either in leaf litter on travertine limestone, in calcareous sand or in red-brown loam over limestone, usually within a few kilometres of the sea, either in scrubby heath or under mallee, but uncommonly, usually as single plants or small groups widely spread.	Possible – Records within 20km and suitable habitat present	Unlikely

<i>Prasophyllum fecundum</i> (Self-pollinating Leek-orchid)		R	1	2004	Mallee-broombush or Callitris scrub in the more fertile terra-rossa soils, or in deep yellow sands, which have largely been cleared for farming so that only small, isolated populations of <i>P. fecundum</i> remain.	Unlikely – records within 20km but no suitable habitat present	Unlikely
<i>Prasophyllum goldsackii</i> (Goldsack's Leek-orchid)	EN	E	1	1982	Goldsack's leek orchid grows in hard terra rossa soil on the lower Eyre Peninsula and on the Yorke Peninsula. It is difficult to observe because the flowers rarely open and when they do open, appear withered.	Unlikely – No records in past 40 years	Unlikely
<i>Prasophyllum occultans</i> (Hidden Leek-orchid)		R	1	1995	Plants occur singly or in small groups in well-grassed open forests. Habitats recorded include: mallee-broombush or in low scrub about rock, outcrops in the Lower North wheat-belt, on shallow soils over rock, including limestone, often with other Leek-orchids. near Native Pine woodland with mixed shrubs on sandy soil, along with <i>Prasophyllum occidentale</i> and <i>P. pallidum</i> .	Possible – record within Whalers HA, no suitable habitat within Project areas	Unlikely
<i>Prostanthera calycina</i> (West Coast Mintbush)	VU	V	1	1990	Occurs in association with <i>Eucalyptus diversifolia</i> Mallee. Records in nearby heritage agreements. Intensive targeted search for this species returned no individuals. Recorded <i>Prostanthera serpyllifolia</i> along coast fringe in similar preferred habitat. Definitely not recorded within project footprints.	Likely – Records within 20 km and suitable habitat present	Unlikely
<i>Pteris tremula</i> (Tender Brake)		R	1	2002	Fern species occurs in wet shaded gullies or gorges, sinkholes or in caves.	Unlikely - No suitable habitat present within Project area	Unlikely

<i>Ptilotus beckerianus</i> (Ironstone Mulla Mulla)	VU	V	1, 5	1984	Occurs in the central and western regions of Kangaroo Island and in the southern part of Eyre Peninsula, from near Marble Range to a railway line near the Hyde Road and Lincoln Highway intersection, near Port Lincoln. The Ironstone Mulla Mulla occurs in association with several plant communities including Sugar Gum ( <i>Eucalyptus cladocalyx</i> ) open woodland, Drooping She-oak ( <i>Allocasuarina verticillata</i> ) woodland and Broombush ( <i>Melaleuca uncinata</i> ) shrubland on Eyre Peninsula. Previous personal knowledge of this species has seen it largely confined to gravelly soils around Wanilla on southern Eyre Peninsula. Very different habitat to that found within Project area.	Unlikely- no records within 20km and no suitable habitat present	Unlikely
<i>Sphaerolobium minus</i> (Leafless Globe-pea)		R	1	1995	Rush-like shrub usually <50 cm high; stems terete, mostly leafless, sometimes with a few linear leaves. Sclerophyll forests, woodlands and heathlands.	Possible- records within 20km, suitable habitat present	Unlikely
<i>Spyridium bifidum</i> ssp. <i>bifidum</i> (Marble Range Spyridium)		V	1	2013	There is no literature available on the habitat preferences for this species however the author has recorded this species in high abundance south of Cummins in <i>Eucalyptus incrassata</i> Mallee associated with <i>Acacia pinguifolia</i> and <i>Daviesia pectinata</i> .	Unlikely, no suitable habitat present within Project area	Unlikely
<i>Spyridium leucopogon</i> (Silvery Spyridium)		R	1	1967	Small slender shrub; leaves narrow-linear, 3-6 mm long, 0.5-0.75 mm wide, more or less erect.	Unlikely – No records in past 40 years	Unlikely
<i>Spyridium spathulatum</i> (Spoon-leaf Spyridium)		R	1	2018	Erect shrub, 1-2 m high; leaves spatulate, 5-15 mm long, more or less glabrous above, silky- or golden-pubescent below, margins recurved, apex mucronate.	Unlikely – All records near Port Lincoln	Unlikely
<i>Stackhousia annua</i> (Annual Candles)	VU	V	1	1995	Annual herb, may be confused with perennial <i>Stackhousia aspericocca</i> .	Possible, no records within 15km. Suitable habitat present	Unlikely

<i>Tecticornia lepidosperma</i>		R	1	1996	Decumbent to erect, robust shrub, 0.15-1.3 m high. Fl. Sep to Nov. Coastal & inland saline areas, tidal mud flats.	Unlikely - records within 20km however no suitable habitat present within Whalers Way	Unlikely
<i>Thelymitra epipactoides</i> (Metallic Sun-orchid)	EN	E	1, 5	2001	Occurs largely on fertile red loams ideally suited to cropping, hence the high levels of fragmentation, with most remnant populations occurring within road reserves and other easements such as rail, power and water corridors. It is likely the historical disturbance from grazing has all but destroyed any real chance of this species occurring within area.	Unlikely- No suitable habitat present within Project areas	Unlikely
<i>Thysanotus nudicaulis</i>		E	1	1967	Perennial herb, rhizome small and more or less erect; roots swollen into tubers. Flowers purple, Nov to Dec. Sand, lateritic clay, sandy clay	Unlikely – No records in past 40 years	Unlikely
<i>Thysanotus wangariensis</i> (Eyre Peninsula Fringe-lily)		R	1	1995	Perennial, with small (5-10 mm diam.) rhizome with stiff fibrous non-tuberous roots; plant leafless at maturity. Recorded within 10km, on limestone outcropping with <i>Eucalyptus angulosa</i> .	Possible – records within previous 25 years, potentially suitable habitat	Unlikely
<i>Wurmbea decumbens</i> (Trailing Nancy)		R	1	1991	Records at Lincoln national park where found growing on stony limestone ledges.	Unlikely – No records within 10km and no suitable habitat present within Project area	Unlikely
<i>Xanthorrhoea semiplana ssp. tateana</i> (Tate's Grass-tree)		R	1	2018	Widespread throughout southern Eyre Peninsula, most often in association with Mallee / Banksia, <i>Hysterobaeckea</i> on inland consolidated white sand dunes and low rises. Species observed in road reserve not far from Fishery Beach. Record near Groper Bay associated with some other doubtful records and observation description does not match site location. No Yaccas present within coastal fringe of HA nor within Project areas. No Yaccas recorded within HA at all however may be present in northern sections as present on Fisheries Beach Road reserve.	Unlikely - not observed during the baseline assessment	Unlikely

Source; 1- BDBSA, 2 – Atlas of Living Australia, 3 – NatureMaps 4 – Observed/recorded in the field, 5 - Protected matters search tool, 6 – others

Conservation codes:

EPBC Act: E Endangered V Vulnerable

NPW Act: V Vulnerable R Rare

# Appendix E

Likelihood of  
Occurrence - Fauna

## Appendix E Likelihood of Occurrence - Fauna

Scientific Name	Common Name	Conservation Code		Habitat	Desktop Assessment - Likelihood	Post Field Surveys - Likelihood
		EPBC Act	NPW Act			
<b>Birds</b>						
<i>Actitis hypoleucos</i>	Common Sandpiper	Mi	R	Edges of saltwater to fresh waterbodies and wetlands, including estuaries, lakes, drainage lines, tidal watercourses and mudflats; occasionally beaches and rocky headlands; mainly spring-summer non-breeding migrant.	Unlikely	Unlikely
<i>Apus pacificus</i>	Fork-tailed Swift	Mi, Ma	-	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. They mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. They are also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes. The sometimes occur above rainforests, wet sclerophyll forest or open forest or plantations of pines.	Possible	Unlikely
<i>Ardea alba</i>	Great Egret	Ma	-	The Great Egret occupies a wide variety of wet habitats including freshwater wetlands, dams, flooded pastures, estuarine mudflats, mangroves and reefs (Morcombe, 2003). The species is also known to visit shallows of rivers, sewage ponds and irrigation areas (Pizzey & Knight, 2007).	Unlikely	Unlikely
<i>Ardea ibis</i>	Cattle Egret	Ma	R	The Cattle Egret occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands. It has occasionally been seen in arid and semi-arid regions however this is extremely rare. High	Unlikely	Unlikely

Scientific Name	Common Name	Conservation Code		Habitat	Desktop Assessment - Likelihood	Post Field Surveys - Likelihood
		EPBC Act	NPW Act			
				numbers have been observed in moist, low-lying poorly drained pastures with an abundance of high grass; it avoids low grass pastures. It has been recorded on earthen dam walls and ploughed fields. It is commonly associated with the habitats of farm animals, particularly cattle, but also pigs, sheep, horses and deer. The Cattle Egret is known to follow earth-moving machinery and has been located at rubbish tips. It uses predominately shallow, open and fresh wetlands including meadows and swamps with low emergent vegetation and abundant aquatic flora. They have sometimes been observed in swamps with tall emergent vegetation.		
<i>Ardenna carneipes</i>	Flesh-footed Shearwater	Mi, Ma	R	The Flesh-footed Shearwater mainly occurs in the subtropics over continental shelves and slopes and occasionally inshore waters. They breed on islands in burrows on sloping ground in coastal forest, scrubland, shrubland or grassland.	Unlikely	Unlikely
<i>Ardenna grisea</i>	Sooty Shearwater	Mi, Ma	-	The Sooty Shearwater forages in pelagic (open ocean) sub-tropical, sub-Antarctic and Antarctic waters.	Unlikely	Unlikely
<i>Ardenna tenuirostris</i>	Short-tailed Shearwater	Mi, Ma	-	Found in coastal waters. Likely to be present on adjacent offshore islands potentially.	Possible	Unlikely
<i>Ardeotis australis</i>	Australian Bustard	-	V	Ground dweller, common in grasslands, woodland and in agricultural areas (Birdlife, 2020). Not likely to utilise shrubland community or if does would be very unfrequently. The project areas are highly unlikely to constitute critical habitat for this species and there are no records within project areas. This species has a habit of turning up unexpectedly in random locations so is always a possibility almost anywhere.	Known	Unlikely/ possible as vagrant

Scientific Name	Common Name	Conservation Code		Habitat	Desktop Assessment - Likelihood	Post Field Surveys - Likelihood
		EPBC Act	NPW Act			
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E	V	Favours wetlands with tall dense vegetation where it forages in still shallow water at the edge of pools and waterways or from platforms or mats of vegetation over deep water (TSSC, 2019).	Unlikely	Unlikely
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	Mi	-	Prefers the grassy edges of shallow inland freshwater wetlands. It is also found around sewage farms, flooded fields, mudflats, mangroves, rocky shores and beaches.	Unlikely	Unlikely
<i>Calidris alba</i>	Sanderling	Mi, Ma	R	Coastal species, open sandy beaches exposed to open sea-swell and exposed sandbars and spits and shingle banks where they forage in wave-wash zone amongst rotting seaweed. May occur on sheltered sandy shorelines of estuaries, inlets and harbours.	Possible	Unlikely
<i>Calidris canutus</i>	Red Knot	E, Mi, Ma	-	Intertidal mudflats, sandflats and sandy beaches of sheltered coasts. Sometimes seen on terrestrial saline wetlands.	Unlikely	Unlikely
<i>Calidris ferruginea</i>	Curlew Sandpiper	CE, Mi, Ma	-	Coastal estuaries, bays and shallow wetlands, tidal mudflats and sandflats; mainly spring-summer non-breeding migrant.	Unlikely	Unlikely
<i>Calidris melanotos</i>	Pectoral Sandpiper	Mi, Ma	R	Shallow freshwater or brackish wetlands, including swamps, flooded grasslands, sewage ponds, occasionally tidal flats and saltmarshes.	Unlikely	Unlikely
<i>Calidris ruficollis</i>	Red-necked Stint	Mi, Ma	-	Coastal areas, sheltered inlets, intertidal mudflats, protected sandy or coralline shores.	Unlikely	Unlikely
<i>Catharacta skua</i>	Great Skua	Ma	-	Marine species, breeds on islands.	Unlikely	Unlikely
<i>Cereopsis novaehollandiae</i> (NC)	Cape Barren Goose	-	R	Coastal grasslands and wetlands (Birdlife, 2020). Noted grazing in open paddocks adjacent to Whalers Way. Have taken advantage of grain left in paddocks and roost in Sleaford Mere. Commonly occurring in local area but unlikely to use Whalers	Known	Unlikely

Scientific Name	Common Name	Conservation Code		Habitat	Desktop Assessment - Likelihood	Post Field Surveys - Likelihood
		EPBC Act	NPW Act			
				as habitat area. No observations over three site visits.		
<i>Charadrius ruficapillus</i>	Red-capped Plover	Ma	-	Coastal species on bare sand or mudflats at margins of saline, brackish or freshwater wetlands (Birdlife, 2020).	Unlikely	Unlikely
<i>Charadrius veredus</i>	Oriental Plover	Mi	-	A non-breeding visitor to Australia, they spend a few weeks in coastal habitats such as estuarine mudflats and sandbanks, on sandy or rocky ocean beaches or nearby reefs, or in near-coastal grasslands, before dispersing further inland. Thereafter they usually inhabit flat, open, semi-arid or arid grasslands, where the grass is short and sparse, and interspersed with hard, bare ground, such as claypans, dry paddocks, playing fields, lawns and cattle camps.	Unlikely	Unlikely
<i>Chrysococcyx osculans</i>	Black-eared Cuckoo	Ma	-	Dry country in mulga and mallee open woodlands and shrublands. Often found in vegetation along creekbeds.	Unlikely	Unlikely
<i>Diomedea antipodensis</i>	Antipodean Albatross	V, Mi, Ma	-	Marine, pelagic and aerial. Nests on New Zealand islands in open patch vegetation among tussock grassland or shrubs on ridges, slopes and plateaus.	Unlikely	Unlikely
<i>Diomedea epomophora</i>	Southern Royal Albatross	V, Mi, Ma	V	Predominantly marine, breeds on a few select islands in tussock grassland, plateaus or ridges (Birdlife, 2020).	Unlikely	Unlikely
<i>Diomedea exulans</i>	Wandering Albatross	V, Mi, Ma	V	Marine, pelagic and aerial. Breeds on islands.	Unlikely	Unlikely
<i>Diomedea sanfordi</i>	Northern Royal Albatross	E, Mi, Ma	E	Marine, pelagic and aerial. Nests on Chatham Islands.	Unlikely	Unlikely

Scientific Name	Common Name	Conservation Code		Habitat	Desktop Assessment - Likelihood	Post Field Surveys - Likelihood
		EPBC Act	NPW Act			
<i>Falco peregrinus</i>	Peregrine Falcon	-	R	A well-known falcon, the Peregrine inhabits a vast array of environs in Australia. Usually uncommon and migratory (Pizzey & Knight, 2007). This species lays its eggs in recesses of cliff faces, tree hollows or large abandoned nests (Bamford, 2009). Possibly fly through however project not likely to impact on this species. More likely to encourage this species and provide advantageous benefit if towers used as part of project.	Known	Possible fly through Project Area
<i>Falco subniger</i>	Black Falcon	-	R	Sparsely spread across inland Australia where it is found along tree-lined watercourses and isolated woodlands. It may move to coastal areas and is known to have regular seasonal movements (Birdlife, 2020). Possibly fly through only, uncommon species unlikely to use whalers as part of critical habitat.	Known	Possible fly through Project Area
<i>Gallinago hardwickii</i>	Latham's Snipe	Mi, Ma	R	Wet grasslands and pastures, open and wooded swamps; spring-summer non-breeding migrant.	Unlikely	Unlikely
<i>Haematopus fuliginosus</i>	Sooty Oystercatcher	-	R	Occurs over the Southern Ocean. Non-breeding visitor to Australia. Breeds on Campbell I and Auckland Island (Birdlife, 2020). None recorded within area including targeted searches at Redbanks where beach was available, probably not extent of habitat required for permanent habitat. Definitely at Fishery Bay and may very infrequently utilise Redbanks Bay.	Known	Unlikely
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	Ma	E	Occupies all coastal areas extending inland through main waterways, coastal islands, coastal lakes and along some inland rivers. It forages primarily for fish over large areas of open water. Was recorded flying along cliffs and probably does so frequently.	Known	Known

Scientific Name	Common Name	Conservation Code		Habitat	Desktop Assessment - Likelihood	Post Field Surveys - Likelihood
		EPBC Act	NPW Act			
				Requires ongoing surveys to determine extent of use of Whalers area and potential impacts relating to rocket launching facility. Requires EPBC referral.		
<i>Halobaena caerulea</i>	Blue Petrel	V, Ma	-	Breeds offshore stacks near Macquarie Island. It forages in Antarctic and subantarctic waters (TSSC, 2015).	Unlikely	Unlikely
<i>Hydroprogne caspia</i>	Caspian Tern	Mi, Ma	-	Breeding in SA has been recorded along the coast from the Coorong north-west to Ceduna, and inland at Lake Eyre and Lake Goyder. It forages in open wetlands including lakes and rivers. Prefers sheltered shallow water near margins.	Unlikely	Unlikely
<i>Larus pacificus</i>	Pacific Gull	Ma	-	Prefers sandy beaches or sometimes rocky coasts and/or areas that are protected from ocean swells including estuaries, bays and harbours. It has also been seen on farmland and rubbish piles (Birdlife, 2020).	Possible	Unlikely
<i>Leipoa ocellata</i>	Malleefowl	V	V	Mallee woodlands, scrubland and heathlands, often with sandy substrate. Breed in areas with good leaf litter layer. Occasional forage in open areas, including farmland and clearing amongst mallee.	Unlikely	Unlikely
<i>Lichenostomus cratitius occidentalis</i>	Purple-gaped Honeyeater	-	R	Inhabits mallee heathlands and sometimes mallee with open understorey. Preferred habitat present along with historical records. Other honeyeater species present within project areas in high abundance. No individuals recorded however would utilise area periodically and targeted approach to identifying this species would likely be successful.	Known	Likely
<i>Limosa lapponica</i>	Bar-tailed Godwit	Mi, Ma	R	Coastal habitats including large intertidal sandflats, banks, mudflats, estuaries, inlets and harbours. Forages near edge of water, prefers soft mud.	Unlikely	Unlikely

Scientific Name	Common Name	Conservation Code		Habitat	Desktop Assessment - Likelihood	Post Field Surveys - Likelihood
		EPBC Act	NPW Act			
				Roosts on sandy beaches, sandbars, spits and near-coastal saltmarsh.		
<i>Limosa lapponica baueri</i>	Bar-tailed Godwit	V	-	Non-breeding visitor to Australia where it occurs in coastal habitats including intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays (TSSC, 2016a).	Possible	Unlikely
<i>Limosa lapponica menzbieri</i>	Northern Siberian Bar-tailed Godwit	CE	-	Non-breeding visitor to Australia where it occurs in coastal habitats including intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays (TSSC, 2016b).	Possible	Unlikely.
<i>Macronectes giganteus</i>	Southern Giant-Petrel	E, Mi, Ma	V	This species breeds on subantarctic and Antarctic islands in Australian territory.	Unlikely	Unlikely
<i>Macronectes halli</i>	Northern Giant Petrel	V, Mi, Ma	-	Breeds in the sub-Antarctic and visits Australian mainland during winter months. Commonly seen in waters around Fremantle (Western Australia) to Sydney (New South Wales).	Unlikely	Unlikely
<i>Merops ornatus</i>	Rainbow Bee-eater	Ma	-	Spring-summer migrants to Victoria where they occur in many wooded habitats with an annual rainfall of less than 800mm, especially north of the Great Divide; often along vegetated watercourses and cuttings or banks along watercourses. Lack of cuttings and nesting areas for species. Lack of historical records suggests unlikely.	Unlikely	Unlikely
<i>Motacilla cinerea</i>	Grey Wagtail	Mi, Ma	-	The grey wagtail is found around fast-flowing mountain streams, often in forested areas, as well as lowland watercourses such as canals and rivers.	Unlikely	Unlikely
<i>Motacilla flava</i>	Yellow Wagtail	Mi, Ma	-	The yellow wagtail occurs in a variety of damp or wet habitats with low vegetation, from rushy pastures, meadows, hay fields and marshes to damp steppe and grassy tundra.	Unlikely	Unlikely

Scientific Name	Common Name	Conservation Code		Habitat	Desktop Assessment - Likelihood	Post Field Surveys - Likelihood
		EPBC Act	NPW Act			
<i>Neophema elegans</i>	Elegant Parrot	-	R	Inhabits open areas including grasslands, shrublands, mallee, woodlands and thickets, bluebush plains, heathlands, saltmarsh and farmland (Birdlife, 2020). Suitable habitat present. One sighting in 2004.	Known	Likely
<i>Neophema petrophila</i>	Rock Parrot	-	R	Restricted to coastlines and offshore rocky islands, frequenting windswept coastal dunes, mangroves, saline swamps and rocky islets (Birdlife, 2020). Suitable habitat present. Sighted 17 times in 2004 comprising 479 individuals and other surveys have noted high abundance and frequency of this species within coastal fringing and low dune swales. One of the more common species at Whalers Way.	Known	Present
<i>Numenius madagascariensis</i>	Eastern Curlew	CE, Mi, Ma	V	Coastal lakes, estuaries, tidal mudflats and sandflats, mangroves and saltmarshes; occasionally fresh or brackish lakes near coast; mainly spring-summer non-breeding migrant.	Unlikely	Unlikely
<i>Pachyptila turtur subantarctica</i>	Fairy Prion (southern)	V	-	Breeds on Macquarie Island and other subantarctic islands.	Unlikely	Unlikely
<i>Pandion haliaetus</i>	Osprey, Eastern Osprey	Mi, Ma	E	Occurs in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia. Found in coastal areas of open fresh, brackish or saline water for foraging. Four records, five individuals. Lack of data to determine level of habitat utilisation. Requires EPBC referral.	Known	Present
<i>Pezoporus occidentalis</i>	Night Parrot	E	E	Extinct in south-eastern Australia; historical records from arid and semi-arid chenopod shrublands, spinifex ( <i>Triodia</i> ) on stony rises, flats around salt lakes and flooded claypans. Lack of suitable habitat.	Unlikely	Unlikely

Scientific Name	Common Name	Conservation Code		Habitat	Desktop Assessment - Likelihood	Post Field Surveys - Likelihood
		EPBC Act	NPW Act			
<i>Phalacrocorax fuscescens</i>	Black-faced Cormorant	Ma	-	Coastal waters where they are found in flocks in large bays, deep inlets, rocky headlands and islands.	Possible	Unlikely
<i>Phoebastria fusca</i>	Sooty Albatross	Mi, Ma	E	This species is marine and pelagic and breeds on subtropical and subantarctic islands in the Indian and Atlantic Oceans.	Unlikely	Unlikely
<i>Psophodes leucogaster</i>	Western Whipbird (eastern) (eastern subspecies)	V	E	Occupies mallee and thicket vegetation in coastal and inland areas of southern SA (DAWE, 2020b). 80 records and heard with high frequency during targeted surveys. Very difficult to determine how many individuals present due to inconspicuous nature however appear to be relatively abundant within Whalers Way area.	Known	Present
<i>Pterodroma mollis</i>	Soft-plumaged Petrel	Ma		Marine, oceanic species that is a non-breeding visitor to Australia.	Unlikely	Unlikely
<i>Rostratula australis</i>	Australian Painted Snipe	Ma	V	Inhabits shallow terrestrial freshwater wetlands and inundated or waterlogged grassland or saltmarsh. Exposed bare wet mud with ample canopy cover nearby are preferred.	Unlikely	Unlikely
<i>Stagonoleura guttata</i>	Diamond Firetail	-	V	Open grassy woodland, heath and farmland or grassland with scattered trees (Birdlife, 2020). One record of 10 individuals in BDBSA as well as additional record during baseline assessments.	Known	Present
<i>Sternula nereis nereis</i>	Australian Fairy Tern	V	V	Nests in southern Australia on sheltered sandy beaches, spits and banks above the high tide line and below vegetation between October and February. Occupies a variety of habitats including offshore, estuarine or lacustrine islands, wetlands and mainland coastline. Sighted in 2004. Likely to be around.	Likely	Likely

Scientific Name	Common Name	Conservation Code		Habitat	Desktop Assessment - Likelihood	Post Field Surveys - Likelihood
		EPBC Act	NPW Act			
<i>Stipiturus malachurus parimeda</i>	Southern Emu-wren	V	E	This species is confined to the extreme south of the Eyre Peninsula. It occurs in shrubland/heathland, mallee and sedgeland. 74 sightings in 2004 comprising 109 individuals. Targeted surveys identified presence within project area and also along all areas of suitable habitat within 50m of coast edge. See targeted survey assessment report. EPBC referral required.	Known	Present
<i>Thalassarche cauta cauta</i>	Shy Albatross	V, Mi, Ma	V	Marine species that occurs in subantarctic and subtropical waters. It is a non-breeding visitor to Australia.	Unlikely	Unlikely
<i>Thalassarche cauta steadi</i>	White-capped Albatross	V, Mi, Ma	-	Marine species that occurs in subantarctic and subtropical waters. It is a non-breeding visitor to Australia.	Unlikely	Unlikely
<i>Thalassarche impavida</i>	Campbell Albatross	V, Mi, Ma	V	Marine sea bird and specialised shelf feeders. They are non-breeding visitors to Australian waters.	Unlikely	Unlikely
<i>Thalassarche melanophris</i>	Black-browed Albatross	V, Mi, Ma	-	Marine sea bird that inhabits Antarctic, subantarctic and temperate waters and occasionally enters the tropics. It forages around breaks of continental and island shelves and across nearby underwater banks.	Unlikely	Unlikely
<i>Thinornis rubricollis rubricollis</i>	Hooded Plover	V, Ma	V	Mainly occurs on wide beaches backed by dunes with large amounts of seaweed and jetsam, creek mouths and inlet entrances. Suitable habitat present. Sighted 20 times in 2004 comprising 50 individuals. No records within Redbanks Bay where beach has lack of refuge sites with boulders present at base of cliff at high tide mark. Sure to be present at Fisheries Beach however unlikely within close proximity to project area.	Likely	Unlikely
<i>Tringa nebularia</i>	Common Greenshank	Mi, Ma	-	Found in a variety of inland wetlands and sheltered coastal habitats. It occurs in sheltered coastal	Likely	Unlikely

Scientific Name	Common Name	Conservation Code		Habitat	Desktop Assessment - Likelihood	Post Field Surveys - Likelihood
		EPBC Act	NPW Act			
				habitats, typically with large mudflats and saltmarsh, mangroves or seagrass.		
<i>Turnix varius</i>	Painted Buttonquail	-	R	Prefer closed canopies with understorey cover in temperate and eastern tropical forests and woodlands (Birdlife, 2020). Also known from scrub and grassy habitat. Suitable habitat present. Sighted three times in 2004 comprising 23 individuals. Likely within mallee habitats within Whalers Way.	Likely	Likely
<i>Zanda (Calyptorhynchus) funerea whiteae</i>	Yellow-tailed Black Cockatoo	-	V	Favours Eucalypt woodland and pine plantations (Birdlife, 2020). Six records sighted in 2004 comprising 14 individuals. Potentially flyover, the project area does not support habitat for this species however they may infrequently fly through area to foraging patches on southern EP.	Likely	Possible
<b>Fish</b>						
<i>Acentronura australe</i>	Southern Pygmy Pipehorse	Ma	-	Not considered	-	Marine
<i>Campichthys galei</i>	Gale's Pipefish	Ma	-	Not considered	-	Marine
<i>Carcharodon carcharias</i>	White Shark	V, Mi, Ma	-	Not considered	-	Marine
<i>Filicampus tigris</i>	Tiger Pipefish	Ma	-	Not considered	-	Marine
<i>Heraldia nocturna</i>	Upside-down Pipefish	Ma	-	Not considered	-	Marine
<i>Hippocampus abdominalis</i>	Big-belly Seahorse	Ma	-	Not considered	-	Marine
<i>Hippocampus breviceps</i>	Short-head Seahorse	Ma	-	Not considered	-	Marine

Scientific Name	Common Name	Conservation Code		Habitat	Desktop Assessment - Likelihood	Post Field Surveys - Likelihood
		EPBC Act	NPW Act			
<i>Histiogamphelus cristatus</i>	Rhino Pipefish	Ma	-	Not considered	-	Marine
<i>Hypselognathus horridus</i>	Shaggy Pipefish	Ma	-	Not considered	-	Marine
<i>Hypselognathus rostratus</i>	Knifesnout Pipefish	Ma	-	Not considered	-	Marine
<i>Kaupus costatus</i>	Deepbody Pipefish	Ma	-	Not considered	-	Marine
<i>Lamna nasus</i>	Porbeagle	Mi, Ma	-	Not considered	-	Marine
<i>Leptoichthys fistularius</i>	Brushtail Pipefish	Ma	-	Not considered	-	Marine
<i>Lissocampus caudalis</i>	Australian Smooth Pipefish	Ma	-	Not considered	-	Marine
<i>Lissocampus runa</i>	Javelin Pipefish	Ma	-	Not considered	-	Marine
<i>Maroubra perserrata</i>	Sawtooth Pipefish	Ma	-	Not considered	-	Marine
<i>Notiocampus ruber</i>	Red Pipefish	Ma	-	Not considered	-	Marine
<i>Phycodurus eques</i>	Leafy Seadragon	Ma	-	Not considered	-	Marine
<i>Phyllopteryx taeniolatus</i>	Common Seadragon	Ma	-	Not considered	-	Marine
<i>Pugnaso curtirostris</i>	Pugnose Pipefish	Ma	-	Not considered	-	Marine
<i>Solegnathus robustus</i>	Robust Pipehorse	Ma	-	Not considered	-	Marine
<i>Stigmatopora argus</i>	Spotted Pipefish	Ma	-	Not considered	-	Marine

Scientific Name	Common Name	Conservation Code		Habitat	Desktop Assessment - Likelihood	Post Field Surveys - Likelihood
		EPBC Act	NPW Act			
<i>Stigmatopora nigra</i>	Widebody Pipefish	Ma	-	Not considered	-	Marine
<i>Stipecampus cristatus</i>	Ringback Pipefish	Ma	-	Not considered	-	Marine
<i>Urocampus carinirostris</i>	Hairy Pipefish	Ma	-	Not considered	-	Marine
<i>Vanacampus margaritifer</i>	Mother-of-pearl Pipefish	Ma	-	Not considered	-	Marine
<i>Vanacampus phillipi</i>	Port Phillip Pipefish	Ma	-	Not considered	-	Marine
<i>Vanacampus poecilolaemus</i>	Longsnout Pipefish	Ma	-	Not considered	-	Marine
<i>Vanacampus vercoi</i>	Verco's Pipefish	Ma	-	Not considered	-	Marine
<b>Mammals</b>						
<i>Arctocephalus forsteri</i>	Long-nosed Fur-seal	Ma	-	Not considered	-	Marine
<i>Balaena glacialis australis</i>	Southern Right Whale	E, Mi, Ma	V	Not considered	-	Marine
<i>Balaenoptera acutorostrata</i>	Minke Whale	Ma	R	Not considered	-	Marine
<i>Balaenoptera borealis</i>	Sai Whale	V, Mi, Ma	V	Not considered	-	Marine
<i>Balaenoptera edeni</i>	Bryde's Whale	Mi, Ma	R	Not considered	-	Marine
<i>Balaenoptera musculus</i>	Blue Whale	E, Mi, Ma	E	Not considered	-	Marine
<i>Balaenoptera physalus</i>	Fin Whale	V, Mi, Ma	V	Not considered	-	Marine

Scientific Name	Common Name	Conservation Code		Habitat	Desktop Assessment - Likelihood	Post Field Surveys - Likelihood
		EPBC Act	NPW Act			
<i>Caperea marginata</i>	Pygmy Right Whale	Mi, Ma	R	Not considered	-	Marine
<i>Delphinus delphis</i>	Common Dolphin	Ma	-	Not considered	-	Marine
<i>Grampus griseus</i>	Risso's Dolphin	Ma	R	Not considered	-	Marine
<i>Lagenorhynchus obscurus</i>	Dusky Dolphin	Mi, Ma	-	Not considered	-	Marine
<i>Megaptera novaeangliae</i>	Humpback Whale	V, Mi, Ma	V	Not considered	-	Marine
<i>Neophoca cinerea</i>	Australian Sea-lion	E, Ma	V	Not considered	-	Marine
<i>Orcinus orca</i>	Killer Whale	Mi, Ma	-	Not considered	-	Marine
<i>Tursiops aduncus</i>	Indian Ocean Bottlenose Dolphin	Ma	-	Not considered	-	Marine
<i>Tursiops truncatus s. str.</i>	Bottlenose Dolphin	Ma	-	Not considered	-	Marine
<b>Reptiles</b>						
<i>Caretta caretta</i>	Loggerhead Turtle	E, Mi, Ma	E	Non-breeding visitor to SA waters. They live at or near the surface of the ocean and move with currents.	Unlikely	No suitable habitat present.
<i>Chelonia mydas</i>	Green Turtle	V, Mi, Ma	V	A non-breeding visitor to SA waters. They drift on ocean currents and are often found with driftlines and rafts of <i>Sargassum</i> sp.	Unlikely	No suitable habitat present.
<i>Dermochelys coriacea</i>	Leatherback Turtle	E, Mi, Ma	V	A non-breeding visitor to most Australian waters. This species is highly pelagic and only comes close to shore during nesting season.	Unlikely	No suitable habitat present.

Conservation codes:

EPBC Act: CE Critically endangered, E Endangered, V Vulnerable, Mi Migratory, Ma Marine  
NPW Act: E Endangered, V Vulnerable, R Rare

# Appendix F

## Vegetation Associations

## Appendix F Vegetation Associations

### 1.0 Vegetation Associations

Seven vegetation associations were observed within the Project Areas (Table 22). These were all typical of coastal communities commonly occurring within the southern Eyre Peninsula region.

**Table 22. Vegetation Associations Observed within the Project Area**

Number	Description
1	<i>Beyeria lechenaultii</i> (Pale Turpentine Bush) <i>Melaleuca lanceolata</i> (Dryland Tea-tree) Low Shrubland over sclerophyllous shrubs
2	<i>Acrotriche patula</i> (Prickly Ground Berry) Very Low Open Shrubland
3	<i>Eucalyptus diversifolia</i> (Coastal White Mallee) Low Mixed Mallee over sclerophyllous shrubs
4	<i>Eucalyptus angulosa</i> (Ridge Fruited Mallee) +/- <i>Eucalyptus rugosa</i> (Coastal White Mallee) Low Mixed Mallee
5	<i>Leucopogon parviflorus</i> (Coastal Bearded Heath) Low Very Open Shrubland over exotic annual grasses
6	<i>Callitris</i> sp. 'Limestone' (Native Pine) Low Shrubland
7	<i>Melaleuca lanceolata</i> (Dryland Tea-tree) Closed Shrubland

Vegetation associations are discussed in further detail on the following pages.

**Vegetation Association 1: *Beyeria lechenaultii* (Pale Turpentine Bush) *Melaleuca lanceolata* (Dryland Teatree) Low Shrubland over sclerophyllous shrubs.**

Vegetation Association 1 was largely and primarily dominant on the near cliff zone where stable dune habitats were present intertwined with exposed sheet limestone which was generally devoid of vegetation or contained only sparse sclerophyllous shrubs. Cover within Association 1 was generally high with the most diverse floristic community observed across the area with a mix of primarily coast front species co-habiting with other taller shrubs which were persisting in the hollows resulting in a mixed community. This association had the highest visual incidence of small skinks and dragons observed opportunistically.

Low bird species richness was present with the windy conditions meaning many species were retreating to lower or more dense cover during the day.

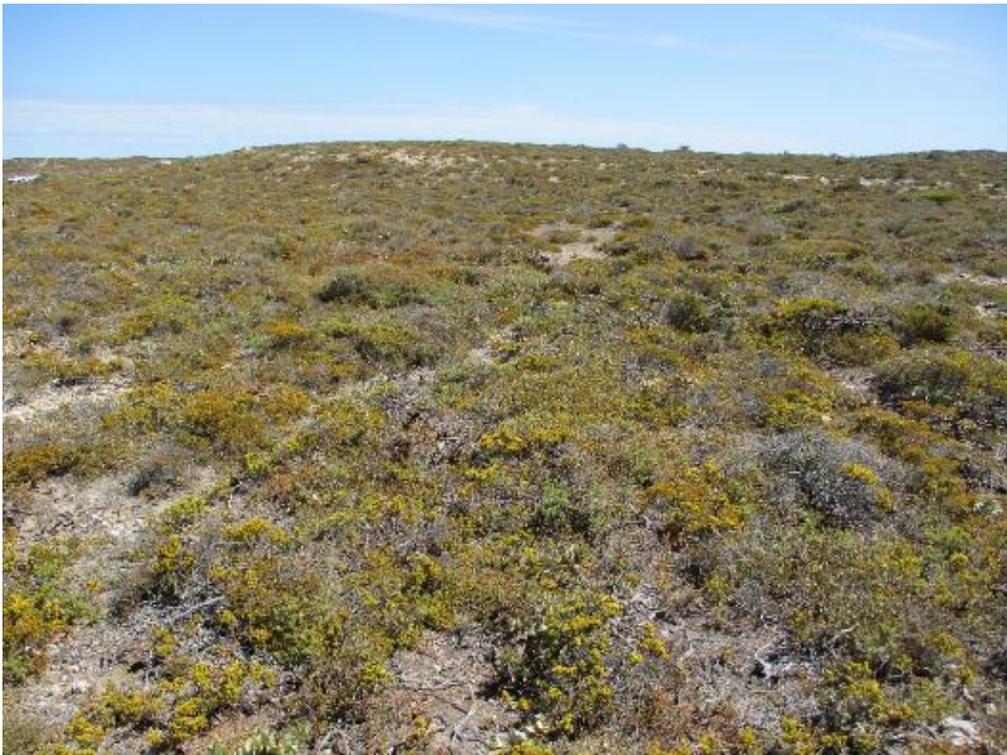
A summary of floristic composition including weeds and threatened species is presented in Table 23 with photographs in Plate 1 and Plate 2.

**Table 23 *Beyeria lechenaultii* (Pale Turpentine Bush) *Melaleuca lanceolata* (Dryland Teatree) Low Shrubland over sclerophyllous shrubs summary**

Stratum	Dominating Species
Overstorey species	<i>Beyeria lechenaultii</i> (Coastal Turpentine) <i>Melaleuca lanceolata</i> (Moonah) <i>Acacia anceps</i> (Port Lincoln Wattle) <i>Acacia nematophylla</i> (Coast Wallowa) <i>Pomaderris obcordata</i> (Wedge leaf Pomaderris)
Midstorey species	<i>Spyridium phyllicoides</i> (Narrow Leaf Spyridium) <i>Dodonaea humilis</i> (Dwarf Hopbush) <i>Acrotriche patula</i> (Prickly Ground-berry) <i>Acrotriche cordata</i> (Blunt leaf Ground-berry) <i>Eutaxia microphylla</i> (Common Eutaxia)
Understorey species	<i>Goodenia varia</i> (Sticky Goodenia) <i>Lomandra effusa</i> (Scented Mat Rush) <i>Carpobrotus rossii</i> (Pigface)
Threatened species	None observed
Exotic species	<i>Limonium companyonis</i> (Sea lavender)



**Plate 1** Vegetation Association 1 mixed structure



**Plate 2** Vegetation Association 1 on grey sandy loam soils in semi sheltered low depressions or swales

### Vegetation Association 2: *Acrotriche patula* (Prickly Ground Berry) Very Low Open Shrubland.

Vegetation Association 2 occupies exposed and/or elevated sections of clifftop where a lack of soil, high alkalinity and salt laden winds result in specific niche communities dominated by ground hugging shrubs and mat plants. The average overstorey height in these areas is less than 300 mm in most instances.

A summary of floristic composition including weeds and threatened species is presented in Table 24 with photographs in Plate 3 and Plate 4.

**Table 24** *Acrotriche patula* (Prickly Ground Berry) Very Low Open Shrubland summary

Stratum	Dominant Species
Overstorey species	<i>Acrotriche patula</i> (Prickly Ground-berry) <i>Acrotriche cordata</i> (Blunt leaf Ground-berry) <i>Eutaxia microphylla</i> (Common Eutaxia) <i>Spyridium phylloides</i> (Narrow Leaved Spyridium)
Midstorey species	<i>Gahnia lanigera</i> (Black Grass Saw Sedge) <i>Pultenaea tenuifolia</i> (Narrow-leaf Bush Pea)
Understorey species	<i>Scaevola crassifolia</i> (Coast Fanflower) <i>Goodenia varia</i> (Sticky Goodenia) <i>Carpobrotus rossii</i> (Pigface)
Threatened species	None observed
Exotic species	<i>Limonium companyonis</i> (Sea Lavender)



**Plate 3** Vegetation Association 2 *Acrotriche patula* (Prickly Ground Berry) Very Low Open Shrubland increasing cover with reduced topography



**Plate 4** Vegetation Association 2 showing sparse cover on exposed stony rise

**Vegetation Association 3: *Eucalyptus diversifolia* (Coastal White Mallee) Low Mixed Mallee over sclerophyllous shrubs.**

Vegetation Association 3 communities were recorded on stable dunes where grey sandy loams overlay sheet limestone. These were often transitional between the low coastal shrublands of the clifftop edges and the higher elevation calcareous clay loam soils. Association 3 occurs in patches, varying from circular ‘hummocks’ to linear lunettes further from the coast. The interpatch spaces were generally sheet limestone occupied by Association 1. With distance from the coastline, the community structure changed by way of a more continuous and taller stratum with average heights of 3.5 m and a denser canopy cover.

A summary of floristic composition including weeds and threatened species is presented in Table 25 with photographs in Plate 5 and Plate 6.

**Table 25 *Eucalyptus diversifolia* (Coastal White Mallee) Low Mixed Mallee over sclerophyllous shrubs summary**

Stratum	Dominant Species
Overstorey species	<i>Eucalyptus diversifolia</i> (Coastal White Mallee) <i>Melaleuca lanceolata</i> (Moonah) <i>Melaleuca decussata</i> (Totem Poles)
Midstorey species	<i>Rhagodia candolleana</i> subsp. (Sea-berry Saltbush) <i>Olearia axillaris</i> (Coastal Daisy) <i>Exocarpos syrticola</i> (Coastal Ballart)
Understorey species	<i>Correa pulchella</i> (Salmon Correa) <i>Dianella revoluta</i> (Flax Lily) <i>Lasiopetalum discolor</i> (Coast Velvet-bush)
Threatened species	None observed
Exotic species	<i>Limonium companyonis</i> (Sea Lavender)



**Plate 5** Vegetation Association 3 with Mixed Mallee and interpatch shrubland



**Plate 6** Vegetation Association 3 Taller *Eucalyptus diversifolia* community approximately 2 km from coastline

#### Vegetation Association 4: *Eucalyptus angulosa* (Ridge Fruited Mallee) +/- *Eucalyptus rugosa* (Coastal White Mallee) Low Mixed Mallee

Vegetation Association 4 was present where soils were largely a calcareous silty loam. The soil surface was highly stable and formed a thick crust with high levels of biocrust and Moss species. *Melaleuca* species were a common species in this Association compared to those on lighter soils with *Eucalyptus diversifolia* (Coastal White Mallee). Inter-patches were dominated largely by Association 6 (*Callitris* sp. limestone). In areas where the community was protected from high coastal winds the strata were taller, with an average of 3 m compared to 2 m near the coast.

A summary of floristic composition including weeds and threatened species is presented in Table 26 with photographs in Plate 7 and Plate 8.

**Table 26** *Eucalyptus angulosa* (Ridge Fruited Mallee) +/- *Eucalyptus rugosa* (Coastal White Mallee) Low Mixed Mallee summary

Stratum	Species
Overstorey species	<i>Eucalyptus angulosa</i> (Ridge-fruited Mallee) <i>Eucalyptus rugosa</i> (Coastal White Mallee) <i>Melaleuca lanceolata</i> (Moonah)
Midstorey species	<i>Callitris</i> subsp. Limestone (Native Pine) <i>Melaleuca decussata</i> (Totem Poles) <i>Exocarpos sparteus</i> (Broom Ballart) <i>Calytrix tetragona</i> (Fringe Myrtle) <i>Acacia nematophylla</i> (Coast Wallowa)
Understorey species	<i>Spyridium phyllicoides</i> (Narrow Leaved Spyridium) <i>Carpobrotus rossii</i> (Pigface) <i>Gahnia lanigera</i> (Black Grass Saw-sedge)
Threatened species	None observed
Exotic species	None observed



**Plate 7** Vegetation Association 4 approximately 2 km from coastline with taller canopy height and high litter cover



**Plate 8** Vegetation Association 4 near coastline with low litter cover and canopy height of approximately 2 m

**Vegetation Association 5: *Leucopogon parviflorus* (Coastal Bearded Heath) Low Very Open Shrubland over exotic annual grasses.**

Vegetation Association 5 was a disturbed regenerating association with pioneer species such as *Adriana quadripartita* (Coast Bitter Bush) present that were otherwise absent from the intact sections of the Project site. Numerous environmental weed species were present throughout the area and grass species were overwhelmingly annual exotic species such as *Bromus* (Brome), *Vulpia* (Fescue) and *Avena* (Wild Oat). Overall, the condition was very poor and regeneration of local species was patchy.

A summary of floristic composition including weeds and threatened species is presented in Table 27 with photographs in Plate 9 and Plate 10.

**Table 27 *Leucopogon parviflorus* (Coastal Bearded Heath) Low Very Open Shrubland over exotic annual grasses summary**

Stratum	Species
Overstorey species	<i>Leucopogon parvifolius</i> (Coastal Bearded-heath) <i>Acacia longifolia</i> subsp. (Coastal Wattle)
Midstorey species	<i>Adriana quadripartita</i> (Coast Bitter bush) <i>Clematis microphylla</i> (Old Mans Beard) <i>Ficinia nodosa</i> (Knobby Club Rush) <i>Acacia cupularis</i> (Cup Wattle)
Understorey species	Exotic annual grasses <i>Vittadinia cuneata</i> (Fuzzy New Holland Daisy) <i>Pimelea serpyllifolia</i> (Thyme Riceflower) <i>Gahnia deusta</i> (Limestone Saw Sedge)
Threatened species	None observed
Exotic species	<i>Marrubium vulgare</i> (Horehound) <i>Asphodelus fistulosus</i> (Onion Weed) <i>Dittrichia graveolens</i> (Stinkweed) <i>Asparagus asparagoides</i> (Bridal Creeper) - WONS



**Plate 9** Vegetation Association 5 Looking south with highly disturbed area with intact coastal vegetation in background



**Plate 10** Vegetation Association 5 -Sparsely scattered regenerating coastal vegetation within interpatch of exotic grass and forbs. Note windmill and bore in left rear of image where vehicles parked

### Vegetation Association 6: *Callitris* sp. 'Limestone' (Native Pine) Low Shrubland.

Vegetation Association 6 was dominated by *Callitris* sp. 'Limestone' mixed with other sclerophyllous shrubs. It occurred exclusively with Association 4 on calcareous silty loam soils. Condition of these communities was generally good with the only perennial exotic species present *Limonium companyonis* (Sea Lavender) which increased with proximity to the coast.

A summary of floristic composition including weeds and threatened species is presented in Table 28 with photographs in Plate 11.

**Table 28** *Callitris* sp. 'Limestone' (Native Pine) Low Shrubland summary

Stratum	Species
Overstorey species	<i>Callitris</i> sp. 'Limestone' <i>Acacia nematophylla</i> (Coast Wallowa) <i>Exocarpos syrticola</i> (Coast Ballart) <i>Melaleuca lanceolata</i> (Dryland Teatree) <i>Melaleuca decussata</i> (Totem Poles) <i>Acacia anceps</i> (Port Lincoln Wattle)
Midstorey species	<i>Acrotriche patula</i> (Prickly Ground-berry) <i>Acacia triquetra</i> (Mallee Wreath Wattle) <i>Beyeria lechenaultii</i> (Pale Turpentine Bush) <i>Dodonaea humilis</i> (Dwarf Hop-bush)
Understorey species	<i>Carpobrotus rossii</i> (Pigface) <i>Lomandra effusa</i> (Scented Mat Rush) <i>Eutaxia microphylla</i> (Common Eutaxia) <i>Gahnia lanigera</i> (Black Grass Saw-sedge)
Threatened species	None observed
Exotic species	<i>Limonium companyonis</i> (Sea Lavender)



**Plate 11** Vegetation Association 6 near access road at Launch Site B patchy community structure

# Appendix G

Fauna Species  
Recorded List

## Appendix D Fauna Species List

Scientific Name	Common Name	Habitat Comment	EPBC Act	NPW Act	Exotic
<b>Birds</b>					
<i>Morus serrator</i>	Australasian Gannet	Cliffs			
<i>Corvus coronoides</i>	Australian Raven	Northern extent			
<i>Cinclosoma castanotum</i>	Chestnut-backed Quailthrush (Chestnut Quailthrush)	Association 4			
<i>Phaps chalcoptera</i>	Common Bronzewing	Widespread			
<i>Sturnus vulgaris</i>	Common Starling	Widespread			*
<i>Stagonopleura guttata</i>	Diamond Firetail	Block C, water trough		V	
<i>Artamus cyanopterus</i>	Dusky Woodswallow	Association 4			
<i>Dromaius novaehollandiae</i>	Emu	Widespread			
<i>Pachycephala pectoralis</i>	Golden Whistler	Northern Extent			
<i>Eolophus roseicapilla</i>	Galah	Widespread			
<i>Cracticus torquatus</i>	Grey Butcherbird	Northern extent			
<i>Strepera versicolor</i>	Grey Currawong	Block B			
<i>Rhipidura albiscapa</i>	Grey Fantail	Northern Extent			
<i>Colluricincla harmonica</i>	Grey Shrikethrush	Association 4			
<i>Falco cenchroides</i>	Nankeen Kestrel	Cliffs			
<i>Phylidonyris novaehollandiae</i>	New Holland Honeyeater	Widespread			
<i>Pandion haliaetus</i>	Osprey	Cliffs	Mi, Ma	E	
<i>Larus pacificus</i>	Pacific Gull	Cliffs			
<i>Neophema petrophila</i>	Rock Parrot	Widespread		R	
<i>Zosterops lateralis</i>	Silvereye	Widespread			
<i>Gavicalis virescens</i>	Singing Honey Eater	Widespread			
<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater	Widespread			
<i>Malurus cyaneus</i>	Superb Fairywren	Widespread			
<i>Petrochelidon nigricans</i>	Tree Martin	Widespread			
<i>Hirundo neoxena</i>	Welcome Swallow	Widespread			
<i>Psophodes nigrogularis leucogaster</i>	Western Whipbird (Eastern)	Heard only, Association 4, Block D	V	E	
<i>Haliaeetus leucogaster</i>	White-bellied Sea Eagle	Western cliffs	Ma	E	
<i>Pomatostomus superciliosus</i>	White-browed Babbler	Block C, water trough			
<i>Sericornis frontalis</i>	White-browed Scrubwren	Widespread			
<i>Rhipidura leucophrys</i>	Willie Wagtail	Widespread			
<b>Mammals</b>					
<i>Felis catus</i>	Cat	Tracks / Widespread			*
<i>Macropus fuliginosus</i>	Western Grey Kangaroo	Observed / Widespread			
<i>Oryctolagus cuniculus</i>	European Rabbit	Observed / Widespread			*
<i>Vulpes vulpes</i>	Red Fox	Scats / Widespread			*
<b>Reptiles</b>					
<i>Tiliqua rugosa</i>	Shingleback Lizard	Few obs. tracks			
<i>Ctenophorus chapmani</i>	Mallee Heath Dragon	Widespread			