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Nuclear-Powered Submarine Construction Yard

Terrestrial and Marine Flora and Fauna Ecological Report

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DOCUMENT SPECIFICATION

Project Name	Osborne Submarine Construction Yard Strategic Assessment
Document Title	Nuclear-Powered Submarine Construction Yard Terrestrial and Marine Flora and Fauna Ecological Report
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This report has been prepared by Succession Ecology Pty Ltd for URPS

ACKNOWLEDGEMENT OF COUNTRY

Succession Ecology acknowledges and pays respect to the past, present and future Traditional Custodians and Elders of this nation and the continuation of cultural, spiritual and educational practices of Aboriginal and Torres Strait Islander peoples.

LIST OF ABBREVIATIONS

ADS	Adelaide Dolphin Sanctuary
ALA	Atlas of Living Australia
ANI	Australian Naval Infrastructure
ASA	Australian Submarine Agency
BAM	Bushland Assessment Methodology
BDBSA	Biological Database of South Australia
BMP	Biosecurity Monitoring Plan
BWMP	Ballast Water Management Plan
BWMC	Ballast Water Management Certificate
BWMS	Ballast Water Management System
CEMP	Construction Environmental Management Plan
COP	Code of Practice
CP	Conservation Park
DCCEEW	Department of Climate Change, Environment, Energy and Water
DEW	Department for Environment and Water
DMP	Dredge Management Plan
DTI	Department for Trade and Investment
EAAF	East Asian-Australasian Flyway
EIS	Environmental Impact Statement
EPA	Environment Protection Agency (SA)
EPBC	Environment Protection and Biodiversity Conservation Act (Commonwealth legislation)
EPP	Environment Protection Policy
TFFRA	Terrestrial Flora and Fauna Requirements Analysis
IBRA	Interim Biogeographical Regionalisation of Australia
LSA	Landscape South Australia Act (SA legislation)
MFO	Marine Fauna Observers
MNES	Matters of National Environmental Significance
MSF	Marine Scalefish Fishery
NDA	Northern Dredging Area
NP	National Park
NPW	National Parks and Wildlife Act (SA legislation)
NPWS	National Parks and Wildlife Service
NV	Native Vegetation Act (SA legislation)
NVC	Native Vegetation Council
OEMP	Operational Environmental Management Plan
ONS	Osborne Naval Shipyard
PAE	Port Adelaide Enfield
PCBs	Polychlorinated biphenyls
PDI	Planning, Development and Infrastructure Act (SA legislation)
PFOs	Perfluorooctane sulfonic acid
PIRSA	Primary Industries and Regions South Australia
PMST	Protected Matters Search Tool
POMS	Pacific Oyster Mortality Syndrome
PTS	Permanent Threshold Shift
SCY	Submarine Construction Yard
SEB	Significant Environmental Benefit
SRA	Same Risk Area
TICP	Torrens Island Conservation Park
TTS	Temporary Threshold Shift

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EXECUTIVE SUMMARY

Succession Ecology Pty Ltd was engaged by URPS on behalf of Australian Naval Infrastructure (ANI) to prepare a Terrestrial and Marine Flora and Fauna Ecological Report to support the Nuclear-Powered Submarine Construction Yard (SCY) Environmental Impact Statement (EIS). The objectives of the Terrestrial and Marine Flora and Fauna Ecological Report are:

- To address the State Planning Commission's Assessment Requirements to provide detailed information and assessment on marine flora and fauna and terrestrial flora and fauna values within and in proximity to the Development.
- To prepare a Terrestrial Flora and Fauna Requirements Analysis to support this report and address the Assessment Requirements relevant to terrestrial flora and fauna.
- To prepare a Biosecurity Report to support this report and address the Assessment Requirements.

The subject site is located on the Lefevre Peninsula, South Australia. The Lefevre Peninsula is a highly industrialised area. Much of the subject site occurs within pre-disturbed land infested with Declared Plants and degraded or planted native vegetation. However, there are pockets of remnant vegetation regenerating native vegetation throughout the subject site. Planted native and/or exotic vegetation is found within Falie Reserve and the Pelican Point Power Station. The subject site contains the Adelaide Dolphin Sanctuary and neighbours Torrens Island and Mutton Cove, which both offer high-value habitats for flora and fauna. In the wider locality, the Adelaide International Bird Sanctuary provides important habitat to migratory birds and resident shorebirds. The subject site provides habitat for several protected or threatened fauna species under the *EPBC Act* and/or *NPW Act*.

Potential construction and operational impacts on the biological environment include:

- Clearance of native vegetation and suitable habitat for protected and/or threatened species.
- Spread of Declared Plants, noxious weeds and/or marine pest species via construction activities, biofouling and ballast water.
- Increased underwater and terrestrial noise and vibration.
- Increased dust.
- Increased light pollution and human activity.
- Diminished water quality.

It is anticipated that construction and operational impacts can be managed through targeted mitigation measures for marine flora and fauna and terrestrial flora and fauna. Appropriate mitigations will be provided in relevant management plans for construction and operation.

1 LIMITATIONS AND ASSUMPTIONS

Three issues limit the inferences that can be drawn from this report:

1. No design was available at the time that this report was completed.
2. The 2024 Management Plan for the Adelaide Dolphin Sanctuary is currently in draft form.
3. Several technical assessments were in draft form at the time this report was completed.

2 INTRODUCTION

Succession Ecology Pty Ltd was engaged by URPS on behalf of Australian Naval Infrastructure (ANI) to prepare a Terrestrial and Marine Flora and Fauna Ecological Report to support the Nuclear-Powered Submarine Construction Yard (SCY) Environmental Impact Statement (EIS). The objectives of the Terrestrial and Marine Flora and Fauna Ecological Report are to:

- Address the State Planning Commission Assessment Requirements to provide detailed information and assessment of marine flora and fauna and terrestrial flora and fauna values within and in proximity to the Development.
- Prepare a Terrestrial Flora and Fauna Requirements Analysis to support this report and address the terrestrial flora and fauna assessment requirements.
- To prepare a Biosecurity Report to support this report and address the Assessment Requirements.

2.1 Description of the Development and the Subject Site

The Australian Submarine Agency (ASA) was established in July 2023 to safely and securely acquire, construct, deliver, technically govern, sustain, and dispose of Australia's conventionally armed nuclear-powered submarine capability for Australia.

ANI as the owner and manager of the existing Osborne Naval Shipyard is proposing the Development of adjacent land to construct a new, purpose-built, secure, SCY. The SCY will provide a facility for the construction of the submarines by a third-party ship builder, for delivery to ASA.

The Minister for Planning declared the SCY as an Impact Assessed Development under section 108 (1)(c) of the *Planning, Development and Infrastructure Act 2016* (*PDI Act*), which requires the preparation of an Environmental Impact Statement.

The Government Gazette Notice that declares the Nuclear-powered SCY as an Impact Assessed Development and describes the scope of the Development as follows:

Development for the purposes of establishing and operating a nuclear-powered Submarine Construction Yard at Osborne (being on the land and coastal waters specified in Table 1 and Figure 1, including:

(a) Development associated with the construction and operation of a submarine construction yard, including

(i) facilities associated with maritime construction works in respect of submarines for defence of the Commonwealth, including:

i. the processing of raw steel and other products to manufacture submarine components;
ii. general steel processing including cutting, forming, welding and non-destructive evaluation;
iii. general and specialist machining in support of fabrication and outfitting;

iv. outfitting of submarine sections and other structures with welded components such as submarine decks and fixed pipework;
v. outfitting units and other structures with electrical, mechanical and piping components;
vi. assembly, testing, commissioning and services installation in support of combat system integration;
vii. manufacture of pipe and electrical components;
viii. assembly, testing and commissioning of the nuclear propulsion system (but excluding the manufacture of the reactor power module);
ix. assembly, construction and commissioning of submarines;
x. on-site system testing, commissioning and set-to-work activities; and
xi. mechanical, hydraulic and electrical conveyance for the purpose of moving submarine components and submarine launch activities;

(ii) the storage or warehousing of chemicals or chemical products, including appropriate bunding/hardstand,

(iii) facilities and works associated with abrasive blasting and surface coating of submarines;

(iv) wet basin, wharf and related support facilities including any associated works (including dredging for the purposes of construction and operation of vessel berths but excluding dredging for the purposes of deepening the Port River Channel);

(v) truck loading and unloading facilities, access and egress;

(vi) ancillary infrastructure, including guard houses, car parking, warehousing, office accommodation, health centre, data centre and general information and communication technology services, sleeping quarters, and general amenities including training facilities and other staff and visitor support facilities, security, and access;

(vii) temporary construction compound and laydown areas; and

(viii) temporary protected storage of waste, including low-level radioactive waste;

(b) Development associated with any change in the use of land and coastal waters associated with any Development within the ambit of the preceding paragraphs;

(c) Development associated with the construction, installation or provision of any or all of the following infrastructure, facilities and services:

(i) stormwater;

(ii) water supply;

(iii) power supply;

(iv) telecommunications; and

(v) wastewater treatment or disposal

in each case, associated with any Development within the ambit of the preceding paragraphs;

d) Development (including Development undertaken on land or coastal waters in the State, inclusive but not limited to the land and coastal waters specified in Table 1 and Figure 1) associated with any excavation or filling of land associated with any Development within the ambit of the preceding paragraphs;

(e) Development (including Development undertaken on land or coastal waters in the State, inclusive but not limited to the land and coastal waters specified in Table 1 and Figure 1) associated with the division of land associated with any Development within the ambit of the preceding paragraphs; and

(f) any related or ancillary Development (including Development undertaken on land or coastal waters in the State, inclusive but not limited to the land and coastal waters specified in Table 1 and Figure 1) associated with any Development within the ambit of the preceding paragraphs;

but excluding:

(i) the relocation of existing electricity transmission lines, substation and gas pipelines;

(ii) works and activities associated with existing port and harbour operations; and

(iii) works associated with the construction and alteration of a road on Lot 103 DP82690, Lot 110 DP118046, Lot 777 DP87145, QP7 DP74306, Lot 208 DP 64682, Lot 801 DP76925 and Lot 601 DP121984.

Fabrication buildings will be of a significant scale, up to 50 metres in height and 200 metres in length.

The SCY subject site is located on the north-eastern side of the Lefevre Peninsula in Port Adelaide, South Australia. It encompasses the following Certificate of Titles shown in Table 1, Figure 1 and Figure 2.

Table 1: SCY Subject Site Certificate of Titles

CT6191/179	CT6191/180	CT6191/181	CT6191/182	CT6268/862	CT6236/388
CT6262/182	CT6289/763	CT6088/174	CT6088/171	CT6088/170	CT6088/177
CT6282/172	CT6088/175	CT6282/178	CT5858/214	CT5855/133	CT5856/14
CT6088/188	CT6088/186	CT6088/185	CT6088/184	CT6088/183	CT6231/17
CT6231/5	CT6282/169	CT6088/193	CT6088/190	CT6088/189	CT 6191/178
CT6191/176	CT6060/497	CT6282/175			

Hereafter, the Development will be referred to as the Nuclear-Powered Submarine Construction Yard (SCY) or the Development. When describing the area, the Development will be referred to as the 'subject site'. Where delineation is required, the subject site will be referred to as the 'land-based portion of the subject site' and/or the 'marine-based portion of the subject site'.

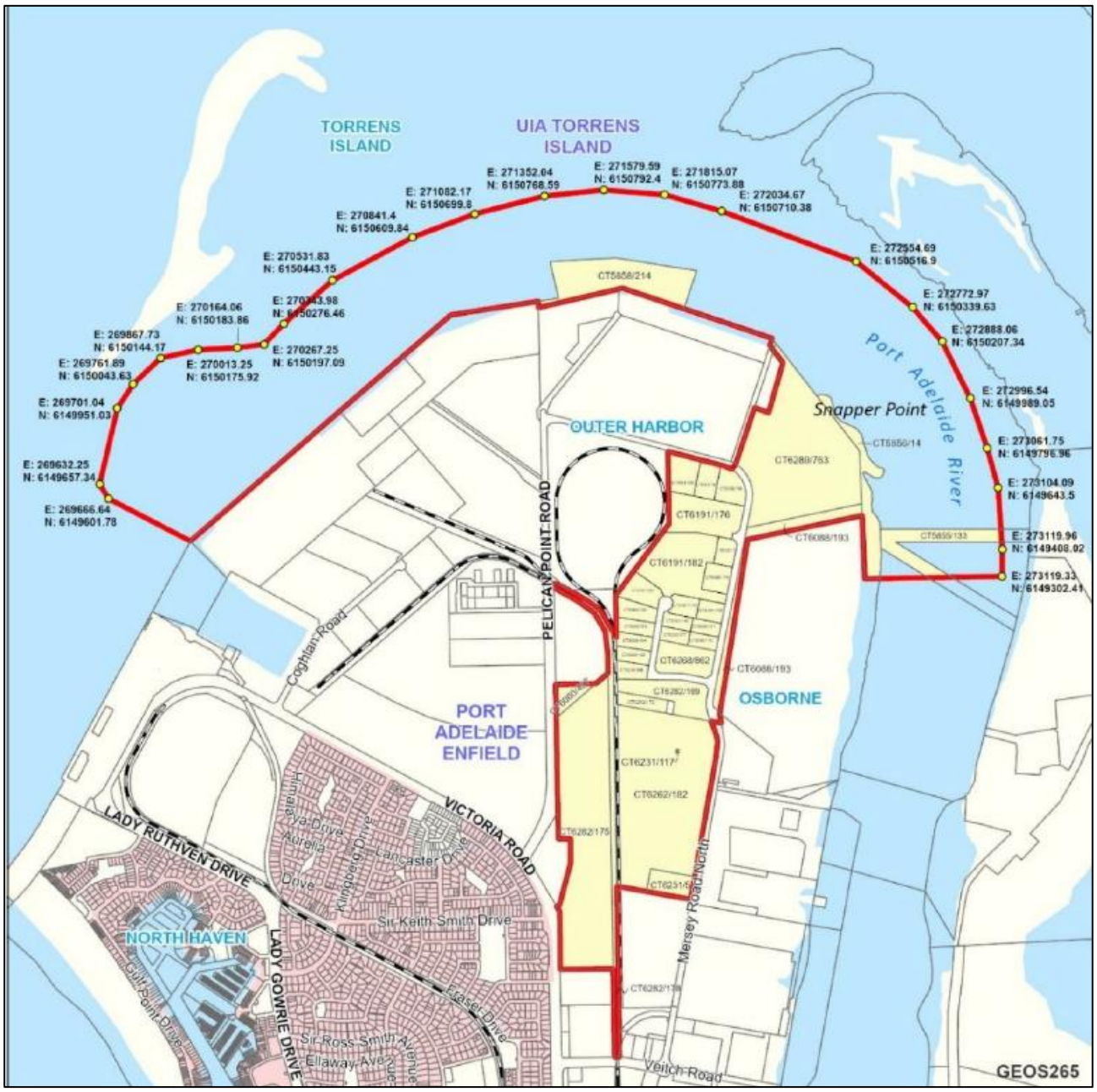

Figure 1: SCY Subject Site (provided to Succession Ecology by URPS 29/04/2024).

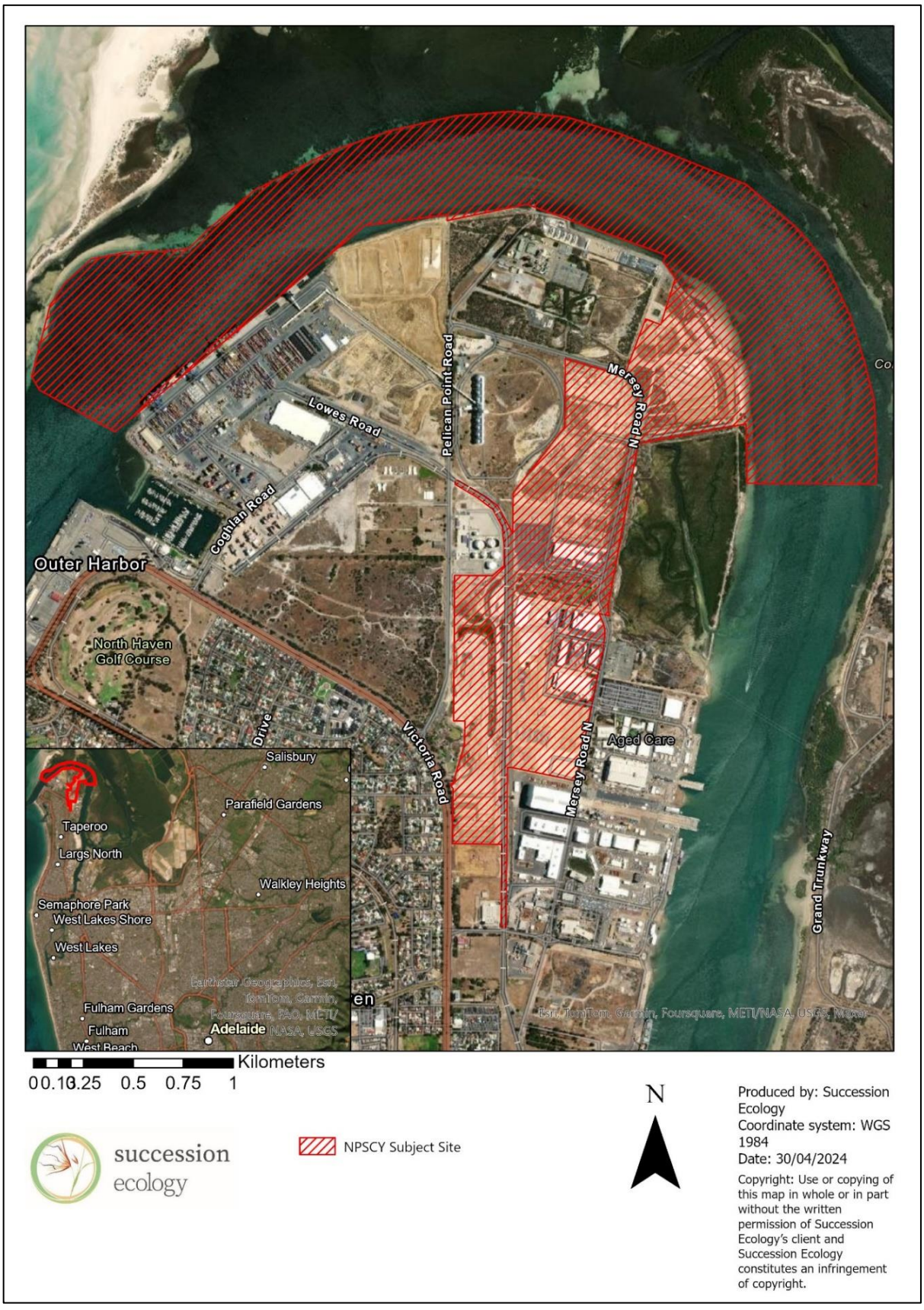

Figure 2: NPSCY Subject Site.

3 ENVIRONMENTAL LEGISLATION AND COMMITTMENTS

The Development is subject to various environmental Commonwealth and State Legislation, which is summarised in Table 2.

Table 2: Relevant Environmental Legislation.

Legislation	**Relevance to Development**
Adelaide Dolphin Sanctuary Act 2005 (SA; ADS Act) The ***Act*** assists management of various activities in the sanctuary, including boating, fishing, and development activities, by requiring decision-makers administering other legislation to have consideration of the ADS objects and objectives. The objectives include the protection of the dolphins and key habitat features, improvement of water quality, community participation, and promotion of the environmental importance of the ADS and the principles of ecologically sustainable development.	The marine-based portion of the subject site occurs directly within the Adelaide Dolphin Sanctuary and therefore this *Act* is relevant to the Development.
Coast Protection Act 1972 (SA; CP Act) This ***Act*** makes provision for the conservation and protection of the beaches and coast of this State; and for other purposes.	The Development and its marine based activities pose a potential risk to reserves, mammal and coastal resources, are considered in this report.
Environment Protection Act 1993 (SA; EP Act) Provides for the protection of the environment; to establish the Environment Protection Authority and define its functions and powers; and for other purposes.	Under section 25 – General Environmental Duty, a person must not undertake an activity that pollutes, or might pollute, the environment unless the person takes all reasonable and practicable measures to prevent or minimise any resulting environmental harm. The Development will integrate this provision and other provision of the *Act* into relevant management plans and mitigations.
Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth; *EPBC Act*)** and ***EPBC Regulations 2000 Provides a framework for the protection and management of threatened flora, fauna and ecological communities. Any action that significantly impacts these will require a referral under the *EPBC Act*.	The subject site is subject to a Strategic Assessment of the Osborne Submarine Construction Yard under the *EPBC Act.* Matters of Environmental National Significance (MNES) and other protected fauna under the *EPBC Act* are considered in the Nuclear-Powered Submarine Construction Yard Terrestrial and Marine Flora and Fauna Ecological Report. On 24 November 2023, the Commonwealth Minister for the Environment and Water and the ASA entered into an agreement to undertake a Strategic Assessment of the Osborne Submarine Construction Yard under the *EPBC Act*. The Strategic Assessment area for the Osborne SCY covers onshore areas of the Lefevre Peninsula. It also covers areas within the Port Adelaide River. Submarine and shipbuilding facilities already exist within and adjacent to the Strategic Assessment area (DCCEEW

Legislation	**Relevance to Development**
	2024). The Strategic Assessment will result in a referral decision by the Department for Climate Change, Environment, Energy and Water (DCCEEW), in which conditions (such as management measures) are likely to be placed on the SCY. Note this report does not form part of the Strategic Assessment. This report has been prepared to support the Environmental Impact Statement (refer to *PDI Act* row of this table).
Fisheries Management Act 2007* (*SA; FM Act*)** and ***Fisheries Management (General) Regulations 2017 This ***Act*** provides for the conservation and management of the aquatic resource es of SA, the management of fisheries and aquatic reserves, the regulation of fishing and the processing of aquatic resources, the protection of aquatic habitats, aquatic mammals and aquatic resources and the control of exotic aquatic organisms and disease in aquatic resources; and for other purposes.	The Development and its marine based activities pose a potential risk to reserves, mammal and marine resources. This are considered in the Succession Ecology 2024 Biosecurity Report.
Landscape South Australia Act 2019 (*SA; *LSA Act) and ***LSA Regulations 2020 –*** Under the *LSA Act* land holders have the responsibility to manage Declared pest plants and animals and prevent land degradation.	Declared Plants and Animals listed under the *LSA Act* are considered in this report and further in the TFFRA (Succession Ecology 2024).
National Parks and Wildlife Act 1972 (*SA; *NPW Act;) and ***NPW Regulations 2019*** – Provides a framework for the protection, management and conservation of flora and fauna.	Threatened flora and fauna species under Schedule 7, 8 and 9 and registered National and Conservation Parks are considered in this report.
National Parks and Wildlife (Protected Animals—Marine Mammals) Regulations 2010 - Outlines the rules for interacting with marine mammals in the wild, including that of vessels, aircraft, people, and commercial activities.	The Development's construction and operational activities and Marine and Coastal Management Plan (MCMP) will be guided by these *Regulations*.
Native Vegetation Act 1991* (SA; *NV Act*)** and the ***NV Regulations 2017 – Relevant for the establishment and management of a SEB offset, where the commitments to this process are outline under this ***Act***.	ANI will commit to prepare a Native Vegetation Clearance Data Report prior to clearance of native vegetation protected under the *NV Act* (e.g. vegetation within the Port River). The native vegetation council boundaries only apply to the marine-based portion of the subject site. The land-based portion of the subject site is exempt from the *NV Act* in accordance Part 1-Preliminary 4 (2b), as it does not fall within the *NV Act* boundaries.
***Planning, Development and Infrastructure Act 2016* (SA; *PDI*)** and ***Planning, Development and Infrastructure (General) Regulations 2017* (*PDI Regulations*)** - governs the development and	On 15 February 2024, the Minister for Planning declared that the proposed development of a Nuclear-Powered Submarine Construction Yard (SCY) by proponent Australian Naval Infrastructure at Osborne (subject land

Legislation	**Relevance to Development**
management of land and buildings, provides a planning system to regulate development within the State, rules with respect to the design, construction and use of buildings, and other initiatives to facilitate the development of infrastructure, facilities and environments.	identified in Figure 1 and Figure 2) be assessed as an Impact Assessed development pursuant to section 108(1)(c) of the *PDI Act*. Impact Assessed development is the most rigorous form of development assessment, which is conducted through the preparation of an Environmental Impact Statement (EIS). The EIS enables the holistic consideration of projects that are considered to be of economic, social or environmental importance to South Australia. The EIS process provides a comprehensive assessment of a development or project proposal and the expected effects on the receiving environment and within the broader context of its setting, which could relate to a local area, region, state or nation. This report addresses the Assessment Requirements issued by the State Planning Commission.

Other environmental management plans and policies relevant to the Project include:

- Adelaide Dolphin Sanctuary Draft Management Plan 2024.
- South Australia's Biosecurity Policy 2020-2023.
- Primary Industries and Regions South Australia (PIRSA) Declared Plant Policies and Declared Animal Policies.
- Environment Protection Policies (EPP) (SA; Environmental Protection Agency).

4 ENVIRONMENTAL CONTEXT

4.1 Terrestrial and Marine Uses

The subject site is located on the Lefevre Peninsula, South Australia. The Lefevre Peninsula is a highly industrialised area. The Osborne Naval Shipyard (ONS), Quantem Fuel Terminal, Pelican Point Power Station, Snapper Point Power Station, Viterra Outer Harbour, Port Adelaide Passenger Terminal, and Flinders Port Adelaide Container Terminal each occupy substantial areas of the peninsula. Other land uses include residential dwellings in North Haven, Mutton Cove Conservation Reserve, Outer Harbor Railway Station Reserve, Falie Reserve, North Haven Marina and other open spaces across the peninsula. Biodiversity Park is located directly south of the subject site.

The marine-based portion of the subject site occurs within the Port River (Figure 4). The river supports industrial, recreational, historical and ecological uses and values. Primarily, the Port River is used as a major shipping channel in SA. It is an access point to the existing ONS shipyard as well as Port Adelaide. The river contains several historic shipwrecks and forms part of the Gulf St Vincent and the Adelaide Dolphin Sanctuary (ADS).

Torrens Island Conservation Park and the Adelaide International Bird Sanctuary National Park - Winaityinaityi Pangkara are located within the wider landscape. The subject site is within the boundaries of the City of Port Adelaide Enfield (PAE) Local Government Area and the Green Adelaide Landscape management region.

4.2 Vegetation

The land-based portion of the subject site occurs with the IBRA Association of Parham, Eyre Yorke Block Region and Subregion St Vincent (Table 3). The marine-based portion of the subject site falls outside the IBRA classification scheme.

Table 3: Eyre Yorke Block Region Description

Feature	Description
Land type	Erosional, Depositional or Volcanic
Landscape	Dunefield
Landform	Low limestone dune ridges: small granitic islands with dunes
Geology	Ripon Calcrete; Loveday Soil in aeolian sand sheets, dune sand, red soils (terra rossa)
Soil	Sands soils of minimal pedologic Development, Brown calcareous earths, Brown sand soils, Shallow red brown sandy soils, Sandy soils with yellow clayey mottled subsoil.
Vegetation	Mallee Woodland and Shrubland
Climate	E2: Mediterranean climate, but with drier cooler winters and less growth than E1.

Although much of the land-based portion of the subject site is dominated by industrial land uses, there are pockets of regenerating native vegetation throughout. Planted native and /or exotic vegetation is found within Falie Reserve and the Pelican Point Power Station. The marine-based portion of the subject site contains patches of *Zostera spp.* seagrasses. Field surveys conducted by

Succession Ecology identified a variety of terrestrial vegetation associations within and surrounding the subject site (refer to section 5 for methodology). Out of the 14 terrestrial vegetation associations surveyed by Succession Ecology, three are within the subject site (VA1, VA2b and VA4) (Table 4 and Figure 3). Mangrove woodlands and the Subtropical and Temperate Coastal Saltmarsh Threatened Ecological Community do not occur within the subject site.

Table 4: Vegetation types identified within and surrounding the subject site and their broad description.

Vegetation Type	Description
VA1: Degraded chenopod shrubland	This vegetation is dominated by chenopod species, including *Atriplex* and *Maireana* species. The vegetation is heavily degraded by an incursion of Declared Plants and human activities.
VA2a: Subtropical and Temperate Coastal Saltmarsh Threatened Ecological Community	This vegetation is dominated by samphire species including Brown-head Glasswort (*Tecticornia indica*) and Beaded Glasswort (*Sarcocornia quinqueflora*). Coastal chenopod species are also present. There are few weed species.
VA2b: Degraded samphire shrubland ± sedges, rushes and chenopod species	This vegetation is dominated by samphire species. Several coastal chenopod species are also present, whilst some sedge and rush species are present within Falie Reserve. Additionally, Creeping Boobialla occurs in this vegetation. The vegetation is heavily degraded by an incursion of Declared Plants and past human activities.
VA2c Samphire Shrubland	This vegetation is dominated by samphire species including Brown-head Glasswort (*Tecticornia indica*) and Beaded Glasswort (*Sarcocornia quinqueflora*). Coastal chenopod species are also present. There are few weed species. This VA did not meet the criteria for the TEC due to it being cut off from tidal influence.
VA3: Planted exotic trees with weedy understorey	This area consists mostly of planted exotic trees with a weedy understorey. There are several remnant native species present, including *Acacia* and chenopod species.
VA4: Planted *Melaleuca lanceolata* and *Myoporum insulare* shrubland	These plantings consist of species that are endemic to the area, including Dryland Tea-tree (*Melaleuca lanceolata*), Common Boobialla (*Myoporum insulare*) and chenopod species. Scattered regeneration of native species occurs within the understorey.
VA5: Planted *Eucalyptus* species	A row of *Eucalyptus* species is planted along the northern fence of the Pelican Point Power Station.
VA6: Mixed native plantings	A mix of planted *Eucalyptus* species, Cypress Pine (*Callitris gracilis*), Drooping She-oak (*Allocasuarina verticillata*), Dryland Tea-tree and *Acacia* species with a predominantly weedy understorey.
VA7: Mangrove	Dense forest of Grey Mangrove (*Avicennia marina* ssp. *marina*). Few other species grow in this community.
VA8: *Callitris gracilis* Woodland	Cypress Pine over a mix of native and weedy understorey.
VA9: *Acacia* Shrubland	Golden Wattle (*Acacia pycnantha*) and Umbrella Bush (*Acacia ligulata*) over Coast Spinifex (*Spinifex hirsutus*) and chenopod species.

Vegetation Type	Description
VA10: Planted exotic and native trees	Plantings of native species, such as Scarlet Bottlebrush (*Callistemon rugulosa*) and exotic species such as Aleppo Pines (*Pinus halepensis*) and Norfolk Island Pine (*Araucaria heterophylla*). Remnant native *Eucalyptus* species are present in the northern half of the area. The understorey consists of a mix of native and introduced species.
VA11: Mixed *Eucalyptus* open woodland	South Australian Blue Gum (*Eucalyptus leucoxylon*) and River Red Gum (*Eucalyptus camaldulensis*) over Golden Wattle and Sea-berry Saltbush (*Rhagodia candolleana* ssp. *candolleana*). There is a large amount of weedy grass present in the understorey.
VA12: Exotic Grassland with scattered native and exotic shrubs	A predominantly exotic grassland, dominated by Tall Wheat-grass (*Thinopyrum elongatum*), Couch (*Cynodon dactylon*) and Fleabane (*Conyza bonariensis*). Scattered exotic and native shrubs occur within the VA.

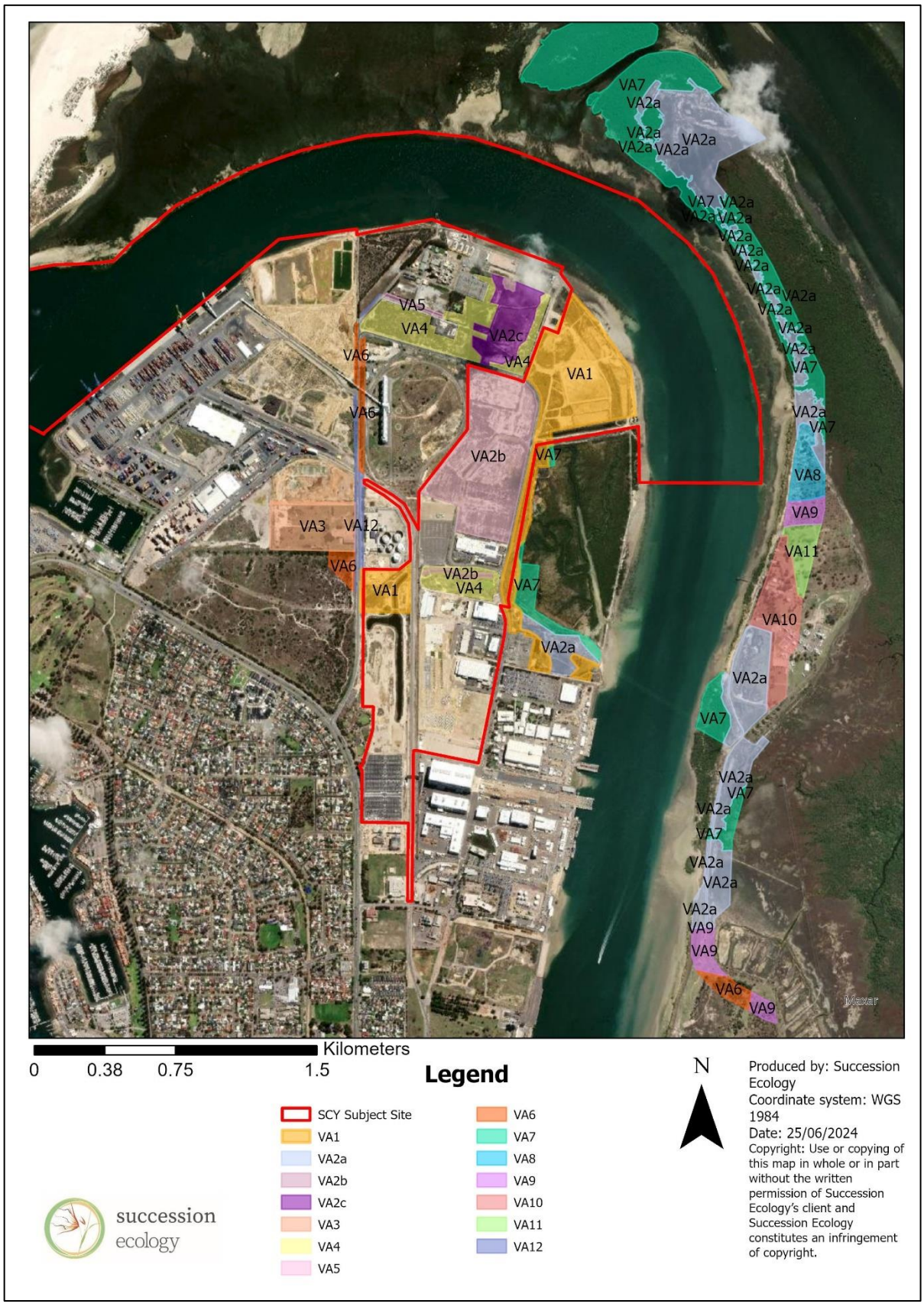

Figure 3: Vegetation Associations within the subject site.

4.3 Geology, Soils and Landforms

The land-based portion of the subject site is characterised largely by flat terrain, excluding the several constructed drainage swales or other stormwater and drainage features. The underlying soils are estuarine muds and sands of an area that was formerly part of extensive tidal flats bordering Barker Inlet. This area was below sea level during the period of Holocene marine regression approximately 7,500 years ago. The majority of the land-based portion of the subject site has been cut-off from intertidal flows. The Port Adelaide River is a tidal inlet from Gulf St Vincent and has been subject to historical dredging activities. Previous studies identified the riverbed was comprised of sand, silt and clay.

5 METHODOLOGY

To inform this report Succession Ecology undertook:

- A desktop assessment
- Field surveys; and
- Review of relevant literature

5.1 Database Searches

Environmental data was collected through a desktop assessment to inform this report and ensure any species listing changes under the *NPW Act* and *EPBC Act* were captured. Several database searches were undertaken to determine the range of threatened flora and fauna species and threatened ecological communities protected under the *EPBC Act* and *NPW Act*, that are 'known' or 'likely' to occur within a 10 km search area from the subject site (Figure 4). Database searches included:

- The DCCEEW Protected Matters Search Tool (PMST) - used to identify any relevant MNES, including threatened flora and fauna species and threatened ecological communities listed under the *EPBC Act Part 13 – Species and communities – Division 1- Listed threatened species and ecological communities – Subdivision A – Listing – 178 Listings of threatened Species*:
    - Section 178 (c) – Critically Endangered
    - Section 178 (d) – Endangered
    - Section 178 (e) – Vulnerable
- A NatureMaps search - undertaken for both threatened flora and fauna, to capture other nationally threatened species that may not be captured in the PMST. Records of species since 1995 were considered.
- Atlas of Living Australia (ALA) - used to identify any further threatened flora and fauna species not captured in the PMST. Records from 'citizen science' initiatives were excluded from search results.

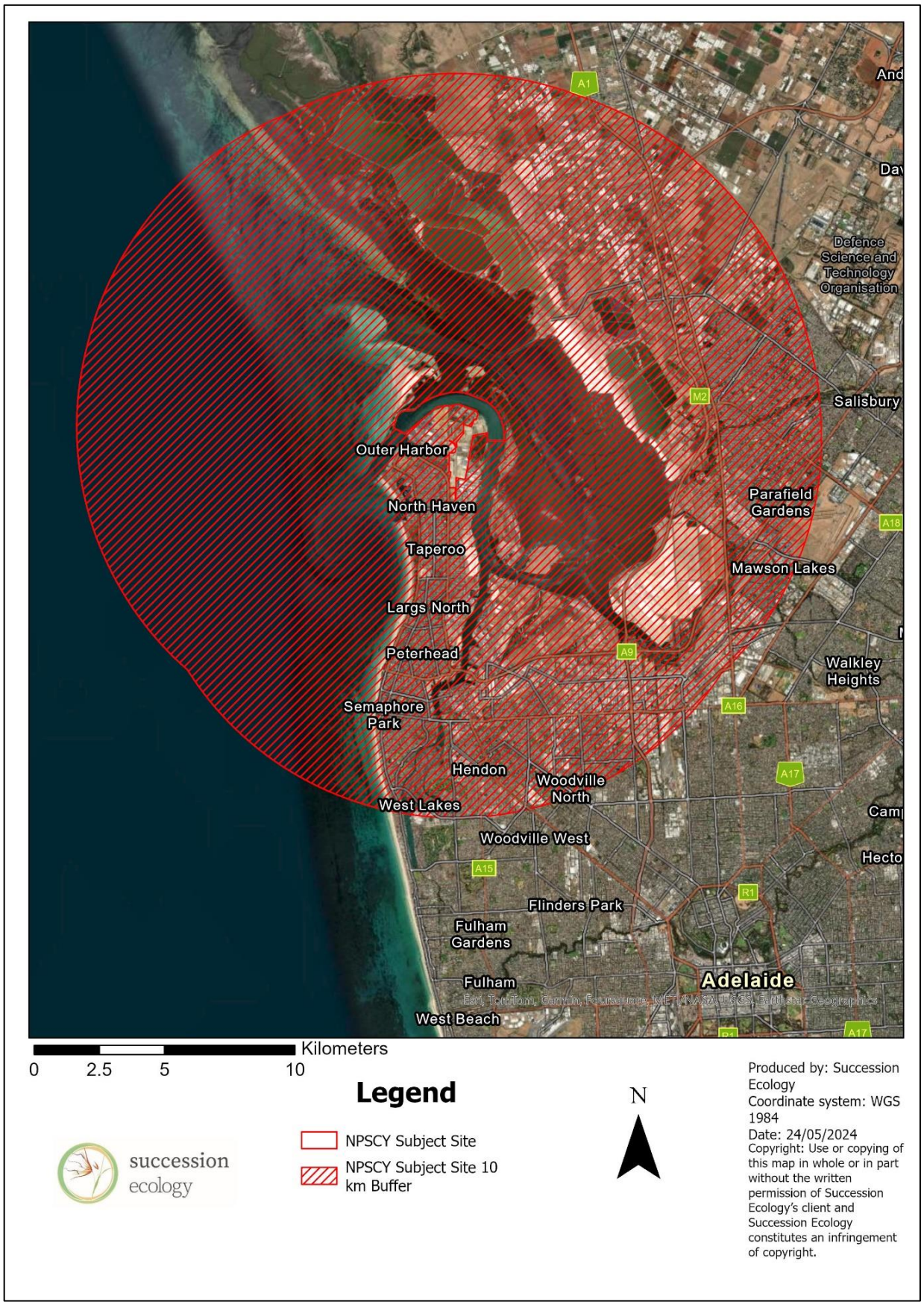

Figure 4: SCY Subject Site 10 km database search buffer.

5.2 Field Surveys

Field surveys were conducted by Succession Ecology on May 15, June 19, July 11, and July 18 2023 as well as 8 May and 13 July 2024 to identify environmental risks associated with the proposed Development and associated infrastructure. The assessments addressed native vegetation, amenity plantings, Regulated and Significant trees, Declared Plants, as well as fauna and the habitat value of vegetation and trees at the subject site and Torrens Island. Other field surveys were undertaken by consultants to inform a range of environmental assessments.

Several other field surveys have been undertaken by other consultants engaged with the Development. These included:

- **J Diversity Pty Ltd** undertook a benthic survey of what was at that time termed the "Northern Dredging Area" on 3 August 2023, using a towed camera system aimed 45° below horizontal streaming to a screen on the vessel and high-definition cameras pointing forward, 45° below horizontal, and downwards. Transects were placed initially at defined points on a coarse grid, and classified live (J Diversity Pty Ltd 2023).
- **The Australian Submarine Agency as part of the Osbourne Submarine Construction Yard Strategic Assessment** undertook field surveys including:
  - Four week-long surveys were conducted for migratory shorebirds between December 2023 and February 2024. Field surveys were conducted during appropriate tides, coinciding with neap and spring tide conditions as recommended in the guidelines. During each survey event, surveys were undertaken at low and high tide to record shoreline foraging and roosting (Australian Submarine Agency 2024).

For further detail of these reports, refer to Table 5.

5.3 Literature Review

The Client provided reports relevant to the Development. These reports were reviewed to support the production of this report, in addition to publicly available literature and resources.

Table 5: Key literature sources reviewed to inform this report.

Report	Scope
J Diversity Pty Ltd. 2023. Marine Ecological Assessment.	Identifies and maps native vegetation, including that protected under the *NV Act*, and areas (or features) of marine biodiversity value, and discuss implications for future Development.
Australian Submarine Agency. 2024. Biodiversity Values Report, Submarine Construction Yard Strategic Assessment.	Assessment of biodiversity values present in the Strategic Assessment Area. This report also documents the method and results of migratory bird surveys undertaken in accordance with the *EPBC Act* Policy Statement 3.21 *Industry guidelines for avoiding, assessing, and mitigating impacts on EPBC Act listed migratory shorebird species.*

6 STATE PLANNING COMMISSION ASSESSMENT REQUIREMENTS

This report has been prepared in accordance with the *PDI Act*, *PDI Regulations* and the State Planning Commission's Practice Direction 17 Impact Assessment Development. The report has also been prepared with guidance from the Department for Trade and Investment (DTI) Assessment Requirements Library, Impact Assessment Development s.108 (1) (b) (c) of the *PDI Act*.

URPS provided the Assessment Requirements to Succession Ecology on 23 August 2024, in which there was a total of 27 assessment requirements relating to the biological environment (biosecurity, terrestrial flora and fauna and marine flora and fauna) (Table 7). The Level of Assessment determined by the State Planning Commission is *Detailed*. This report directly responds to the State Planning Commission's Assessment Requirements on terrestrial and marine flora and fauna. The remaining Assessment Requirements for biosecurity and terrestrial flora and fauna are detailed in Succession Ecology's Nuclear-Powered Submarine Construction Yard Terrestrial Flora and Fauna Requirements Analysis and the Biosecurity Report.

Table 6: The State Planning Commission's Assessment Requirements for terrestrial flora and fauna and marine flora and fauna.

Objective	Assessment Requirement	Section
BE2 / Marine Flora and Fauna / Detailed		
To ensure that the nature and scale of the development avoids or minimises adverse effects on biodiversity, threatened and protected marine flora and fauna	Describe the nature and extent of the impacts likely to affect listed threatened native 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 *National Parks and Wildlife Act 1972*). Detail any residual	7.1

Objective	Assessment Requirement	Section
species, their ecological communities and habitat	impacts that cannot be avoided and propose measures to offset the residual loss.	
	Assess the potential impacts of the proposed project's activities on the Port River and Adelaide Dolphin Sanctuary more specifically. Model the spread and assess the impacts of any sediment plume to be created by dredging, construction or excavations.	7.3
	Assess the potential loss of habitat or diversity that could result from the activity and assess any potential impacts on commercial or recreational fisheries, including impacts that could arise from the loss of nursery habitat (e.g. seagrass beds, reefs, mangroves) of target species (such as prawns and fish). Assess the potential short-term or long-term impacts of noise on marine fauna, particularly cetaceans.	7.1, 7.2, 7.4
	Detail the potential impact, including cumulative impacts, (such as any likely increase in vessel numbers, or habitat fragmentation and loss) on marine fauna, including the Port Adelaide bottlenose dolphins (Indo-Pacific bottlenose dolphins) both during construction and operation, including ecologically and economically important species (e.g. fisheries).	7.1
	The assessment will also need to take into consideration the outputs of any underwater noise assessment, physical coastal and marine assessment, biosecurity assessment for potential impacts and incorporation of suitable mitigation measures in line with those and other relevant assessments for the Development.	7.1, 7.2, 7.3
	Prepare advice, prepared by a suitably qualified coast and marine expert, which details the existing environment, identifies any coastal hazards (e.g. erosion, sea level rise etc) and significant coastal or marine features or habitats. The report should also assess the impacts of the proposed operations and documents the environmental protection controls and measures to be implemented and monitored. The report should address impacts on marine organisms from Development activities (including noise, vibration, and water quality).	7.5
BE3 / Terrestrial Flora and Fauna / Detailed		
To ensure that the nature and scale of the development avoids or minimises adverse effects on biodiversity, threatened and protected terrestrial and aquatic flora and fauna species, their ecological communities and habitat.	Describe the location of public or private protected areas reserved under the *National Parks and Wildlife Act 1972*, *Wilderness Protection Act 1992*, *Crown Land Management Act 2009* and *Forestry Act 1950*, council reserves and Indigenous Protected Areas which may be impacted by the Development. Include reference to areas under Heritage Agreements through the *Native Vegetation Act 1991*.	8.1
	Assess the impacts on public and private protected areas from the Development including management of interface issues (e.g. biosecurity, fire management, access) and any implications for Heritage Agreements.	8.1

Objective	Assessment Requirement	Section
	Describe the location, extent, condition and significance of native vegetation, including listed threatened flora species and ecological communities in the Development's environs, and identify those that may need to be cleared or disturbed during construction and / or maintenance.	Succession Ecology 2024 TFFRA
	Identify and characterise any wetlands or groundwater dependent ecosystems that may be affected by altering the hydrogeological environment.	8.2
	Describe the Development activities with the potential to impact on native vegetation and listed threatened flora species and ecological communities and provide an assessment of how those impacts will be avoided, mitigated or offset.	Succession Ecology 2024 TFFRA
	For locations to which the *Native Vegetation Act 1991* applies, prepare 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), including seagrass in the tidal or subtidal marine environment, detail compliance with the impact mitigation hierarchy and describe how the significant environmental benefit would be achieved.	
	Detail potential impacts of fire on native vegetation, and the effects of fire risk management processes during construction, operation and maintenance.	
	Outline measures to mitigate effects on native vegetation by addressing the mitigation hierarchy, including any compensatory activities in already degraded areas and use of existing easements. Refer to guidelines produced by the Native Vegetation Council and outline the likely effectiveness of any mitigation measures adopted during both construction and maintenance.	
	Describe the location, extent, condition and significance of native fauna populations (including aquatic and subterranean fauna such as stygofauna) and listed threatened and migratory fauna species in the Development's environs and identify those that are likely to be disturbed during construction and / or maintenance.	
	Describe the Development activities with the potential to impact on native fauna species and listed threatened and migratory fauna species and habitats and provide an assessment of how those impacts will be avoided or mitigated.	
	Identify all potential sources of light pollution from the construction and operation of the proposed Development. Describe their impacts on native fauna, including nocturnal species, and how these impacts will be managed.	
	Detail appropriate buffer distances that would be required between the proposed Development and threatened species,	

Objective	Assessment Requirement	Section
	including feeding areas, nesting sites and roosting sites, and Mutton Cove more specifically.	

7 BE2 - MARINE FLORA AND FAUNA

This section addresses the State Planning Commission's Assessment Requirements, BE2 – Marine Flora and Fauna.

7.1 Native Marine Fauna

Assessment requirements addressed:

- *Describe the nature and extent of the impacts likely to affect listed threatened native 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 National Parks and Wildlife Act 1972). Detail any residual impacts that cannot be avoided and propose measures to offset the residual loss.*
- *Detail the potential impact, including cumulative impacts, (such as any likely increase in vessel numbers, or habitat fragmentation and loss) on marine fauna, including the Port Adelaide bottlenose dolphins (Indo-Pacific bottlenose dolphins) both during construction and operation, including ecologically and economically important species (e.g. fisheries).*
- *The assessment will also need to take into consideration the outputs of any underwater noise assessment, physical coastal and marine assessment, biosecurity assessment for potential impacts and incorporation of suitable mitigation measures in line with those and other relevant assessments for the Development.*
- *Assess the potential loss of habitat or diversity that could result from the activity and assess any potential impacts on commercial or recreational fisheries, including impacts that could arise from the loss of nursery habitat (e.g. seagrass beds, reefs, or mangroves) of target species (such as prawns and fish). Assess the potential short-term or long-term impacts of noise on marine fauna, particularly cetaceans.*

This section relates marine ecological impacts such as species habitat, breeding and population. It does not discuss noise and vibration impacts to *EPBC Act* or *NPW Act* listed/protected species. The Projects noise and vibration impacts were assessed and are summarised in section 7.3.

The Port River has been substantially modified by anthropogenic inventions. As such, the Port River consists of a largely disturbed environment including, moderate to sparse covering of seagrass *Zostera* species, filamentous macroalgae of varying densities and sand or rocky ledges of the shipping channel. Nonetheless, the Port River continues to support marine native fauna. Most notably the Port River is home to *Tursiops aduncus* (Indo-Pacific bottlenose dolphins) which is explored in this section and further in section 7.3. Some other native marine species which are likely to utilise the Port River include stingrays and fish species (J Diversity Pty Ltd 2023). However overall, there are minimal records of sharks, turtles or whales in the Port River (J Diversity Pty Ltd 2023). Surveys by J Diversity recorded there are a substantial number of introduced marine species, refer to the Succession Ecology 2024 Biosecurity Report for further details.

The majority of the marine-based portion of the subject site lies within the existing open shipping channel. The dredging is anticipated to occur along primarily along the Port River frontage of the

SCY, out to and along the northern extent of the current shipping channel. The actual extent of dredging will be confirmed during detailed design. The Northern Dredge Area (NDA) assessed by J Diversity via a limited towed camera survey in August 2023. The NDA represents a portion of the marine-based portion of the subject site. For the purposes of this report, the NDA will henceforth be referred to as the surveyed marine-based portion of the subject site. An indicative map of seagrass and other habitats was prepared. Nevertheless, further survey effort will be required to confirm the accuracy and precision of the seagrass cover in the marine-based portion of the subject site. The marine-based portion of the subject site occupies approximately 82 ha, of which only a portion was surveyed by J Diversity. This surveyed area consisted of approximately 7 ha of sparse and moderate density *Zostera* species. The remaining area consisted of filamentous macroalgae of varying densities and sand or rocky ledges of the shipping channel. Notably, no pest *Caulerpa* species, which previously dominated sections of the Port River, were observed (J Diversity Pty Ltd 2023). This is possibly a result of improved water quality in the Port River.

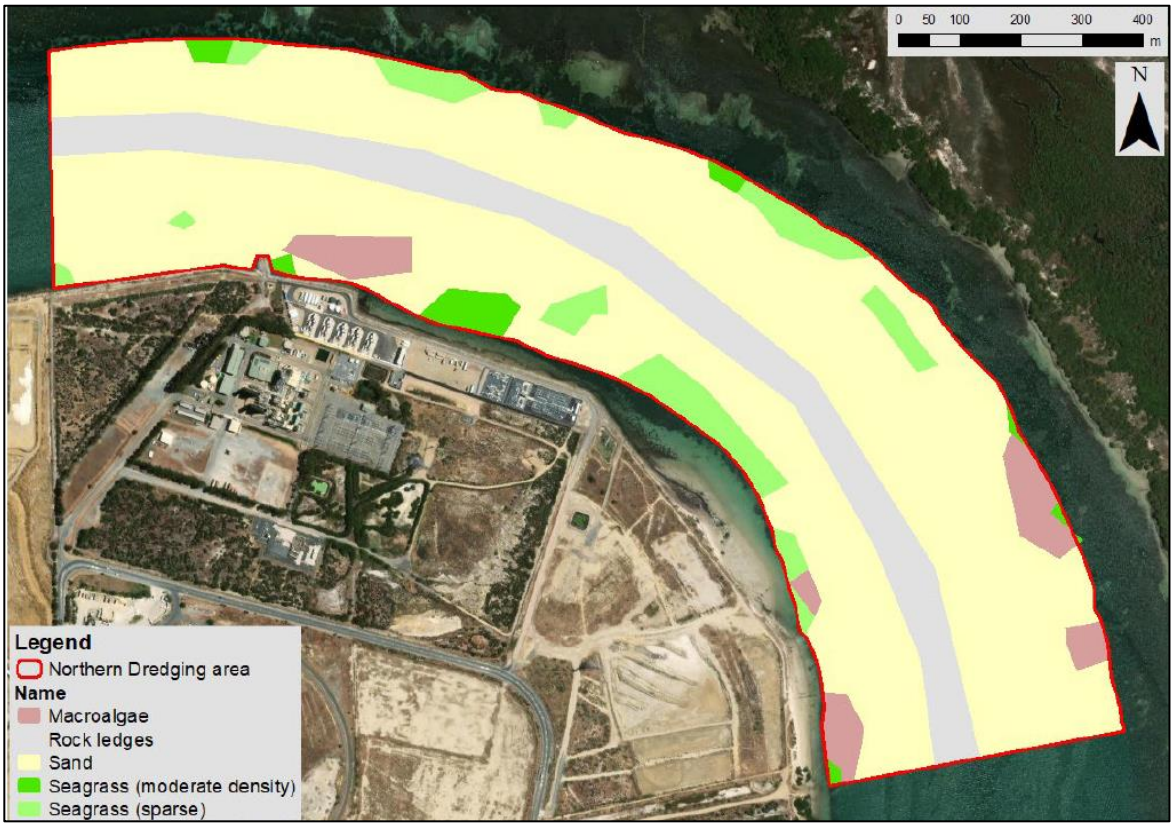

Figure 5: Northern Dredge Area boundaries and benthic habitat. Source: J Diversity 2023.

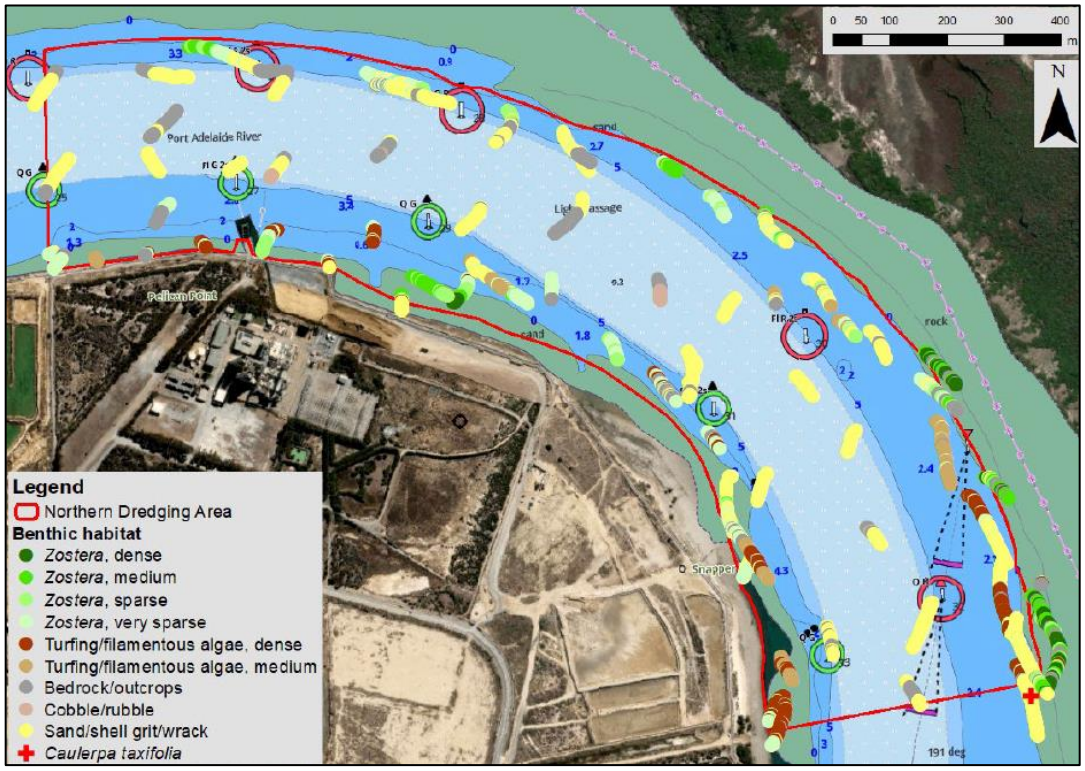

Figure 6: Habitats recorded in Northern Dredging Area during towed camera survey in August 2023. Source: J Diversity 2023.

7.1.1 Native Marine Fauna Regulatory Framework

Native marine fauna (including mammals, cetaceans and fish) is subject to legislation and guidelines including:

- *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act*; Commonwealth) (MNES and protected matters) Marine and cetacean species are protected under provisions of the *EPBC Act*, specifically:
    - Under section 225 of the *EPBC Act*, all cetaceans are protected in the Australian Whale Sanctuary. The Australian Whale Sanctuary in any waters of the sea inside the seaward boundary of the exclusive economic zone. It is an offence to kill, injure or interfere with a cetacean under section 229 of the *EPBC Act*.
    - Listed Marine species are protected under section 248 of the *EPBC Act*. It is an offence to kill or injure a member of listed marine species under section 254 of the *EPBC Act*.
- *EPBC Regulations 2000*
- *EPBC Act* guidelines including:
    - Significant Impact Guidelines 1.1 (Matters of National Environmental Significance)
    - Significant Impact Guidelines 1.2 (Actions on, or impacting upon, Commonwealth Land, and actions by Commonwealth agencies).
- *National Parks and Wildlife Act 1972* (*NPW Act*; South Australia)
- *NPW Act Regulations 2019*

- *NPW (Protected Animals—Marine Mammals) Regulations 2010*
- *Adelaide Dolphin Sanctuary Act 2005 (SA; ADS Act); and*
- *Adelaide Dolphin Sanctuary Draft Management Plan 2024.*

7.1.2 Native Marine Fauna Impact

The impact assessment presented in this section utilises the framework of the *EPBC Act* Significant Impact Guidelines 1.1. However, it does not serve as an *EPBC Act* significant impact assessment. Rather, it provides a high-level assessment of the potential risk to marine species to support the RFI under the *PDI Act*. The Development is subject to a Strategic Assessment, under which significant impacts to MNES will be assessed.

Results from the J Diversity Marine Ecological Assessment (2023) were reviewed to determine which threatened or protected species under the *EPBC Act* and/or *NPW Act* were relevant for the assessment of likelihood of impacts, and which should be excluded from assessment. Threatened or protected species were excluded from assessment if any of the following applied:

- They were ranked by regulatory agencies as 'unlikely' occur within the search area.
- They were ranked by J Diversity (J Diversity Pty Ltd 2023) as unlikely to occur within 5 km of the subject site.
- Records of occurrence were dated prior to 1995.
- The habitat present within the subject site is completely unsuitable for the species; or
- The distribution of the species did not occur within the subject site.

Threatened or protected species under the *EPBC Act* or *NPW Act* were assessed "unlikely, possible, likely or known to occur" within a 5 km of the subject site (J Diversity Pty Ltd 2023). Following this, a likelihood of impact of assessment was carried out for species considered "possible, likely or known to occur", using the metric in Table 8.

A total of 10 threatened or protected marine fauna species under the *EPBC Act* and/or *NPW Act* were identified as *possible*, *likely* or *certain* to be impacted by the Development (Table 7).

Table 7: EPBC Act and/or NPW Act species identified as possible, likely or certain to be impacted by the Development.

Name	***EPBC listing***	***NPW* Listing**	**Likelihood of occurrence**	**Likelihood of impact**
Pinniped				
Neophoca cinerea (Australian Sea Lion)	Endangered	Vulnerable	Likely	Possible
Arctocephalus forsteri (Long-nosed Fur Seal)	Listed marine	No conservation status	Likely	Possible
Cetacean				
Delphinus delphis (Short-beaked Common Dolphin)	Listed cetacean	No conservation status	Likely	Possible

Name	***EPBC listing***	***NPW* Listing**	**Likelihood of occurrence**	**Likelihood of impact**
Tursiops aduncus (Indo-Pacific Bottlenose Dolphin)	Listed cetacean	No conservation status	Certain	Certain
Tursiops truncatus (Common Bottle-nose Dolphin)	Listed cetacean	No conservation status	Likely	Possible
Fish				
*Hippocampus breviceps (*Short-head Seahorse)	Listed marine	No conservation status	Likely	Possible
Kaupus costatus (Deep-bodied Pipefish)	Listed marine	No conservation status	Certain	Certain
Phycodurus eques (Leafy Seadragon)	Listed marine	No conservation status	Possible	Possible
*Pugnaso curtirostris (*Pug-nosed Pipefish)	Listed marine	No conservation status	Likely	Possible
Stigmatopora nigra (Wide-bodied Pipefish)	Listed marine	No conservation status	Likely	Possible

Table 8: Descriptions of likelihood of impacts on threatened or protected species.

Likelihood of Impact	**Description**
None	The threatened or protected species, or relevant habitat, does not occur within the defined subject site, nor within adjacent properties.
Unlikely	The threatened or protected species, or relevant habitat, does not occur within the defined subject site nor within adjacent properties, however there is some possibility that offsite impacts could occur.
Possible	The threatened or protected species, or relevant habitat, may occur within the defined subject site, or it is known to occur in adjacent properties.
Likely	The threatened or protected species, or relevant habitat, is known to occur within the defined subject site and may overlap with the infrastructure footprint.
Certain	The threatened or protected species, or relevant habitat, is known to occur within the defined subject site and is known to overlap with infrastructure footprint.

A Significant Impact on a Matter of National Environmental Significance (MNES) under the *EPBC Act* is one that is 'important, notable or of consequence, having regard to its context or intensity' (Department of Environment, 2013). Threatened species are one of the classes of MNES protected by the *EPBC Act*. Whether an impact is Significant depends on the sensitivity, value, and quality of the environment as well as the extent, duration, and characteristics of the proposed action, including mitigation measures. An impact assessment has been conducted utilising the framework

of the Significant Impact Guidelines 1.1 for one threatened species *Neophoca cinerea* (Australian Sea Lion; Table 9).

The nine remaining species are listed as marine or cetacean species under the *EPBC Act* and do not have a conservation status (i. e., they are not considered to be threatened). The Significant Impact Guidelines 1.1 do not provide criteria for such 'protected' species; however, these species were assessed utilising the Significant Impact Guidelines 1.1 framework to ensure consistency in approach (Table 10).

Table 9: Significant Impact Assessment for Endangered Species identified as possible, likely or certain to be impacted by the Development.

Criteria	***Neophoca cinerea* (Australian Sea Lion)**
Lead to a long-term decrease in the size of an important population of a species	**Unlikely**. The subject site does not support an important population. There is no significant breeding, haul out or colonies within or in proximity to the subject site. The long-term impact to the species is unlikely to be significant, even with the removal of seagrass in the subject site.
Reduce the area of occupancy of an important population	**Unlikely**. The subject site provides limited suitable habitat for this species. A review of the Australian Sea Lion Biologically Important Areas (BIA) showed the subject site contains only foraging habitat for males. There are no female foraging sites, haul out sites nor breeding sites within the subject site. The nearest haul out and breeding sites are located within Backstairs Passage and Kangaroo Island. There are no large colonies within the subject site, the nearest again is at Kangaroo Island on Seal Bay. The Development will not significantly reduce the range of this species.
Fragment an existing important population into two or more populations	**Unlikely**. The subject site provides only limited suitable habitat for this species. A review of the Australian Sea Lion Biologically Important Areas (BIA) showed the subject site contains only foraging for males. There are no female foraging sites, haul out sites, or breeding sites within the subject site. The nearest haul out and breeding sites are located within Backstairs Passage and Kangaroo Island. There are no large colonies within the subject site, the nearest is at Kangaroo Island on Seal Bay. It is therefore unlikely that the Development will significantly reduce the range of this species.
Adversely affect habitat critical to the survival of a species	**Unlikely**. There are 58 breeding sites in Australia that are considered habitat critical to the survival of the species (Department of Sustainability, Environment, Water, Population and Communities 2013). None of them, nor any critical habitat occur within the subject site. The Outer Harbour breakwater, which is recognised as small haul-out site for the species is located over 2.5 km from the marine-based portion of the subject site. The long-term impact to the species is unlikely to be significant, even with the removal of seagrass in the subject site.
Disrupt the breeding cycle of an important population	**Unlikely**. There is no significant breeding, haul out or colonies within the subject site. The Outer Harbour breakwater, which is recognised as small haul out site for the species, is located over 2.5 km from the marine-based portion of the subject site.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely**. The subject site may provide limited suitable habitat for foraging (males only). Even with the removal of seagrass and subsequently prey species habitat within the subject site, the long-term impact to the population is unlikely to be significant. There are no significant breeding sites, haul outs, or colonies within or in proximity to the subject site.

Criteria	*Neophoca cinerea* (Australian Sea Lion)
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	**Unlikely.** It is unlikely that this Development will introduce or increase the density of any invasive species in the region.
Introduce disease that may cause the species to decline, or	**Unlikely**. It is unlikely that this Development will introduce any animal diseases.
Interfere substantially with the recovery of the species	**Unlikely**. The subject site does not support critical habitat or breeding sites. It is unlikely the Development will interfere substantially with the recovery of the species.

In consideration of assessment results it is **unlikely** that there is a "real chance or possibility" for a Significant Impact (as defined by DSEWPC, 2013) to the *Neophoca cinerea* (Australian Sea Lion).

Table 10: Significant Impact Assessment for Protected Species (pinnipeds and cetaceans) identified as possible, likely or certain to be impacted by the Development.

Criterion	***Arctocephalus forsteri*** **(Long-nosed Fur Seal)**	***Delphinus delphis*** **(Short-beaked Common Dolphin)**	***Tursiops aduncus*** **(Indo-Pacific Bottlenose Dolphin)**	***Tursiops truncatus*** **(Common Bottle-nose Dolphin)**
Lead to a long-term decrease in the size of an important population of a species	**Unlikely**. The Development will not lead to a long-term decrease in the size of an important population.	**Unlikely**. The Development will not lead to a long-term decrease in the size of an important population.	**Unlikely**. It is unlikely the Development will lead to a long-term decrease in the size of an important population.	**Unlikely**. The Development will not lead to a long-term decrease in the size of an important population.
Reduce the area of occupancy of an important population	**Unlikely**. The Development will not significantly reduce the species area of occupancy. The species has a wide range, extending through southern and eastern Australia, and breeding colonies in New Zealand and subantarctic islands (The Australian Museum n.d.).	**Unlikely**. The species is found throughout Australia's seas, with a worldwide population estimated at six million (Australian Geographic n.d.). The Development will not reduce the area of occupancy of an important population.	**Highly likely**. The Development will affect the ADS through dredging and establishment of marine infrastructure. This will reduce the area of occupancy of *Tursiops aduncus* in the ADS.	**Unlikely**. The species is found throughout Australia's seas. The Development will not reduce the area of occupancy of an important population.
Fragment an existing important population into two or more populations	**Unlikely**. The Development will not fragment any populations. Populations are currently estimated at 80,000 in Australia (The Australian Museum n.d.). Records indicate scattered occurrences of the species within and in proximity to the subject site.	**Unlikely**. The Development will not fragment any populations. The species has a wide range, extending throughout offshore around Australia.	**Unlikely**. The Development will involve the removal and alteration of habitat within the ADS. However, it is not expected to fragment the ADS *Tursiops aduncus* population.	**Unlikely**. The Development will not fragment any populations. The species has a wide range, extending throughout offshore water around Australia.
Adversely affect habitat critical to the survival of a species	**Unlikely**. The species prefers rocky coastlines and offshore islands which are characterised by large, jumbled angular rocks, boulder-strewn beaches, smooth rock platforms and some vegetated areas (The Australian Museum n.d.). The subject site provides limited suitable habitat. It is unlikely the Development will significantly impact important habitat.	**Unlikely**. The species may be a transient visitor the ADS. However, the species usually inhibits deeper waters off South Australia. It is unlikely the Development will adversely affect habitat critical to the survival of the species.	**Unlikely**. Seagrass meadows within the ADS are currently under threat (Department for Environment and Water 2024). The Development will remove seagrass (*Zostera* spp.). Seagrass and mangroves are key habitats in the ADS. The volume of seagrass clearance is unconfirmed. A small amount of removal of this seagrass habitat is unlikely to impact	**Unlikely**. The species may be a transient visitor the ADS, which encompasses the subject site. However, the species usually inhabits oceanic coasts and deep waters off South Australia. The species occurs around the world and has a large distribution range. It is unlikely the Development will adversely affect habitat critical to the survival of the species.

Criterion	*Arctocephalus forsteri* (Long-nosed Fur Seal)	*Delphinus delphis* (Short-beaked Common Dolphin)	*Tursiops aduncus* (Indo-Pacific Bottlenose Dolphin)	*Tursiops truncatus* (Common Bottle-nose Dolphin)
			significantly *Tursiops aduncus* prey species.	
Disrupt the breeding cycle of an important population	**Unlikely**. There is no significant breeding, haul out or colonies within to the subject site. The Outer Harbour breakwater, which is recognised as small haul out site for the species, is over 2.5 km from the marine-based portion of the subject site. The species has breeding colonies in New Zealand and Subantarctic islands. No breeding sites occur within the subject site.	**Unlikely**. No breeding sites occur within the subject site.	**Possible**. Dolphin births usually occur between summer and early autumn in the ADS. The population of *Tursiops aduncus* in the ADS exhibits low genetic diversity and high inbreeding. Small home ranges may contribute to inbreeding (Department for Environment and Water 2024), reducing resilience to adverse conditions. Dolphins take several years to reach sexual maturity, have few offspring, and take two to three years between giving birth (Department for Environment and Water 2024). It is possible the Development could disrupt their breeding cycle, via reducing the area of occupancy and disrupting their habitat.	**Unlikely**. The species be a transient visitor the ADS, which encompasses the subject site. However, the species usually inhibits deeper waters off South Australia.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely**. The species has a wide distribution range in which there is suitable habitat. The Development will not modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	**Unlikely**. The species has a wide range in which there is suitable habitat. The Development will not modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	**Unlikely**. Removal of seagrass meadows in the ADS has the potential to impact prey species which support the species. However, considering the scale of the ADS, it is unlikely that the clearance of *Zostera* spp. will affect the availability or quality of habitat to the extent that the species is likely to decline.	**Unlikely**. The species has a wide range in which there is suitable habitat. The Development will not modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to the	**Unlikely.** It is unlikely that this Development will introduce or	**Unlikely**. It is unlikely that this Development will introduce or	**Unlikely**. The Development has potential to spread *Caulerpa taxifolia*	**Unlikely**. It is unlikely that this Development will introduce or

Criterion	*Arctocephalus forsteri* (Long-nosed Fur Seal)	*Delphinus delphis* (Short-beaked Common Dolphin)	*Tursiops aduncus* (Indo-Pacific Bottlenose Dolphin)	*Tursiops truncatus* (Common Bottle-nose Dolphin)
species becoming established in the species' habitat	increase the density of any invasive species in the region.	increase the density of any invasive species in the region.	which has been identified within 5 km of the subject site. In severe cases *C. taxifolia* can outcompete native seagrasses, reducing foraging habitat for dolphins. However, this risk can be mitigated via the implementation of a basic weed reduction mitigation.	increase the density of any invasive species in the region.
Introduce disease that may cause the species to decline, or	**Unlikely**. It is unlikely that this Development will introduce any animal diseases.	**Unlikely.** It is unlikely that this Development will introduce any animal diseases.	**Unlikely**. It is unlikely that this Development will introduce any animal diseases.	**Unlikely**. It is unlikely that this Development will introduce any animal diseases.
Interfere substantially with the recovery of the species	**Unlikely**. The species is not at risk of extinction. The species is not listed as threatened under the *EPBC Act* or *NPW Act*.	**Unlikely**. The species is not at risk of extinction. The species is not listed as threatened under the *EPBC Act* or *NPW Act*.	**Unlikely**. This ADS population of faces several existing threats and intrinsic and extrinsic factors contribute to this population being particularly vulnerable to anthropogenic pressures. However, it is not expected the Development will interfere significantly.	**Unlikely**. The species is not at risk of extinction. The species is not listed as threatened under the *EPBC Act* or *NPW Act*.

Table 11: Significant Impact Assessment for Protected Species (Fish) identified as possible, likely or certain to be impacted by the Development.

Criterion	***Hippocampus breviceps* (Short-head Seahorse)**	***Kaupus costatus (Deep-bodied Pipefish)***	***Phycodurus eques (Leafy Seadragon)***	***Pugnaso curtirostris (Pug-nosed Pipefish)***	***Stigmatopora nigra (Wide-bodied Pipefish)***
Lead to a long-term decrease in the size of an important population of a species	**Unlikely**. The Development will not lead to a long-term decrease in the size of an important population.	**Unlikely**. The Development will not lead to a long-term decrease in the size of an important population.	**Unlikely**. The Development will not lead to a long-term decrease in the size of an important population.	**Unlikely**. The Development will not lead to a long-term decrease in the size of an important population.	**Unlikely**. The Development will not lead to a long-term decrease in the size of an important population.

Criterion	*Hippocampus breviceps* (Short-head Seahorse)	*Kaupus costatus (Deep-bodied Pipefish)*	*Phycodurus eques (Leafy Seadragon)*	*Pugnaso curtirostris (Pug-nosed Pipefish)*	*Stigmatopora nigra (Wide-bodied Pipefish)*
Reduce the area of occupancy of an important population	**Likely**. The Development will affect this species known range through dredging and establishment of marine infrastructure. This will reduce the area of occupancy of the species in the Port River. However, the species distribution covers a large area of South Australia, the Great Australian Bight, eastern Tasmania, Victoria and Western Australia.	**Likely**. The Development will affect this species known range through dredging and establishment of marine infrastructure. This will reduce the area of occupancy of the species in the Port River. However, the species distribution covers a large area of South Australia, the Great Australian Bight, eastern Tasmania and Victoria.	**Likely**. The Development will affect this species known range through dredging and establishment of marine infrastructure. This will reduce the area of occupancy of the species in the Port River. However, the species distribution covers a large area of South Australia and Western Australia.	**Likely**. The Development will affect this species known range through dredging and establishment of marine infrastructure. This will reduce the area of occupancy of the species in the Port River. However, the species distribution covers a large area of South Australia and northern Tasmania and areas of Western Australia.	**Likely**. The Development will affect the ADS through dredging and establishment of marine infrastructure. This will reduce the area of occupancy of *the species* in the Port River. However, the species distribution is from Queensland, New South Wales, Victoria, South Australia and Western Australia.
Fragment an existing important population into two or more populations	**Unlikely**. It is unlikely the Development will fragment an existing important population.	**Unlikely**. It is unlikely the Development will fragment an existing important population.	**Unlikely**. It is unlikely the Development will fragment an existing important population.	**Unlikely**. It is unlikely the Development will fragment an existing important population.	**Unlikely**. It is unlikely the Development will fragment an existing important population.
Adversely affect habitat critical to the survival of a species	**Possible**. The species is found in shallow seagrasses and macroalgae beds. Dredging has the potential to impact habitat that the species prefers. However, following the establishment of marine infrastructure associated with the Development, it is possible that overtime this infrastructure will provide artificial marine habitat.	**Possible**. The species is found in clear water environments of Zostera seagrasses and filamentous macroalgae. Dredging has the potential to impact habitat that the species prefers. However, following the establishment of marine infrastructure associated with the Development, it is possible that overtime this infrastructure will provide artificial marine habitat.	**Possible**. The species is found in seagrasses and sand patches near weed covered reefs. Dredging has the potential to impact habitat that the species prefers. However, following the establishment of marine infrastructure associated with the Development, it is possible that overtime this infrastructure will provide artificial marine habitat.	**Possible**. The species is found in shallow seagrass, eelgrass and algal habitats in sheltered bays and estuaries to a depth of about 11 m. Dredging has the potential to impact habitat that the species prefers. However, following the establishment of marine infrastructure associated with the Development, it is possible that overtime this infrastructure will provide artificial marine habitat.	**Possible**. The species is found in sheltered seagrass and algal habitats. Dredging has the potential to impact habitat that the species prefers. However, following the establishment of marine infrastructure associated with the Development, it is possible that overtime this infrastructure will provide artificial marine habitat.

Criterion	*Hippocampus breviceps* (Short-head Seahorse)	*Kaupus costatus (Deep-bodied Pipefish)*	*Phycodurus eques (Leafy Seadragon)*	*Pugnaso curtirostris (Pug-nosed Pipefish)*	*Stigmatopora nigra (Wide-bodied Pipefish)*
Disrupt the breeding cycle of an important population	**Possible**. The species breeds on a monthly cycle in summer, producing 50-100 young per brood. Disturbance caused by marine construction activities may disrupt the breeding cycle.	**Possible**. The species breeds in spring and summer. Disturbance caused by marine construction activities may disrupt the breeding cycle.	**Possible**. The species congregates in winter for mating and spawning occurs in summer. Disturbance caused by marine construction activities may disrupt the breeding cycle.	**Possible**. The males brood during late spring and summer. Disturbance caused by marine construction activities may disrupt the breeding cycle.	**Possible**. Disturbance caused by marine construction activities may disrupt the breeding cycle.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely**. The Development will reduce the area of habitat available for the species, however, this will be limited to the subject site. The species has other available habitat adjacent the subject site and within nearby aquatic reserves.	**Unlikely**. The Development will reduce the area of habitat available for the species. Dredging may also affect the species due to turbidity. however, this will be limited to the subject site. The species has other available habitat adjacent the subject site and within nearby aquatic reserves.	**Unlikely**. The Development will reduce the area of habitat available for the species, however, this will be limited to the subject site. The species has other available habitat adjacent the subject site and within nearby aquatic reserves.	**Unlikely**. The Development will reduce the area of habitat available for the species, however, this will be limited to the subject site. The species has other available habitat adjacent the subject site and within nearby aquatic reserves.	**Unlikely**. The Development will reduce the area of habitat available for the species, however, this will be limited to the subject site. The species has other available habitat adjacent the subject site and within nearby aquatic reserves.
Result in invasive species that are harmful to the species becoming established in the species' habitat	**Unlikely.** It is unlikely that this Development will introduce or increase the density of any invasive species in the region.	**Unlikely.** It is unlikely that this Development will introduce or increase the density of any invasive species in the region.	**Unlikely.** It is unlikely that this Development will introduce or increase the density of any invasive species in the region.	**Unlikely.** It is unlikely that this Development will introduce or increase the density of any invasive species in the region.	**Unlikely**. It is unlikely that this Development will introduce or increase the density of any invasive species in the region.
Introduce disease that may cause the species to decline, or	**Unlikely**. It is unlikely that this Development will introduce any animal diseases.	**Unlikely**. It is unlikely that this Development will introduce any animal diseases.	**Unlikely**. It is unlikely that this Development will introduce any animal diseases.	**Unlikely**. It is unlikely that this Development will introduce any animal diseases.	**Unlikely**. It is unlikely that this Development will introduce any animal diseases.
Interfere substantially with the recovery of the species	**Unlikely**. The species is not at risk of extinction. The species is not listed as threatened under the *EPBC Act* or *NPW Act*.	**Unlikely**. The species is not at risk of extinction. The species is not listed as threatened under the *EPBC Act* or *NPW Act*.	**Unlikely**. The species is not at risk of extinction. The species is not listed as threatened under the *EPBC Act* or *NPW Act*.	**Unlikely**. The species is not at risk of extinction. The species is not listed as threatened under the *EPBC Act* or *NPW Act*.	**Unlikely**. The species is not at risk of extinction. The species is not listed as threatened under the *EPBC Act* or *NPW Act*.

In consideration of the assessment results (Table 12), it is **unlikely** that there is a "real chance or possibility" for a Significant Impact (as defined by DSEWPC, 2013) to the following species:

- *Arctocephalus forsteri (Long-nosed Fur Seal)*
- *Delphinus delphis (Short-beaked Common Dolphin)*
- *Tursiops aduncus (Indo-Pacific Bottlenose Dolphin)*
- *Tursiops truncatus (Common Bottle-nose Dolphin)*
- *Hippocampus breviceps (Short-head Seahorse)*
- *Kaupus costatus (Deep-bodied Pipefish)*
- *Phycodurus eques (Leafy Seadragon)*
- *Pugnaso curtirostris (Pug-nosed Pipefish); and*
- *Stigmatopora nigra (Wide-bodied Pipefish).*

Nevertheless, it is likely that the Development will cause impacts to *Tursiops aduncus* (Indo-Pacific Bottlenose Dolphin), impacts are further discussed in section 7.3. The impacts to the five fish species are expected to mostly be unlikely, small in scale, or relatively minor in magnitude. These impacts and their mitigation are further explored in the following paragraphs.

***Tursiops aduncus* (Indo-Pacific Bottlenose Dolphin) summary**

The Development is contained within the Port River and Barker Inlet, which is home to a small population of Indo-Pacific bottlenose dolphins that face several threats. Several intrinsic and extrinsic factors contribute to ADS Indo-Pacific Bottlenose Dolphin population being particularly vulnerable to anthropogenic pressures. Construction and dredging associated with the Development is likely to cause a negative impact on the dolphin population. However, these impacts can be mitigated using industry's best practice approaches.

Fish species summary

Five species of fish may be impacted by the Development via the marine construction activities, removal of habitat, and potential turbidity resulting from dredging (Table 11). These species are already threatened by coastal development and loss of seagrass habitats. Further coastal development is likely to exacerbate these threats. The marine-based portion of the subject site offers suitable habitat but unlikely to provide optimal features. The subject site is largely pre-disturbed and is well-established as a shipping channel. The five fish species utilise *Zostera* sp. habitat. However, these species records of occurrences were minimal and there were few records within 5 km of the subject site.

The loss of the *Zostera* is considered to have a minor impact as it represents a small portion of the extensive *Zostera* habitat in the ADS (J Diversity Pty Ltd 2023). Although it has a low resistance to disturbance, *Zostera* meadows are usually able to reestablish within a time frame of months (J Diversity Pty Ltd 2023). These species have large distribution and are not threatened species. Within the wider landscape there are dedicated aquatic reserves to foster the preservation of seagrass meadows and provide fish breeding grounds. These aquatic reserves are likely to provide fish species more sufficient resources.

Native Marine Fauna Cumulative Impact

Cumulative impacts are critical to consider for the Development. The Lefevre Peninsula has multiple long-standing industrial developments, as well as several in the construction or pre-construction stages. Several of those related to the Development include service infrastructure realignments and the Osborne North Car Park and Grade Separated Road.

A cumulative impact assessment considers the Development at its broadest scope, including construction, operation, and all related activities and infrastructure, with direct and indirect impacts. Cumulative impact assessments need to consider intensity, timing, duration, scale and frequency of the Development and all its stages. They also consider the sensitivity of the receiving environment. At the time of writing, limited details are known about the Development's design, duration, scale, intensity or frequency. However, a summary of high-level cumulative impacts is described below:

Particular impacts that may result from the Development construction and/or operation activities include:

- Habitat loss (terrestrial and marine)
    - Reduced habitat for prey species
    - Reduced area of *Zostera* sp. in the ADS
    - Reduced foraging resources for threatened or protected species.
    - Disturbance to adjacent habitats and ecosystems
    - Sedimentation and erosion of the coastline
    - Diminished amenity of the ADS
- Increased noise and vibration
- Decreased air quality (via construction dust, vehicle emissions)
- Increased human activity in the Port River and surrounding land.
- Increased artificial light
- Diminished water quality
- Increased stormwater run-off
- Increased pollutant concentrations in water bodies, soil or sediments, or their bioaccumulation.
- Disturbance of contaminated sediments; and
- Introduction or spread of terrestrial and marine pests.

Collectively, over time, these impacts are likely to diminish the existing ecosystem if left unmanaged. The subject site and its surrounding locality has already been heavily modified via through anthropogenic activities such as dredging, vegetation removal, establishment of infrastructure (such as roads, train transport corridors, fuel storage, power stations, bulk shopping and grain operations, importation of fill, contamination by industries and introduction and spread of pest flora and fauna species.

7.1.3 Native Marine Fauna Management

Management measures will consist of mandatory requirements under the relevant legislation and guidelines and recommended measures based on the expert knowledge. To minimise impacts to

native marine fauna, the Development will implement the required management measures. These will be detailed in a Marine and Coastal Environmental Management Plan, as a subplan to the CEMP and OEMP.

Recommended management measures could be outlined in plans, including the Marine and Coastal Environmental Management Plan. Additionally, sediment disturbance management measures can be incorporated into a Dredge Management Plan (required under the EPA 2020 Dredge Guidelines).

Table 12:Native Marine Fauna Management.

Impact pathway	Risk	Required Management Measures	Recommended Management Measures
Coastal and marine construction and operational activities, dredging, vessels.	Impact to marine fauna species, diminished habitat quality, diminished water quality (increased turbidity, sediment disturbance), accidental contamination and spills.	• All vessels associated with the construction and operation of the Development to adhere to the *Interaction with marine mammals* as stipulated by the *National Parks and Wildlife (Protected Animals—Marine Mammals) Regulations 2010*, Regulation 9 and 10: o A person who is in control of a vessel that is not a prescribed vessel must not— (a) move the vessel closer than 100 metres to a whale; or (b) move the vessel closer than 50 metres to a marine mammal other than a whale. o A person who is in control of a vessel that is not a prescribed vessel must not move the vessel closer than 150 metres to a marine mammal other than a whale if— (a) the marine mammal— (i) shows signs of disturbance; or (ii) (iii) appears to be sick or injured; or is stranded; or (iv) is entangled or otherwise incapacitated by material of human origin; or (v) is a calf or pup; or (b) there are 2 vessels already within 150 metres of the marine mammal. o A person who is in control of a vessel that is within 150 metres of a marine mammal other than a whale must not— (a) approach the marine mammal head on or tail on; or (b) drop an anchor from the vessel; or (c) allow the vessel to remain within 150 metres of the marine mammal for more than 60 minutes.	Integration of management principles from DCCEEW's National Light Pollution Guidelines for Wildlife Including Marine Turtles, Aquatic Communities, Seabirds and Migratory Shorebirds (DCCEEW 2020). Where Australian Standards, design, work health and safety and security requirements allow, some basic measures that could be implemented include: • Start with natural darkness and only add light for specific purposes. • Use adaptive light controls to manage light timing, intensity and colour. • Light only the object or area intended – keep lights close to the ground, directed and shielded to avoid light spill. • Use the lowest intensity lighting appropriate for the task. • Use non-reflective, dark-coloured surfaces. • Use lights with reduced or filtered blue, violet and ultra-violet wavelengths. These could be outlined in a Marine and Coastal Environmental Management Plan. **Exclusion Zones and Marine Fauna Observers** (not applicable to fish species): • The training and deployment of Marine Fauna Observers (MFO). • The establishment of exclusion zones during construction and dredging works. • The minimisation of construction vessel uses and vessel speed limits during construction. • The use of dedicated and qualified MFOs in the operation of marine plant and equipment.

Impact pathway	Risk	Required Management Measures	Recommended Management Measures
		○ If a dolphin is swimming on a pressure wave created ahead of the bow of a vessel, the person who is in control of the vessel must, while the dolphin is so swimming, maintain the vessel's direction and speed unless it is necessary for the vessel to stop, in which case, the person must reduce the vessel's speed gradually. ○ If a marine mammal other than a whale shows signs of disturbance by the presence of a vessel that is within 150 metres of the marine mammal, the person in control of the vessel must move the vessel to at least 150 metres from the marine mammal and keep the vessel at that distance until the marine mammal no longer shows signs of disturbance. • Adherence to regulated or otherwise appropriate speed limits within the Port River. The *National Parks and Wildlife (Protected Animals—Marine Mammals) Regulations 2010*, Regulation 11 stipulate: ○ A person who is in control of a motorised vessel that is within— (a) 300 metres of a whale; or (b) 150 metres of a marine mammal other than a whale, must not operate the vessel at a speed exceeding 4 knots.	• The monitoring of individual dolphins, and the ADS dolphin population, during construction of the marine works. These could be outlined in a Marine and Coastal Environmental Management Plan and Dredge Management Plan. **Sediment disturbance management**: • The monitoring and recording of both baseline and activity generated water turbidity, and other water parameters. • The monitoring and recording of baseline contaminants in sediments and water and any that are potentially released by the activities. • The limitation of operation hours. • Using a construction methodology that reduced the risk of sediment disturbance. These could be outlined in a Dredge Management Plan. **Dredging management**: • Monitoring by a MFO within the caution zone (150 m of any dredging vessel). • Record any sightings on a Marine Mammal Observation Log Sheet. • If possible and safe for the vessel, vessels to slow down to no-wake speeds when 150 m of a dolphin. These could be outlined in a Dredge Management Plan and a Marine and Coastal Environmental Management Plan.

7.2 Noise and Vibration: Native Marine Fauna

***Assessment requirements addressed**:*

- *Assess the potential loss of habitat or diversity that could result from the activity and assess any potential impacts on commercial or recreational fisheries, including impacts that could arise from the loss of nursery habitat (e.g. seagrass beds, reefs, or mangroves) of target species (such as prawns and fish). Assess the potential short-term or long-term impacts of noise on marine fauna, particularly cetaceans.*
- *The assessment will also need to take into consideration the outputs of any underwater noise assessment, physical coastal and marine assessment, biosecurity assessment for potential impacts and incorporation of suitable mitigation measures in line with those and other relevant assessments for the Development.*

Activities such as pile driving and the movement of large vessels generate acoustic energy over a broad range of frequencies, but differ in duration. For example, pile driving generates an impulsive (i.e. loud and short duration) sound. Screeching or whistling noises are composed mainly of high-frequency sounds, whereas rumbles or booms are composed mainly of low-frequency sounds. Impacts of underwater noise were assessed for marine fauna species. Marine fauna species detect, utilise, and make sound in various ways, depending upon their biology and natural history. Marine fauna species were grouped according to their hearing sensitivity and to their susceptibility to sound. Hearing groups relevant to this assessment include low-frequency cetaceans, high-frequency cetaceans, Phocid Carnivores, and Other Carnivores (Table 13). Low and high-frequency cetaceans are most sensitive to sound in low and high frequencies, respectively. The hearing sensitivity of Phocid carnivores is similar to that of low-frequency cetaceans. Most of the species of "Other Carnivores" are pinnipeds, which have hearing sensitivity similar to that of high-frequency cetaceans.

Table 13: Hearing groups relevant to the assessment, and representative mammals of each group that may be impacted by the Development.

Hearing Group	Species
Low-frequency cetaceans	*Balaenoptera edeni* (Bryde's Whale) *Caperea marginata* (Pygmy Right Whale) *Eubalaena australis* (Southern Right Whale); and *Megaptera novaeangliae* (Humpback Whale).
High-frequency cetaceans	*Delphinus delphis* (Common Dolphin) *Lagenorhynchus obscurus* (Dusky Dolphin) *Orcinus orca* (Killer Whale) *Physeter macrocephalus* (Sperm Whale) *Tursiops aduncus* (Indian Ocean Bottlenose Dolphin); and *Tursiops truncatus* (Common Bottle-nosed Dolphin).
Phocid Carnivores	*Hydrurga leptonyx* (Leopard Seal)
Other Carnivores	*Arctocephalus forsteri* (Long-nosed Fur Seal) *Arctocephalus pusillus* (Australian Fur Seal)

Hearing Group	Species
	Arctocephalus tropicalis (Subantarctic Fur Seal); and *Neophoca cinerea* (Australian Sea Lion).

The marine-based portion of the subject site for the purpose of the noise assessment is characterised as a shallow water river and coastal environment. Ambient noise levels in shallow water vary in frequency and level distributions depending on time and location. Shallow water regions comprise of three main primary sources; shipping, industrial, or geophysical-survey noise; wind and wave noise; and biological noise. Results from the underwater noise monitoring found the marine area noise consisted of snapping shrimp noise underpinned by continuous low-frequency mechanical noise. However, this background noise was largely masked in the immediate vicinity by vessels passing. Vessel movement within the marine-based portion of the subject site were described as significant and operated at all times of the day or night.

7.2.1 Noise and Vibration: Native Marine Fauna Regulatory Framework

Construction and operational noise and vibration impacts to marine fauna are governed by legislation and guidelines including:

- *EPBC Act 1999*
- *Environment Protection Act 1993*
- *Environment Protection (Commercial & Industrial Noise) Policy 2023*
- *National Parks and Wildlife Act 1972 (NPW Act; South Australia)*
- *NPW Act Regulations 2019*
- *NPW (Protected Animals—Marine Mammals) Regulations 2010*
- *Planning, Development and Infrastructure (General) Regulations 2017* (*PDI Regulations*); and
- *Planning, Development and Infrastructure Act 2016* (*PDI;* South Australia).

7.2.2 Noise and Vibration Impacts on Native Marine Fauna

The results from the Underwater Noise Assessment, as prepared by Resonate and attached as Appendix 1.2 of the EIS, indicated the effect on marine mammals relates to the length of exposure time, which also relates to the mobility of the animals relative to the distance from each noise source. Based on specific scenarios, predications, construction methodology and noise modelling, the following potential for impacts were identified:

Marine Mammals – low-frequency cetaceans and phocid carnivores:

- **Dredging**: prolonged exposure (i.e. > 15 minutes) at distances less than 3m from the dredging noise source may cause permanent hearing injury. Temporary hearing injury could occur for these mobile animals within approximately less than 55 m of the noise source and would depend on the direction of travel and their behavioural response to the noise.
- **Vibro-driving**: in comparison to impact piling, vibro-driving of sheet piles has a significantly lower potential to impact. Even with a 50-minute exposure time, the potential for permanent hearing injury is considered negligible, given the very short distances in

comparison to the mobility potential of the animals. Furthermore, the potential for temporary hearing impacts is possible for phocids and low frequency cetaceans remaining within approximately 240 and 390 m of vibro-driving respectively, however given the mobility potential of these animals, particularly for migratory low frequency cetaceans, this is considered unlikely.

- **Impact piling**: even short exposure times (i.e. 5 minutes) at distances of 240 m (phocids) to 470 m (low frequency cetaceans) from the piling noise source may cause permanent hearing injury. A temporary hearing threshold shift could occur for these mobile animals within approximately 1700 m (phocids) to 2300 m (low frequency cetaceans) of the noise source for only 5 minutes of exposure and the level of exposure beyond 5 minutes would depend on the direction of travel and their behavioural response to move away from the noise.
- **Vessel movements**: the potential for both temporary and permanent hearing impacts for phocids and low frequency cetaceans is considered negligible given the significantly shorter distances to meet physiological criteria in comparison to the mobility potential of these animals.

Marine Mammals – high-frequency cetaceans / pinniped carnivores:

- **Dredging**: permanent or temporary physiological impacts are unlikely to occur for high frequency cetaceans and other carnivores given the short distances to meet the physiological impact criteria relative to the mobility potential of the animal and likely behavioural response to the noise.
- **Vibro-driving**: the potential for permanent or temporary hearing impacts for high frequency cetaceans and other pinniped carnivores is considered unlikely given the significantly short distances to meet the physiological impact criteria relative to the mobility potential of these animals.
- **Impact Piling**: comparatively, the potential for permanent or temporary physiological impacts for high frequency cetaceans and other carnivores is significantly less than low frequency cetaceans and phocid carnivores. This is because the significantly shorter distances to meet the physiological impact criteria relative to the mobility potential of the animals and their likely behavioural response to the noise. Whilst the two species have a similar noise exposure sensitivity to permanent hearing injury with distance, the other pinniped carnivores have the greater potential for a temporary threshold shift to their hearing, with the exposure versus time distance almost four times that of high frequency cetaceans.
- **Vessel movements**: the potential for both temporary and permanent hearing impacts is predicted to be nil.
- **Operational activities**: in comparison to the construction noise sources and existing vessel movements, submarine related operational activities are expected to have negligible impact. However, the impacts of operational activities, such as the use of active sonar, should be investigated prior to operation to determine impacts.

Fish, Sharks and Marine Turtles

- **Dredging:** the potential for permanent physiological injury is low, particularly in the understanding that a behavioural response to avoid higher noise levels is likely.
- **Vibro-driving:** the potential for permanent physiological injury is low, particularly in the understanding that a behavioural response to avoid higher noise levels is likely.
- **Impact Piling:** The results indicate that the effect on fish, sharks and turtles relates to the length of exposure time, which also relates to the mobility of the animals in the area during piling activities. The greatest impact potential is on fish with swim bladders given their increased hearing sensitivity. For marine turtles, the distance is approximately half that of fish with swim bladders at longer exposure times. For an assumed 60 minutes equivalent of continuous piling noise over a 24-hour period, fish with swim bladders and marine turtles, may incur organ damage and an increased risk of fatality within 35 m and 18 m respectively. A temporary hearing threshold shift could occur for fish (both with/without swim bladders) within approximately 75 m of initial piling commencement, depending upon the direction of travel and behavioural response to the noise to move away from the noise. For an assumed 60 minutes equivalent of continuous piling noise over a 24-hour period, fish remaining within an area of approximately 1300 m from the piling noise, may incur temporary hearing threshold shift.
- **Vessel movements**: vessel movements are considered a continuous non-impulsive noise source. Given that vessel movements are expected to be operating for short transit periods, the predicted impacts are nil.

In summary, the following impacts are anticipated:

- The greatest impact is expected on low-frequency cetaceans, given their increased hearing sensitivity to low-frequency noises.
- Impacts to high-frequency cetaceans are unlikely.
- Pinnipeds (particularly phocid carnivores) are significantly less sensitive to noise exposure in air than in water.
- The potential for temporary or permanent physiological impact from non-impulsive sources is very low for fish, sharks and marine turtle. However, within this group, the greatest impact potential is on fish with swim bladders, given their increased hearing sensitivity.
- Short-term impacts are expected to be limited to the construction phase.
- It is expected that underwater noise impacts can be managed via a series of mitigation measures.
- Long term impacts are expected to be negligible.

7.2.3 Noise and Vibration Impacts on Native Marine Fauna Management

A series of mitigations have been formulated based on the results of the noise and vibration impact assessment. Mitigation and management measures are considered necessary for impact sheet piling in particular and to a lesser extent dredging and vibratory piling. In relation to impact piling however, it is expected that most of the piling would be undertaken using vibro-driving, and impact piling only required if very stiff soils are encountered.

Management measures will consist of mandatory requirements under the relevant legislation and guidelines and recommended measures based on the expert knowledge. To minimise noise and vibration impacts to native marine fauna, the Development will implement the required management measures. These will be detailed in the CEMP. These will also be detailed in the Dredge Management Plan.

Recommended management measures could be outlined in several plans including the CEMP and OEMP. Additionally, these management measures can be incorporated into a Dredge Management Plan (required under the EPA 2020 Dredge Guidelines).

Table 14: Noise and Vibration Impacts on Native Marine Fauna Management.

Impact pathway	Risk	Required Management Measures	Recommended Management Measures
Marine construction and operational activities. Vessel movements. Increased marine activity.	Hearing damage to marine native fauna, diminished habitat quality, marine native fauna avoidance of the marine-based portion of the subject site.	The Development must adhere to the *National Parks and Wildlife (Protected Animals—Marine Mammals) Regulations 2010*, Regulation 18 – Noise and light near marine mammals: • A person who is— (a) within 300 metres of a whale for the purpose of observing the whale; or (b) within 150 metres of a marine mammal other than a whale for the purpose of observing the marine mammal, must not— (c) make, or cause to be made, a noise that is likely to frighten or otherwise cause distress to the whale or other marine mammal because of its loudness or suddenness or for any other reason; or (d) play back a recording of sounds made under water in a manner that is likely to be heard by the whale or other marine mammal; or	Management measures are derived from: • **Piling in low tide or dry conditions**: Piling noise propagates less efficiently in very shallow water (i.e. <1 m) and is negligible during dry conditions. Consideration of the low tide times with respect to the piling plan may provide an opportunity to reduce the underwater noise propagation and associated noise exposure. • **Soft start**: Adopting a soft start procedure in which the piling impact energy is gradually increased over a 10-minute time period may alert marine mammals (including fish, sharks and marine turtles) to the presence of the piling rig and enable animals to move away to distances where injury is unlikely. The soft start procedure should also be used after long breaks of more than 30 minutes in piling activity. • **Avoid whale migration season**: To reduce the potential for noise impact on low-frequency cetaceans, dredging and impact piling works should ideally be undertaken outside of the whale migration season (May to September). • **Bubble curtains**: Where site depth and conditions are appropriate, a bubble curtain may be utilised to attenuate impact piling activities, where practical and cost effective. A bubble curtain is a sheet of air bubbles that are produced around the location where piling activity occurs. • **Safety Zones**: The establishment of a Safety Zone of a defined radius around the works to monitor for megafauna prior to and/or during noisy activities. Safety zones are not applicable to fish or marine turtles, nor are they required when piling in low tide or dry conditions. • **Observation Zones**: The establishment of an Observation Zone where the movement of marine mammals shall be monitored to determine whether they are approaching or entering the Shutdown Zone. • **Shutdown Zones:** Shutdown zones are sized based on the potential for a temporary threshold shift in marine mammals. The Shutdown zone allows for the cumulative effect of multiple hammer strikes during impact piling and the time duration of a continuous noise source. This allows some time for the marine mammal to move away from the noise source thereby reducing the likelihood of hearing injury to occur. When a marine mammal is sighted within or appears to enter the Shutdown Zone, piling or dredging activities must be stopped as soon as reasonably practical.

Impact pathway	Risk	Required Management Measures	Recommended Management Measures
			• **Potential Effects Zones:** Potential Effects Zones are applicable to the impact assessment upon fishes and marine turtles for impact piling activities (i.e. impulsive sound) only. Potential Effects Zones are not applicable for vibratory or dredging activities (i.e. continuous sound sources) or for marine mammals. Potential Effects Zones for fish and marine turtles are not to be considered Shutdown Zones, but rather zones to inform the project's risk evaluation process and identify reasonable and practicable noise mitigation measures where required. Mitigation measures could include the adoption of alternative lower noise methods, design changes (e.g. pile material type, number of piles required) and soft starts to warn fish and marine turtles. • **Preliminary Safety Zones**: The preliminary Shutdown Zones and Potential Effects Zones (refer to Appendix A). The preliminary Shutdown Zone distances (without additional attenuation measures) are: o Dredging – 320 m from dredging activities for low-frequency cetaceans and phocid carnivores o Vibro-driven sheet piles – 390 m for low-frequency cetaceans and phocid carnivores. o Impact-driven piles: ▪ 3.4 km for low-frequency cetaceans and phocid carnivores. Note that 3.4 km has been adopted for low -frequency cetaceans instead of 4.1 km, given that there is a break in the line of sight (i.e. noise shielding equivalent to a conservative assumption of 4 dB attenuation) to the animal from piling activities due to the meander of the Port River. ▪ 880 m for pinniped 'other' carnivores ▪ 240 m for high-frequency cetaceans. o Vessel movements – Nil. **Marine Fauna Observers:** • MFO Level 1 – a person who is a suitably qualified marine fauna specialist with experience in marine mammal identification, including behaviour, as well as distance estimation. • MFO Level 2 – a person who has sufficient experience in marine fauna identification and distance estimation. These management measures could be detailed in the CEMP and Dredge Management Plan.

7.3 Adelaide Dolphin Sanctuary

Assessment requirement addressed:

- *Assess the potential impacts of the proposed project's activities on the Port River and Adelaide Dolphin Sanctuary more specifically. Model the spread and assess the impacts of any sediment plume to be created by dredging, construction or excavations.*
- *The assessment will also need to take into consideration the outputs of any underwater noise assessment, physical coastal and marine assessment, biosecurity assessment for potential impacts and incorporation of suitable mitigation measures in line with those and other relevant assessments for the Development.*

The Adelaide Dolphin Sanctuary (ADS) is located within the marine-based portion of the subject site. The ADS covers an area of 118 km^2, it includes the Port Adelaide River and Barker Inlet, North Haven Marina, north around Outer Harbor and the Port Gawler Conservation Park (Figure 7) (Department for Environment and Water 2024). The ADS is characterised by a tidal estuary with mangrove creeks, seagrass beds and mudflats. Notably, the ADS contains high ecological significance for a range of marine species including fish, invertebrates, birds, and dolphins. Conversely, the ADS is subject to high levels of human activities, as it is the main shipping port of South Australia, which has led to modification of the ADS environment. Up to 2,000 large vessel movements occur within the Port River annually (Department for Environment and Water 2024).

The ADS supports important shorebird and seabird habitats, including the at Bird Island / Section Bank (approximately 2 km north west of subject site) and the Outer Harbor revetment. Bird Island was created along the northern revetment (originally completed in 1913) from dredged clay and sand spoil placed in 1976 and extended in 1997. The Island now contains intertidal flat habitat and estuarine on different areas of the island. Coast saltbush and samphire have colonised the higher points of the island, while mangroves have established within more protected areas (Australian Submarine Agency 2024). The Island currently supports a variety of bird species including the Australian Fairy Tern *(Sternula nereis nereis)*, which has a well-established breeding population.

The ADS is home to about 30 resident *Tursiops aduncus* (Indo-Pacific bottlenose dolphins), with another 30 dolphins considered to be frequent visitors to the area. Persistent threats to the dolphins in the ADS include disease, algal blooms, pollutants, climate change and direct human interactions. Indo-Pacific bottlenose dolphins are commonly observed in nearshore and protected areas of the Gulf, including in the Port River estuary and adjacent coastline. Key demographics, population and health of the *Tursiops aduncus* ADS population have been identified and are presented in Figure 8. As a result of increasing public concern, the ADS was established in 2005 together with the enforcement of the *ADS Act* 2005 and the ADS Management Plan 2008. The ADS Draft Management Plan 2024 is currently out for public consultation.

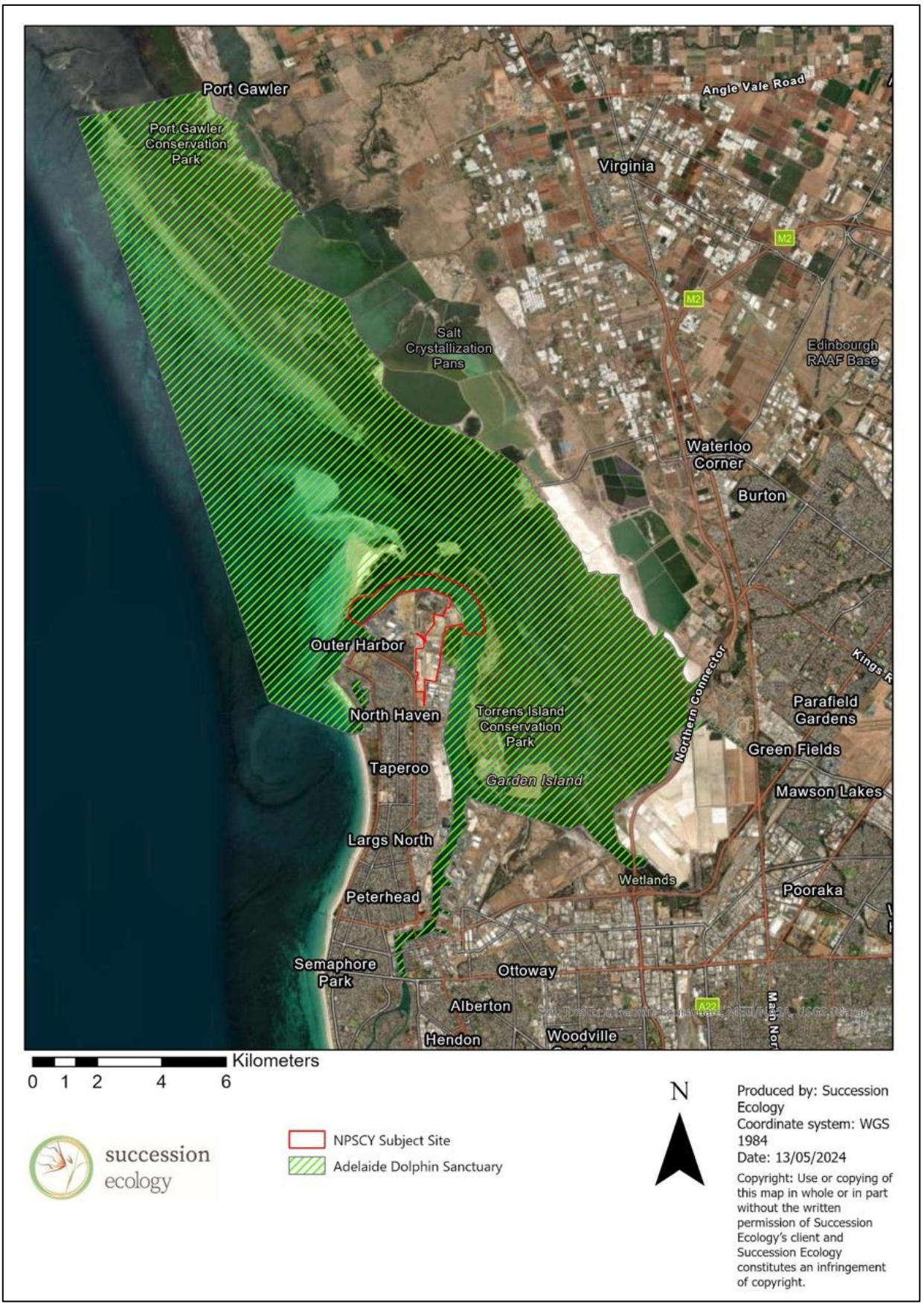

Figure 7: Map of the Adelaide Dolphin Sanctuary in relation to the subject site.

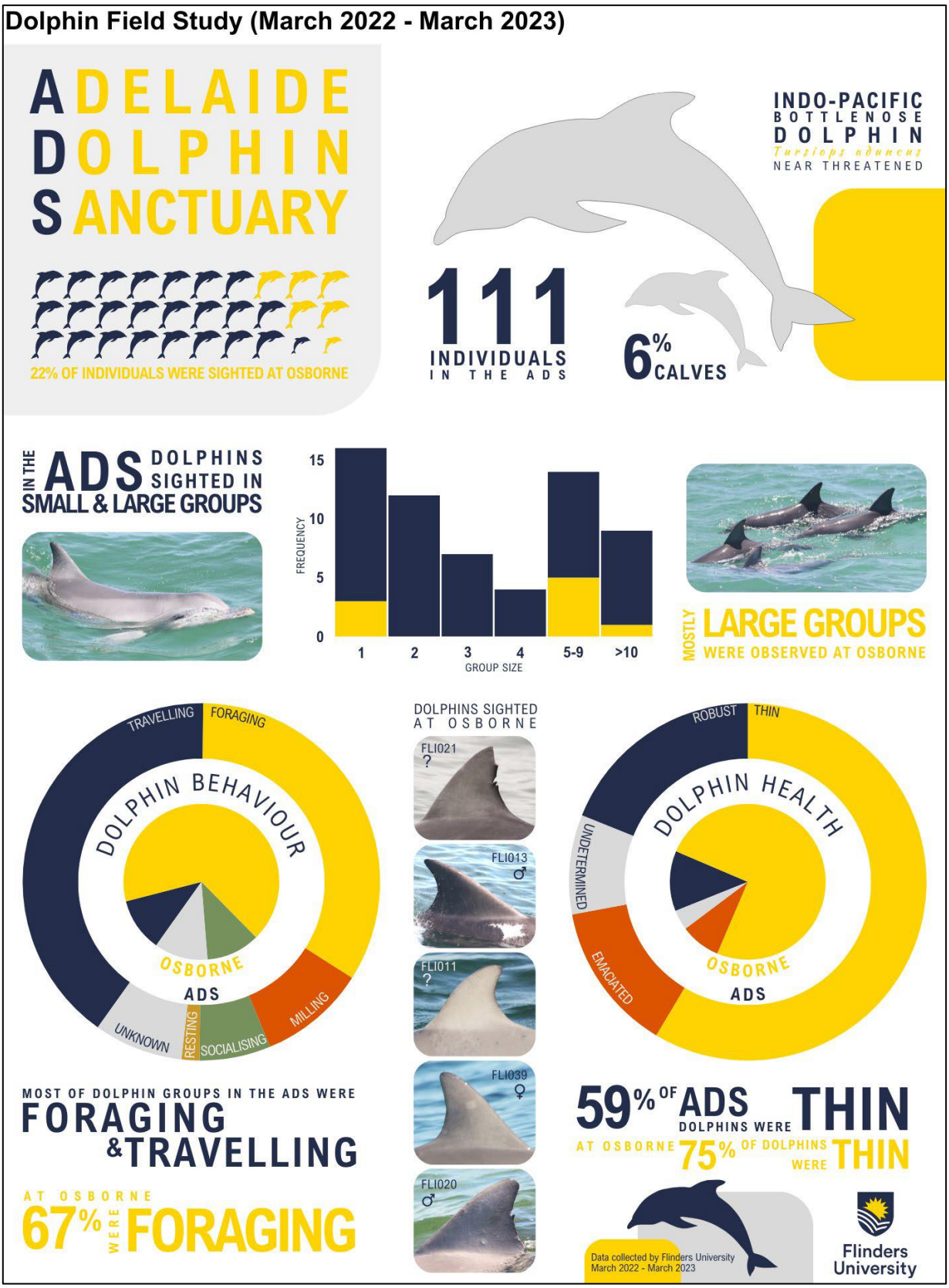

Figure 8: Population demographics, group structure and behaviour, and individual health of Indo-Pacific bottlenose dolphins in the Adelaide Dolphin Sanctuary.

7.3.1 Adelaide Dolphin Sanctuary Regulatory Framework

The ADS is subject to legislation and guidelines including:

- *Adelaide Dolphin Sanctuary Act 2005 (SA; ADS Act)*
- *ADS Draft Management Plan 2024*
- *National Parks and Wildlife Act 1972 (NPW Act; South Australia)*
- *NPW Act Regulations 2019*
- *Native Vegetation Act 1991* (*NV Act*; South Australia)
- *NV Regulations 2017*
- *Planning, Development and Infrastructure (General) Regulations 2017* (*PDI Regulations*)
- *Planning, Development and Infrastructure Act 2016* (*PDI;* South Australia); and
- *South Australian Planning and Design Code.*

The ADS Draft Management Plan 2024 outlines objectives for the ADS, including the protection of dolphins, protection of key habitat features, improvement of water quality, community participation, promotion of the environmental importance of the ADS; and promotion of the principles of ecological sustainable development (Department for Environment and Water 2024). It lists several challenges that face the ADS. The challenges that are most relevant to the Development include vessel strikes, impacts from human interactions, and new industrial developments.

7.3.2 Adelaide Dolphin Sanctuary Impacts

The Development's construction and operational activities will involve building of wharfs, wet docks and dredging, sheet piling, an increase in vessel traffic, including movement of submarines, and generally an increase in the disturbance and potential for other impacts to the Port River and dolphin habitats. The potential impacts of these construction and operational activities are assessed below:

Dredging Noise Impacts

Predicted noise impacts from dredging were assessed based on a backhoe dredging scenario. The Indo-Pacific bottlenose dolphins are grouped as high-frequency cetaceans. Their hearing is most sensitive in frequencies from 8 kHz to 100 kHz. Noise from shipping, drilling and piling activities occur predominantly in frequencies to which high-frequency cetaceans hearing is least sensitive. It was assessed that dredging was unlikely to cause permanent or temporary physiological impacts. Noise impacts from dredging are unlikely to impact Indo-Pacific bottlenose dolphin. However, it is note that masking and other behaviour changes may occur. The presence of man-made sounds may make it difficult to detect biologically significant sounds against the noise background. Masking of sounds from predators may result in reduced survival. Masking of sounds used for orientation and navigation may affect the ability to find preferred habitats and in the case of fish, spawning areas, affecting recruitment, growth, survival, and reproduction.

In summary the following impacts are anticipated. Refer to section 7.2 for a further description of noise impacts.

- The greatest potential for adverse impacts is on low-frequency cetaceans, given their increased hearing sensitivity at low frequencies (refer to Table 13) for a description of low-frequency cetaceans).
- Impacts to high-frequency cetaceans are unlikely (refer to Table 13 for a description of high-frequency cetaceans).
- Pinnipeds (particularly phocid carnivores) are significantly less sensitive to noise exposure in air than in water.
- The potential for temporary or permanent physiological impact from non-impulsive sources is very low for fish, sharks and marine turtles. However, there is potential for impacts to fish with swim bladders, given their increased hearing sensitivity.
- Short-term impacts are expected to be limited to the construction phase. It is expected that underwater noise impacts can be managed via a series of mitigation measures.
- Long term impacts are expected to be negligible.

The results are further described in section 7.2 of this report.

Dredging – impacts to habitat and water quality

Dredging will result in the alteration of the shoreline, removal of benthic habitats, increased turbidity, sedimentation and erosion.

Dredging will directly result in habitat loss. The extent of vegetation clearance within the marine-based portion of the subject site is yet to be confirmed. The precise areas to be dredged are yet to be confirmed, once dredging methodology, footprint and further benthic surveys have been established (J Diversity Pty Ltd 2023). The loss of *Zostera* meadow is considered to have a minor impact as it represents a small portion of the extensive *Zostera* habitat in the ADS (J Diversity Pty Ltd 2023). Although *Zostera* seagrasses have a low resistance to disturbance, they are rapid colonisers and therefore are expected to be able to reestablish within a period of months following disturbance (J Diversity Pty Ltd 2023). Note that the removal of seagrass requires approval under the *PDI Act* and *NV Act*.

Direct impacts from dredging may include disturbances to species which inhabit the ADS. Specifically, it is anticipated that sparse microalgae and the invasive pest *Sabella spallanzanii* (European Fan Worm) would recolonise dredged areas in the shipping channel (J Diversity Pty Ltd 2023). Denser areas of microalgae and razor clams, which are currently present in areas outside the shipping channel, would be impacted and unlikely to recolonise in an active shipping channel (J Diversity Pty Ltd 2023). Species with more mobility including fish and crabs would be likely to migrate away from dredging activity and potentially recolonise after dredging activities (J Diversity Pty Ltd 2023).

Potential indirect impacts from dredging include increased turbidity and sedimentation. An increase in turbidity reduces light availability and penetration, in turn hampering seagrass growth, and in extreme cases resulting in death (J Diversity Pty Ltd 2023). Similarly, sedimentation can result in the covering of leaf blades or the burial of seagrass patches, which also hampers seagrass growth, and in extreme cases results in death (J Diversity Pty Ltd 2023). Mangroves adjacent to the Port River and Barker Inlet are unlikely to be impacted by dredging unless the pneumatophores (breathing

roots), which usually stand about 10 cm above ground level, are buried under sediment (J Diversity Pty Ltd 2023). Similarly, it is not expected that the saltmarsh species in the upper intertidal or supratidal zones will be subject to significant volumes of dredging sediment (J Diversity Pty Ltd 2023).

The disturbance of contaminated sediments poses a potential indirect impact of dredging for the ADS. When contaminated sediments are disturbed, they can be released into the water column (J Diversity Pty Ltd 2023). For example, the disturbance of microalgae and nutrients could result in algal blooms, particularly during calm and warm weather (J Diversity Pty Ltd 2023). Laboratory analysis from neighbouring projects in the Port River did not detect contaminants within sediments, in accordance with the screening levels in the *National Assessment Guidelines for Dredging* (NAGD) (J Diversity Pty Ltd 2023). The alteration of benthic habitats can also lead to changes in the availability of prey resources and local food webs. Additionally, disturbance of contaminants during dredging can bioaccumulate in near-top predators, such as dolphins, via the food web. Sampling in accordance with the NAGD is recommended to confirm the impacts from dredging of contaminated sediments.

Finally, plume dispersion modelling would aid in understanding the extent of the indirect impacts from dredging associated with the Development on *Zostera* seagrasses and other aquatic flora species (J Diversity Pty Ltd 2023). However, a sediment plume model was not available at the time of writing and therefore has not been assessed as part of this report.

Impacts to other fauna species

The construction and operation of the Development may cause impacts to other fauna species, specifically birds.

- Removal of benthic flora and alteration of the shoreline can lead to reduced habitat and foraging resources for marine species, shorebirds and waterbirds.
- Noise associated with the Development's construction and operation activities can disrupt migratory shorebirds feeding, foraging and roosting time. Disturbance sources from the Development are likely to include (DCCEEW 2017):
    - Increased artificial light.
    - Increased noise via construction and operation activities. Particularly unpredictable disturbances such as sudden loud noises from construction and demolition activities.

Impacts to other fauna species are detailed in the Succession Ecology 2024 TFFRA.

Water Quality

Water quality in the ADS and Port River has the potential to be impacted by the construction and operational activities of the Development. Activities that may impact water quality via accidental spills and release of contaminants include ballast water transfers, bilge water discharge, and vessel manufacturing, commissioning, and testing. Activities that may have indirect impacts include dust, spills and pollution. Potential negative impacts include pollution, contamination and spills, wastewater and stormwater discharge, introduction of pest marine species and turbidity. Dolphins

and fish in the ADS have shown high levels of polychlorinated biphenyls (PCBs), perfluorooctane sulfonic acid (PFOs) and heavy metals, such as lead, mercury, and arsenic. These toxins can impact on the dolphins' immune system, making them more vulnerable to pathogens and deteriorating their overall health condition. Impacts to water quality can led to a decrease in habitat quality, availability of food resources and direct impact on individuals through the introduction of disease inducing pathogens.

Vessel Strike

Vessel strikes to marine megafauna have the potential to occur from vessel movements associated with dredging or the in-situ dredging equipment, resulting in physical injury, death or behavioural changes. Vessel collisions with marine mammals in the Gulf St Vincent are rare, considering that more than 1,000 vessels utilise the Port River annually (J Diversity Pty Ltd 2023). There have been five Indo-Pacific bottlenose dolphin (*Tursiops aduncus*) mortalities due to vessel collision and two non-fatal collisions in the ADS since 1988 (J Diversity Pty Ltd 2023). Dolphins are believed to have better capacity to avoid collisions with vessels than whales, however dolphins have a greater tendency to investigate or bow ride vessels (J Diversity Pty Ltd 2023).

Marine Pests

There is potential for marine pest species to be introduced or increase in abundance in the ADS via ballast water, vessel movements, and biofouling on vessels and marine infrastructure. The ADS currently supports a range of pest marine species, both in the subject site and more broadly. Notably, *Caulerpa taxifolia* has been identified as a dominant component of habitats and communities within the Port River (J Diversity Pty Ltd 2023). *C. taxifolia* was identified during the field survey just outside the southeastern end of the marine-based portion of the subject site in 2023 (J Diversity Pty Ltd 2023). The ADS Management Plan identified *C. taxifolia* as a key issue and a serious threat to the ADS habitat and the prey species of dolphins (Department for Environment and Water 2024). If unmanaged, the Development could exacerbate the impacts of *C. taxifolia* on the ADS and Port River. Refer to the Succession Ecology 2024 Biosecurity Report for details on impacts and management measures.

7.3.3 Adelaide Dolphin Sanctuary Management

In addition to the management measures for marine native fauna (Table 14), Table 15 outlines required management measures under the *ADS Act*. These will be detailed in a Marine and Coastal Environmental Management Plan, as a subplan to the CEMP and OEMP.

Table 15: Adelaide Dolphin Sanctuary Management.

Impact pathway	Risk	Required Management Measures	Recommended Management Measures
Marine construction and operational activities. Vessel activity	Impact to ADS environmental values. Vessel strikes.	Adherence to the *ADS Act* section 32 – General Duty of Care: • A person must take all reasonable measures to prevent or minimise any harm to the Sanctuary	• Maintaining no stormwater discharge into Mutton Cove Conservation Reserve via utilising proposed drainage networks to direct all stormwater around Mutton Cove Conservation Reserve.

Impact pathway	Risk	Required Management Measures	Recommended Management Measures
		through his or her actions or activities. • Adhere to the *National Parks and Wildlife (Protected Animals—Marine Mammals) Regulations 2010*, Regulation 9, 10 and 11 (refer to Table 12).	• Installation of erosion and sedimentation controls, such as preserving existing vegetation, re-vegetation, sediment capture traps, on-site sedimentation basins/ponds and designated areas for stockpiling excavated material. • Periodic monitoring of stormwater quality discharge off-site during the pre-construction, construction and operation stages. • Provision of Marine Fauna Observers (refer to Table 12). These could be outlined in a CEMP, OEMP, Marine and Coastal Environmental Management Plan.

7.4 Commercial and Recreational Fisheries

***Assessment requirements addressed**:*

- *Assess the potential loss of habitat or diversity that could result from the activity and assess any potential impacts on commercial or recreational fisheries, including impacts that could arise from the loss of nursery habitat (e.g. seagrass beds, reefs, mangroves) of target species (such as prawns and fish). Assess the potential short-term or long-term impacts of noise on marine fauna, particularly cetaceans.*

There is one commercial fisheries within the subject site (Port River Vongole Fishery) however it is currently closed due to POMS issues. In the wider area there are three main commercial fisheries in Upper Gulf St Vincent, these include:

- **Marine Scalefish Fishery** (MSF): the MSF targets more than 60 species of scalefish. The main species include *Sillaginodes punctata* (King George Whiting), *Hyporhamphus melanochir* (Southern Garfish) and *Sepioteuthis australis* (Southern Calamari) (Department of Primary Industries and Regions 2022). Catches are reported via large fishing blocks. The Development is contained within Block 36, which covers 3,500 km^2. Considering the size of Block 36, it is unlikely the Development will negatively affect the MFS (J Diversity Pty Ltd 2023).
- **Blue Crab Fishery** (Gulf St. Vincent Sector): the Blue Crab Fishery targets *Portunus armatus* (Blue Swimmer Crab) within the Gulf St Vincent and Spencer Gulf. The Development occurs in the fishing Block 35. There were no catches within Block 35 or the neighbouring Block 36 in 2020/2021 (J Diversity Pty Ltd 2023). It is unlikely the Development will negatively interact with the Blue Crab Fishery (Gulf St. Vincent Sector).
- **Gulf St Vincent Prawn Fishery**: There have been not reported to catches from within 8 km of the Port River. Therefore, it is unlikely this fishery will be impacted by the Development (J Diversity Pty Ltd 2023).

The Port River and Barker Inlet provide recreational fishing opportunities and support habitat for several species:

- *Acanthopagrus butcheri* (Black Bream). A desktop search identified no records of occurrence within the subject site. Two records of the species was recorded towards the southern end of Garden Island (Government of South Australia n.d.).
- *Aldrichetta forster* (Yelloweye mullet). A desktop search identified no records of occurrence within the subject site. However, several records occur in the wider locality.
- *Argyrosomus japonicus* (Mulloway). A desktop search identified no records of occurrence within the subject site nor surrounds. However, it is noted by DEW that the Port River and estuary provides habitat and supports recreational fishing for this species.
- *Arripis truttacea* (Australian Salmon) A desktop search identified no records of occurrence within the subject site. Two records of the species occurred near the southern and eastern end of Garden Island. An additional two records were identified within the inner harbor, south past Largs North (Government of South Australia n.d.).

7.4.1 Commercial and Recreational Fisheries Regulatory Framework

Commercial or recreational fisheries are governed by legislation including:

- *Fisheries management Act 2007*
- *Aquaculture Act 2001* (SA); and
- *Livestock Act 1997* (SA).

7.4.2 Commercial and Recreational Fisheries Impacts

Considering the current use of the subject site and surrounding areas, which are likely to provide more accessible recreational fishing spots, it is unlikely the Development will significantly interfere with recreational fishing. Additionally, the three commercial fisheries are not located within the subject site and will not be impacted by the Development.

7.4.3 Commercial and Recreational Fisheries Management

Where appropriate, the Development will implement standard practice management measures in the CEMP, OEMP and Dredge Management Plan to minimise the risk of spills and contamination entering the marine environment.

7.5 Coastal Environment

Assessment requirements addressed:

- *Prepare advice, prepared by a suitably qualified coast and marine expert, which details the existing environment, identifies any coastal hazards (e.g. erosion, sea level rise etc) and significant coastal or marine features or habitats. The report should also assess the impacts of the proposed operations and documents the environmental protection controls and measures to be implemented and monitored. The report should address impacts on marine organisms from Development activities (including noise, vibration, and water quality).*

The Lefevre Peninsula is highly developed and has been subject to a variety of past human activities, which have altered its landscape and ecosystems (Figure 13). The landscape within the subject site and surrounds was originally intertidal swamp, mudflats, dunes, subtidal seabeds. It has been strongly raised by fill or industrial dumping. This significantly altered the natural landscape (Delta Environmental Consulting 2003). These changes to the natural landscape have been compounded by industrial developments and the installation of seawalls and artificial stormwater systems.

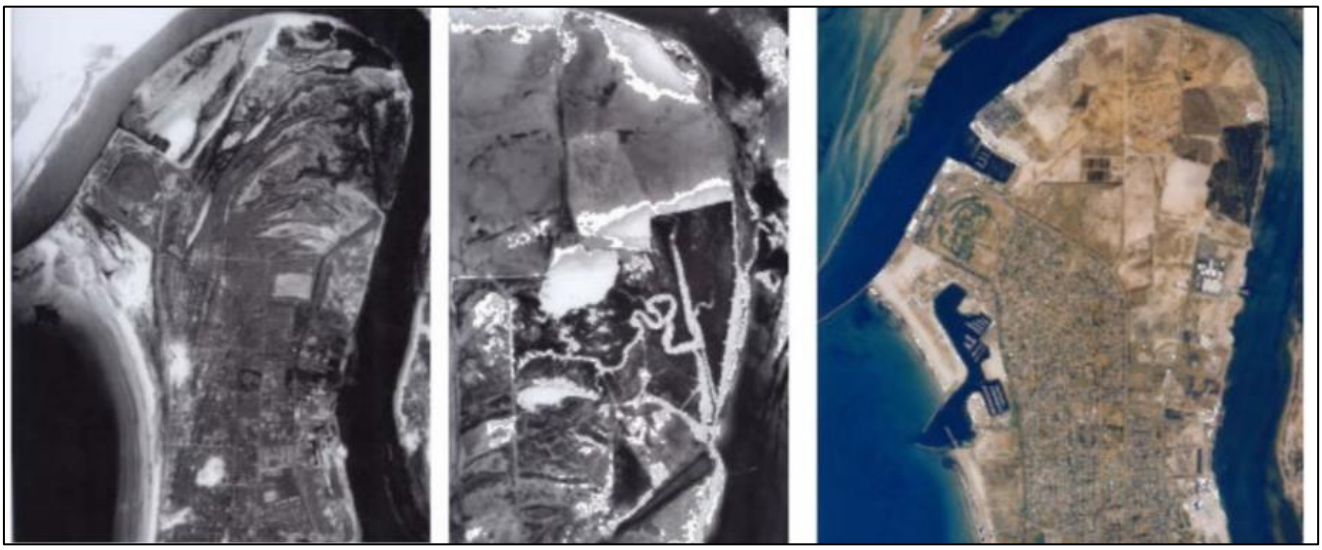

Figure 9: Left-to-right: Lefevre Peninsula in 1954, 1977 and 1991. Source: Delta Environmental Consulting 2003.

The current coastal and marine environment within the marine-based portion of the subject site consists of minor mangrove shrublands, tidal flats and an open dredged marine channel with patchy seagrass beds. The small patch of mangrove shrublands provide limited potential for fish nursery and habitat for marine macroinvertebrates The tidal flats are tidally inundated and provide habitat for marine macroinvertebrates and shorebirds.

7.5.1 Coastal Environment Regulatory Framework

- *Adelaide Dolphin Sanctuary Act 2005 (SA; ADS Act)*
- *ADS Draft Management Plan 2024*
- *Coast Protection Act 1972*
- *National Parks and Wildlife Act 1972 (NPW Act; South Australia)*
- *NPW Act Regulations 2019*
- *Native Vegetation Act 1991* (*NV Act*; South Australia)
- *NV Regulations 2017*
- *Planning, Development and Infrastructure (General) Regulations 2017* (*PDI Regulations*)
- *Planning, Development and Infrastructure Act 2016* (*PDI;* South Australia); and
- *South Australian Planning and Design Code.*

The Development may require specific biosecurity related permits and/or approvals prior to marine construction activities based on the following legislation:

- *PDI Act* (Development Approval from the State Planning Commission)
- *NV Act* (approval from the Native Vegetation Council (NVC) to clear native vegetation)
- *EP Act* / EPP (e.g. requirements for dredging and ballast water)
- *LSA Act* (Water Affecting Activities permit from the Green Adelaide Landscape Board)
- *FM Act* (permit from PIRSA for the removal of Declared Noxious species)
- *EPBC Act* (Strategic Assessment Decision conditions); and/or
- *ADS Act* (may require a permit in accordance with section 69 of the NPW Act).

Permits and/or approvals for biosecurity are detailed in section 7.1 of the Succession Ecology 2024 Biosecurity Report.

7.5.2 Coastal Environment Impacts

Climate hazards such as rising temperatures, sea level rise, and storm surges pose a threat to biodiversity and the coastal environment in the Port Adelaide Region. Threats to the coastal environment include erosion of remnant vegetation from storm surges and the loss of threatened species and Threatened Ecological Communities (TEC) due to reduction in habitat from sea level rise and storm surges. Construction projects, where unmanaged, have the potential to exacerbate these threats to coastal environments. However, the implementation of mitigations and coastal management plans can reduce the impacts.

The Development construction and operations has the potential to impact the coastal environment, including:

- Clearance of coastal vegetation (e.g. mangrove habitats and tidal flats within the subject site).
- Reduced marine habitat, vegetation, foraging resources and fish nursery areas
- Diminished water quality; and
- Changes to coastal morphology.

7.5.3 Coastal Environment Management

To manage the impacts on the coastal environment within the subject site, ANI will prepare a Marine and Coastal Environment Management Plan prior to construction once further details about the Development become available. This management plan will detail mitigation and management measures tailored to the coastal and marine-based portion of the subject site. It will include measures to reduce impacts on the *Tursiops aduncus* (Indo-Pacific bottlenose dolphins) population in ADS. The mitigations in the Marine and Coastal Environment Management Plan will be developed in accordance with the legislation outlined in section 7.5.1 and may draw from the required and recommended management measures outlined in Tables 14 and 15. The Development will refer also to the Terrestrial Flora and Fauna Requirements Analysis for coastal impacts on shorebirds.

8 BE3 - TERRESTRIAL FLORA AND FAUNA

This section addresses several of the State Planning Commission's Assessment Requirements, BE3 – Terrestrial Flora and Fauna. All other Assessment Requirements relating to Terrestrial Flora and Fauna are detailed in the TFFRA (Succession Ecology 2024).

8.1 Protected Areas

Assessment requirements addressed:

- *Describe the location of public or private protected areas reserved under the National Parks and Wildlife Act 1972, Wilderness Protection Act 1992, Crown Land Management Act 2009, Adelaide Dolphin Sanctuary Act 2005 and Forestry Act 1950, council reserves and Indigenous Protected Areas which may be impacted by the Development. Include reference to areas under Heritage Agreements through the Native Vegetation Act 1991.*

A number of public protected areas, including State-maintained parks and Council-maintained parks are located within, adjacent or within the wider locality to the subject site. Protected areas within or adjacent the subject site are described in Table 16 and are shown in Figures 14, 15 and 16.

A review of NatureMaps indicated there are no Indigenous Protected Areas or Heritage Agreements within or adjacent to the subject site. Indigenous Protected Areas or Heritage Agreements are therefore not discussed further in this report.

Table 16: Protected areas within and adjacent to the subject site.

Area	Description and Location
Protected under SA legislation	
Adelaide Dolphin Sanctuary	The Adelaide Dolphin Sanctuary (ADS) is protected under the *Adelaide Dolphin Sanctuary Act 2005*. Its management is guided by the *Adelaide Dolphin Sanctuary Draft Management Plan 2024*. The ADS is governed by Department for Environment and Water (DEW) / National Parks and Wildlife Services (NPWS). The ADS extends from North Haven on the western side of Lefevre Peninsula, north along the coast north to Port Gawler and the intertidal area of Port Adelaide River. The Adelaide Dolphin Sanctuary also extends into Mutton Cove Conservation Reserve and to Bird Island.The ADS is directly adjacent the land-based portion of the subject site. The ADS occurs within the marine-based portion of the subject site.
Adelaide International Bird Sanctuary National Park - Winaityinaityi Pangkara	The Adelaide International Bird Sanctuary National Park encompasses over 60 km of coastline north of Adelaide, adjacent to Gulf St Vincent and Adelaide's northern suburbs. It spans four local council areas. The National Park is protected under the *NPW Act* and governed by DEW / NPWS and co-managed with the Kaurna Parks Advisory Committee. The sanctuary is located at the southern end of the East Asian-Australasian Flyway (EAAF) and provides crucial habitat for migratory shorebirds and resident shorebirds (NPWS n.d.). The National Park is located approximately 1 km from the eastern border of the marine-based portion of the subject site.
Mutton Cove Conservation Reserve	Mutton Cove Conservation Reserve comprises 48 ha and is located on Crown managed land on Mersey Road North (Birds SA 2021). The conservation reserve is under the care and control of DEW. Mutton Cove contains remnant *Tecticornia*

Area	Description and Location
	quinqueflora (Beaded Glasswort) and *Suaeda australis* (Austral Sea-blite) low shrubland, *Tecticornia halocnemoides* (Grey Samphire) low shrubland and some *Avicennia marina* (Grey Mangrove) shrubland. Mutton Cove provides a feeding ground for shorebirds. Extensive areas of Mutton Cove are inundated during high tide, the area is modified by constructed drainage lines and levee banks. The area has been significantly degraded since European settlement (Birds SA 2021).Mutton Cove Conservation Reserve abuts the terrestrial portion of the subject site to the south and east. The marine portion of the subject site shares a border of approximately 225 m in length with the eastern side of Mutton Cove Conservation Reserve.
Torrens Island Conservation Park (CP)	Torrens Island Conservation Park covers about 6.3 km^2 of Torrens Island. It is located within the ADS between the Port River, Barker Inlet and Section Bank mudflats (NPWS n.d.). Torrens Island CP is protected by the *NPW Act* and The National Park is governed by DEW / NPWS and co-managed with the Kaurna Parks Advisory Committee. Torrens Island CP occurs directly northeast, east and southeast of the marine-based portion of the subject site.
Barker Inlet and St Kilda Wetland	Barker Inlet and St Kilda Wetland is a Wetland of National Importance. It is located within the eastern side of the Port River, extending through Mutton Cove, Torrens Island and the eastern leg of Adelaide International Bird Sanctuary. The wetland is contained within the ADS and Adelaide International Bird Sanctuary NP, therefore indirectly protected under the *ADS Act* and *NPW Act*. The Barker Inlet and St Kilda Wetland occurs directly within the marine-based portion of the subject site.
Port Gawler & Buckland Park Lake	Port Gawler & Buckland Park Lake is a Wetland of National Importance. The wetland is contained within the ADS, therefore indirectly protected under the *ADS Act*. It is approximately 650 m northeast of the northern end of the marine-based portion of the subject site.
Barker Inlet – St Kilda Aquatic Reserve and Barker Inlet Chapman Creek Aquatic Reserve	The Barker Inlet – St Kilda Aquatic Reserve extends for about 10 km to the north-west from the northern tip of Torrens Island (Point Grey). The St Kilda – Chapman Creek Aquatic Reserve extends for a similar distance to the south-east and includes most of Torrens Island in addition to the waters of Barker Inlet. Both reserves are protected marine areas for the purpose of fish nursery habitat and breeding grounds. Each reserve occurs within the Adelaide Internal Bird Sanctuary NP and the ADS, therefore these reserves are indirectly protected under the *ADS Act* and *NPW Act*. The marine-based portion of the subject site is approximately 1 km east of the St Kilda Aquatic Reserve. The Chapman Creek Aquatic Reserve is further away, approximately 7.7 km northwest from the northern border of the marine-based portion of the subject site.
St Kilda Mangroves	St Kilda Mangroves are located on the northern side of Barker Inlet. They do not extend to the subject site. However, they are connected to the marine environment in the locality. The St Kilda Mangroves occur within the Adelaide Internal Bird Sanctuary NP and ADS (DEW n.d.). The St Kilda Mangroves are approximately 3 km northeast of the subject site.
NVC Significant Environment Benefit (SEB)	One SEB (2009_3097) overlays the southern end of the land-based portion of the subject site. Discussion via email with the NVC on the 29th August 2024 concluded the SEB (2009_3097) is not applicable to the subject site, as per the except below: *"Over time, the [Native Vegetation] Act has changed in terms of the areas that it applies in metropolitan Adelaide. After a recent review, it was found that the Act does*

Area	Description and Location
	not apply to the land which was approved in 2009 as a Significant Environmental Benefit area (2009/3097). Thus, the site that has been established on your land is not enforceable under the Act. The Native Vegetation Branch is taking action to remove the SEB note from the Administrative Interest section on your Certificate of Title." (URPS and Native Vegetation Council 2024). Therefore, this SEB is not further discussed in this report.
Local Government Maintained Areas	
Falie Reserve	Falie Reserve is located on Mersey Road North, opposite Mutton Cove Conservation Reserve. Falie Reserve is under the care and control of the City of PAE. It was designed for informal recreation, stormwater management and the restoration of local endemic species (Renewal SA 2024). Falie Reserve contains planted samphire shrubland and other planted vegetation, including trees, shrubs and ground covers. The reserve provides links to bicycle and walking path networks and stormwater management systems, and contains seating and a grassy recreation area (Renewal SA 2024). Falie Reserve forms part of the Northern Lefevre open space project from 2010-2013 which involved improvement of the open space network (Renewal SA 2024). Falie Reserve is located within the terrestrial portion of the subject site. However, Falie Reserve is subject to a separate Development Application and therefore excluded from the NPSCY EIS and related reports. It will therefore will not be further discussed in this Ecological Report.
Kardi Yarta Playground	Kardi Yarta is located on the eastern corner of Victoria Road and Pelican Point Road. It is under the care and control of the City of Port Adelaide Enfield Council (City of PAE). Kardi Yarta formed part of the Northern Lefevre open space project from 2010-2013 which involved improvement of the open space network (Renewal SA 2024). Vegetation within this area is planted. This playground is situated directly west of the subject site.
Biodiversity Park	Biodiversity Park is located at Pelican Point Road and Victoria Road, on the Lefevre Peninsula. The park is largely comprised of planted vegetation and naturally regenerating native vegetation. Biodiversity Park is under the care and control of the City of Port Adelaide Enfield Council (City of PAE). Biodiversity Park forms part of the Northern Lefevre open space project from 2010-2013, which involved the improvement of the open space network (Renewal SA 2024).Biodiversity Park is approximately 40 m west of the subject site.

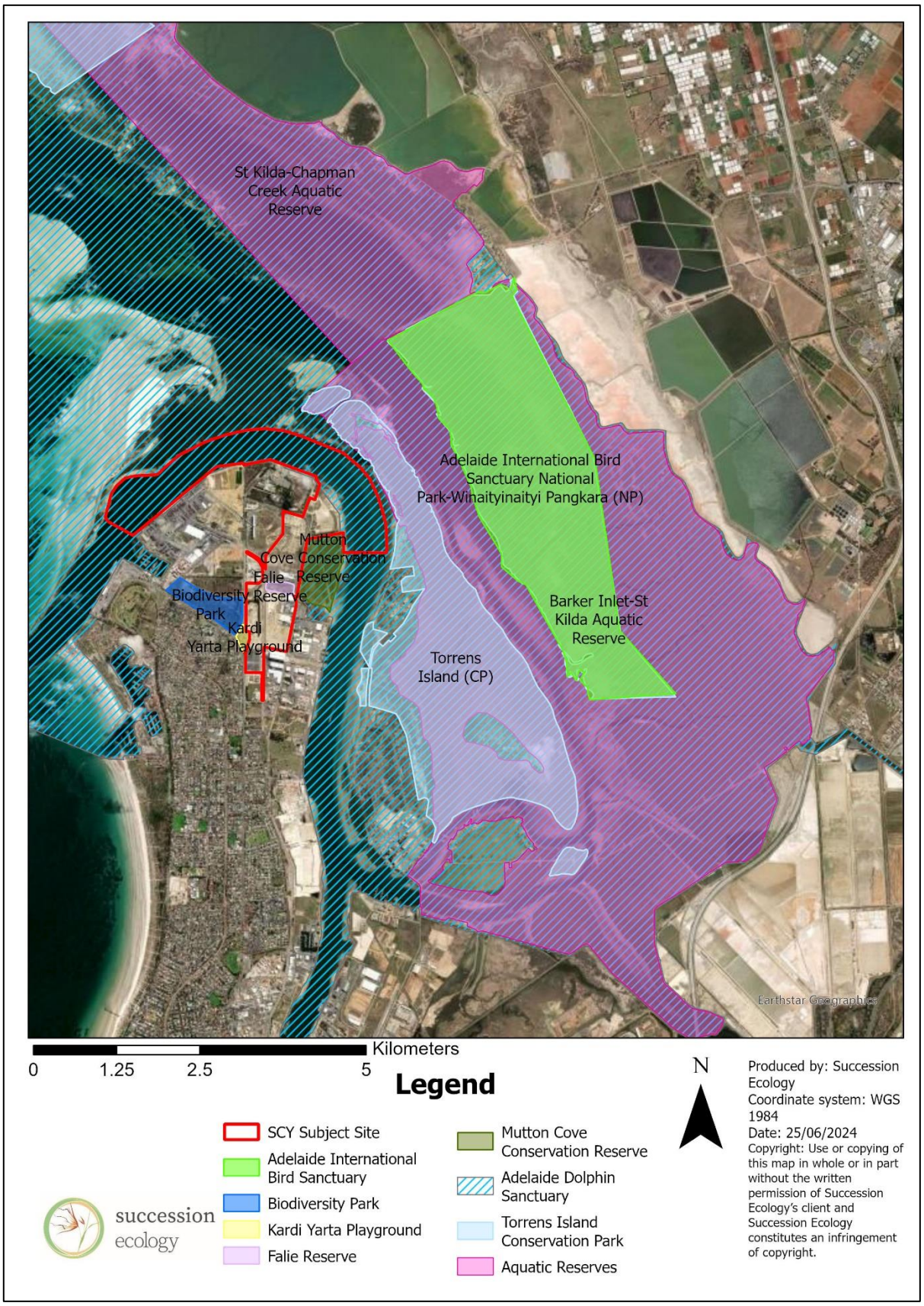

Figure 10. Map of Protected areas and Council Reserves within and adjacent to the subject site (outlined in red).

Figure 11: Wetlands of National Importance within and adjacent to the subject site (outlined in red). Source: NatureMaps 2024.

8.1.1 Protected Areas Regulatory Framework

State legislation that applies to the protected areas within the subject site include:

- *Adelaide Dolphin Sanctuary Act 2005 (SA; ADS Act)*
- *ADS Draft Management Plan 2024*
- *Crown Land Management Act 2009*
- *National Parks and Wildlife Act 1972 (NPW Act; South Australia)*
- *NPW Act Regulations 2019*
- *Native Vegetation Act 1991* (*NV Act*; South Australia); and
- *NV Regulations 2017*.

8.1.2 Impacts on Protected Areas

Assessment requirement: *Assess the impacts on public and private protected areas from the Development including management of interface issues (e.g. biosecurity, fire management, access) and any implications for Heritage Agreements.*

The subject site will directly and indirectly impact several protected areas and non-protected areas. Those that will be directly impacted includes the Adelaide Dolphin Sanctuary.

The remaining protected areas (listed below) risk of indirect impacts are low with the implementation of relevant management plans such as the CEMP and OEMP.

- Biodiversity Park
- Kardi Yarta Playground
- Mutton Cove Conservation Reserve
- Torrens Island Conservation Park
- Adelaide International Bird Sanctuary National Park - Winaityinaityi Pangkara
- Barker Inlet and St Kilda Wetland (Wetland of National Importance)
- Port Gawler & Buckland Park Lake (Wetland of National Importance)
- Barker Inlet – St Kilda Aquatic Reserve
- Barker Inlet Chapman Creek Aquatic Reserve; and
- St Kilda Mangroves.

There are no Heritage Agreements within or adjacent to the subject site. They are therefore not discussed further.

At the time of writing, no concept design for the Development was available. Therefore, the assessment of the impacts on public and private protected areas is based on full removal of terrestrial vegetation and partial removal of marine-based vegetation.

Adelaide Dolphin Sanctuary

The Adelaide Dolphin Sanctuary currently experiences several management issues, including:

- Vessel Strikes
- Disturbance and behaviour change and;
- Habitat impacts loss of seagrass, pollution and marine pests.

The Adelaide Dolphin Sanctuary occurs directly within the of the subject site and will be directly impacted by Development construction and operation. Detailed impacts and management for the ADS are assessed in section 7.3 of this report.

Kardi Yarta Playground and Biodiversity Park

The Development is expected to have a minimal environmental impact on Kardi Yarta Playground and Biodiversity Park. Both areas are located outside of the subject site and no vegetation removal will occur in them. Kardi Yarta Playground supports several *Adriana quadripartita* (Coastal Bitterbush) plants. This species is the host plant for *Theclinesthes albocincta* (Bitter Bush Butterfly) (Green Adelaide n.d.). No direct impacts will occur within Kardi Yarta Playground, however indirect impacts such as construction dust may settle on neighbouring vegetation. It is recommended that neighbouring vegetation, such as *Adriana quadripartita* in Kardi Yarta Playground, is monitored for dust impacts, this could be done shortly following dust-inducing construction activities. Other potential indirect impacts include introduction or spread of weed species, increased noise, and decreased amenity values.

Mutton Cove Conservation Reserve

Mutton Cove Conservation Reserve is directly adjacent to the subject site. Mutton Cove has been subject to extensive human impacts. However, it remains an important ecosystem, containing remnant vegetation and habitat which supports threatened species, such as resident and migratory shorebirds. No direct impacts are expected to occur to Mutton Cove Conservation Reserve.

Potential indirect impacts include:

- Introduction or spread of Declared Plants and weed species.
- Construction dust settling on vegetation.
- Potential spills and contamination entering Mutton Cove via waterways.
- Decreased water quality.
- Impacts to migratory shorebirds feeding, foraging and roosting time can occur from different disturbance sources (DCCEEW 2017):
    - Increased artificial light.
    - Increased noise via construction and operation activities. Particularly unpredictable disturbances such as sudden loud noises from construction and demolition activities or objects which approach them from the water (boats).
- Decreased amenity values.

The Development is unlikely to result in a significant impact to the availability or quality of habitat in a way that would cause threatened species to decline at Mutton Cove.

Torrens Island Conservation Park

Torrens Island Conservation Park (TICP) is directly adjacent to the marine-based portion subject site. TICP has been subject to human disturbance. However, it remains an important ecosystem, containing remnant vegetation and habitat which supports threatened species, such as resident and migratory shorebirds and a population of the *EPBC Act*, Vulnerable, Slender-billed thornbill – Gulf St Vincent. Additionally, Torrens Island is a recovery site for the threatened Sandhill Greenhood Orchid

(*Pterostylis arenicola*). A population has been introduced to the Island as part of the species recovery that is aimed at increasing the number of populations to reduce the extinction risk for the species. The subject site is completely outside of the TICP and therefore no direct impacts will occur to TICP and its physical environment.

Potential indirect impacts:

- Introduction or spread of Declared Plants and weed species.
- Minor construction dust settling on vegetation.
- Potential spills and contamination entering via waterways.
- Impacts to migratory shorebirds feeding, foraging and roosting time from different disturbance sources (DCCEEW 2017):
    - Increased artificial light.
    - Increased noise via construction and operation activities. Particularly unpredictable disturbances such as sudden loud noises from construction and demolition activities or objects which approach them from the water (boats).
- Decreased amenity values.

The Development is unlikely to result in a significant impact to the availability or quality of habitat in a way that would cause threatened species to decline at TICP.

Adelaide International Bird Sanctuary National Park - Winaityinaityi Pangkara

The risk of potential indirect impacts to the Adelaide International Bird Sanctuary NP is low, considering its distance from the subject site. Indirect impacts are limited to increased potential spills and contamination entering via waterways, artificial light and noise. However, it is not expected to be significant due to the distance of the Bird Sanctuary NP to subject site. Impacts to migratory shorebirds feeding, foraging and roosting time can result from different disturbance sources (DCCEEW 2017):

- Increased artificial light.
- Increased noise via construction and operation activities. Particularly unpredictable disturbances such as sudden loud noises from construction and demolition activities.

The Development is unlikely to result in a significant impact to the availability or quality of habitat in a way that would cause threatened species to decline at Adelaide International Bird Sanctuary NP.

St Kilda Mangroves, Barker Inlet and St Kilda Wetland, Port Gawler & Buckland Park Lake, Barker Inlet – St Kilda Chapman Creek Aquatic Reserve

Together, Barker Inlet and St Kilda Wetland, Barker Inlet – St Kilda Aquatic Reserve, the St Kilda Chapman Creek Aquatic Reserve, and the St Kilda Mangroves support important ecological functions. Their mangrove and seagrass communities provide nursery areas for several important commercial and recreational species including the Western King Prawn, King George Whiting, Yellow Fin Whiting, and Blue Swimmer Crab. These three ecosystems are connected to the Port River via a

series of waterways and wetlands. Potential indirect impacts include spills and contamination via waterways.

8.1.3 Protected Areas Management

The majority of impacts to protected areas are expected to be indirect impacts as a result from construction activities, increased artificial light and noise. However, direct impacts are expected to occur to the ADS and SEB 2009_3067. The Development will implement the required management measures in accordance with State and Commonwealth legislation. The Development will manage indirect impacts to protected areas through relevant management plans (CEMP, OEMP, Dredge Management Plan) and management subplans including the TFFRA.

Table 17: Protected Areas Management.

Impact pathway	Risk	Required Management Measures	Recommended Management Measures
Marine and terrestrial construction and operational activities. Vessel activity. Vegetation removal.	Impacts to protected areas environmental values and amenity values.	• For required management measures for the ADS refer to Table 15. • Refer to the Succession Ecology 2024 TFFRA for a discussion of required management measures for *NPW* Act reserves and threatened fauna.	For recommended management measures for protected areas refer to: • ADS and Mutton Cove refer to Table 15. • Adelaide International Bird Sanctuary and Mutton Cove, Succession Ecology 2024 TFFRA, Table 14. • The CEMP and/or OEMP will outline general construction and operational management actions for issues such as contamination and spills, noise, dust and weeds.

8.2 Wetlands and Groundwater-dependent Ecosystems

Assessment requirements addressed:

- *Identify and characterise any wetlands or groundwater dependent ecosystems that may be affected by altering surface water or the hydrogeological environment.*

The subject site only overlays one wetland, Barker Inlet and St Kilda Wetland (Wetland of National Importance). However, the subject site interacts directly and indirectly with multiple ecosystems that contain water bodies, including wetlands, gulfs and human-made drainage lines that drain into the Port River and ADS (See Figures 15 and 16):

- Mutton Cove Conservation Reserve (adjacent to the east)
- Torrens Island Conservation Park (CP) (adjacent to the east and north)
- Adelaide International Bird Sanctuary National Park - Winaityinaityi Pangkara
- Port Gawler & Buckland Park Lake (Wetland of National Importance) (~650 m northeast)
- Barker Inlet – St Kilda Aquatic Reserve (adjacent to the east)
- Barker Inlet Chapman Creek Aquatic Reserve (~650 m northeast); and
- St Kilda Mangroves (3 km northeast).

8.2.1 Wetlands and Groundwater-dependent Ecosystems Regulatory Framework

Legislation and guidelines directly related to the management of water quality includes:

- *Adelaide Dolphin Sanctuary Act 2005 (SA; ADS Act)*
- *ADS Draft Management Plan 2024*
- *Environment Protection (Water Quality) Policy 2015*
- *Environment Protection Act 1993*
- *Landscape South Australia Act 2019*
- *Planning, Development and Infrastructure (General) Regulations 2017* (*PDI Regulations*)
- *Planning, Development and Infrastructure Act 2016* (*PDI;* South Australia); and
- *South Australian Planning and Design Code.*

8.2.2 Wetlands and Groundwater-dependent Ecosystems Impacts

The Development will increase the extent of impervious surfaces and include a range of industrial activities, which together are expected to increase stormwater runoff entering the Port River and connected systems. Common pollutants found in stormwater runoff in industrial areas include suspended sediments, litters, heavy metals, hydrocarbons (oils and grease). These common pollutants have the potential to impact the receiving environment and can result in increased sediment load, turbidity, toxicity, contamination and higher nutrient loads. Acid sulphate soils and potential acid sulphate soils have not been encountered in the subject site to date. Should acid sulphate soils be identified through further investigation, or unexpectedly encountered during construction works (field indicators to be included in the CEMP), an Acid Sulphate Soil Management Plan (ASSMP) will be prepared for areas where soil disturbance cannot be avoided.

8.2.3 Wetlands and Groundwater-dependent Ecosystems Management

Managing stormwater and pollution will be critical to ensuring the neighbouring water bodies and ecosystems are not negatively impacted by the Development. A brief summary of water quality management measures is outlined in Table 18. The CEMP and OEMP will outline spills and contamination management for waterways, water and water quality.

Table 18: Wetlands and Groundwater-dependent Ecosystems Management.

Impact pathway	Risk	Required Management Measures	Recommended Management Measures
Marine and terrestrial construction and operational activities. On-going industrial activities. The Development's design.	Water pollution, diminish water quality, increased impervious surfaces.	Stormwater will be treated prior to entering the Port River.	A brief summary of the stormwater management measures include: • Maintaining no stormwater discharge into Mutton Cove Conservation Reserve via utilising proposed drainage networks to direct all stormwater around Mutton Cove Conservation Reserve. • Implementation of stormwater harvesting from roofs • Installation of independent oil / water separators downstream of high-risk spills areas such as car parks. • Installation of erosion and sedimentation controls, such as preserving existing vegetation, re-vegetation, sediment capture traps, on-site sedimentation basins/ponds and designated areas for stockpiling excavated material. • Periodic monitoring of stormwater quality discharge off-site during the pre-construction, construction and operation stages.

8.3 Native Vegetation Council Data Report

Assessment requirements addressed:

- For locations to which the *Native Vegetation Act 1991* applies, *prepare 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), including seagrass in the tidal or subtidal marine environment, detail compliance with the impact mitigation hierarchy and describe how the significant environmental benefit would be achieved.*

The land-based portion of the subject site is exempt from the *NV Act* in accordance Part 1-Preliminary 4 (2b), as it does not fall within the *NV Act* boundaries. Only the marine-based portion of the subject site therefore falls within the jurisdiction of the Native Vegetation Council.

ANI commits to prepare a NVC Data Report prior to clearance of native vegetation in the areas within the jurisdiction of the *NV Act*.

8.4 Fire and Native Vegetation

Assessment requirements addressed:

- *Detail potential impacts of fire on native vegetation, and the effects of fire risk management processes during construction, operation and maintenance.*

The vegetation within the land-based portion of the subject site contains degraded chenopod shrubland, degraded samphire shrubland and planted *Melaleuca lanceolata* shrubland. The ecological value of the areas of chenopod and samphire shrubland are have been degraded by the incursion of Declared Plants and past human activities.

8.4.1 Fire and Native Vegetation Regulatory Framework

A review of the South Australian Property and Planning Atlas (SAPPA) indicates the subject site does not occur within a bushfire overlay. Nor does the terrestrial portion of the subject site occur within the *NV Act* boundaries. Vegetation within the subject site poses a low fire risk, as the vegetation is either limited in the terrestrial landscape or is contained within the Port River. The extent of terrestrial vegetation will be further reduced during construction. Management of fire, in the context of the Development, is more relevant to the design and engineering of the infrastructure.

8.4.2 Fire and Native Vegetation Impacts

Chenopod and samphire shrublands generally have a high salt content and relatively succulent leaves. These characteristics makes them less flammable than other vegetation. Fire can be detrimental to many species in chenopod and samphire shrublands because the regeneration of chenopod shrubs generally occurs only by seed (Department of Primary Industries and Regional Development n.d.). Fires in these vegetation types would reduce foliar cover and increase the risk of soil erosion (Department of Primary Industries and Regional Development n.d.).

Mutton Cove Conservation Park abuts the subject site to the east. The area directly east of the subject site in Mutton Cove supports chenopod low closed shrubland dominated by *Tecticornia halocnemoides* and *Tecticornia arbuscula* (Cook & Coleman 2003). This type of vegetation has low flammability and is fire sensitive.

8.4.3 Fire and Native Vegetation Management

Fire should be avoided in areas of native vegetation within the subject site and prevented from spreading into adjacent vegetation, including in Mutton Cove Conservation Park, Kardi Yarta Park and Biodiversity Park.

Potential management measures include:

- Installation of appropriate fire systems and management
- Combustible liquids stored in accordance with Australian Standards and relevant legislation; and
- Placement of combustible liquid away from areas of vegetation.

9 SUMMARY OF MANAGEMENT PLANS

Capturing all environmental risks and their associated mitigations is critical for the construction and operation of the Development. Environmental risk management assists to identify hazards, and determine the likelihood and consequence of those hazards, thereby estimating the risk they pose, establish mitigation measures, determine the residual risk, and provide corrective actions. It is important to identify risks prior to construction so that appropriate mitigation measures can be implemented during the construction and operational phases to reduce risks to acceptable levels. The Development will implement a consistent approach to managing environmental risks via the implementation of management plans.

The Development will implement the mandatory management measures required under legislation and associated guidelines. These mandatory management measures will be detailed in relevant environmental management plans. The relationships among the relevant management plans and management subplans are diagrammed in Figure 12.

The recommended management measures, in contrast, are derived from subordinate legislative instruments (e.g. guidelines) or developed by experts to achieve compliance against the relevant Acts and Regulations. These management measures are optional and not enforced under South Australian or Commonwealth law. However, they are strongly recommended to assist in achieving compliance under South Australian and Commonwealth legislation. Many of these management measures are best-practice environmental management and are standard for development and construction projects. It is recommended that the recommended management measures are tailored into relevant environmental management plans and/or management subplans.

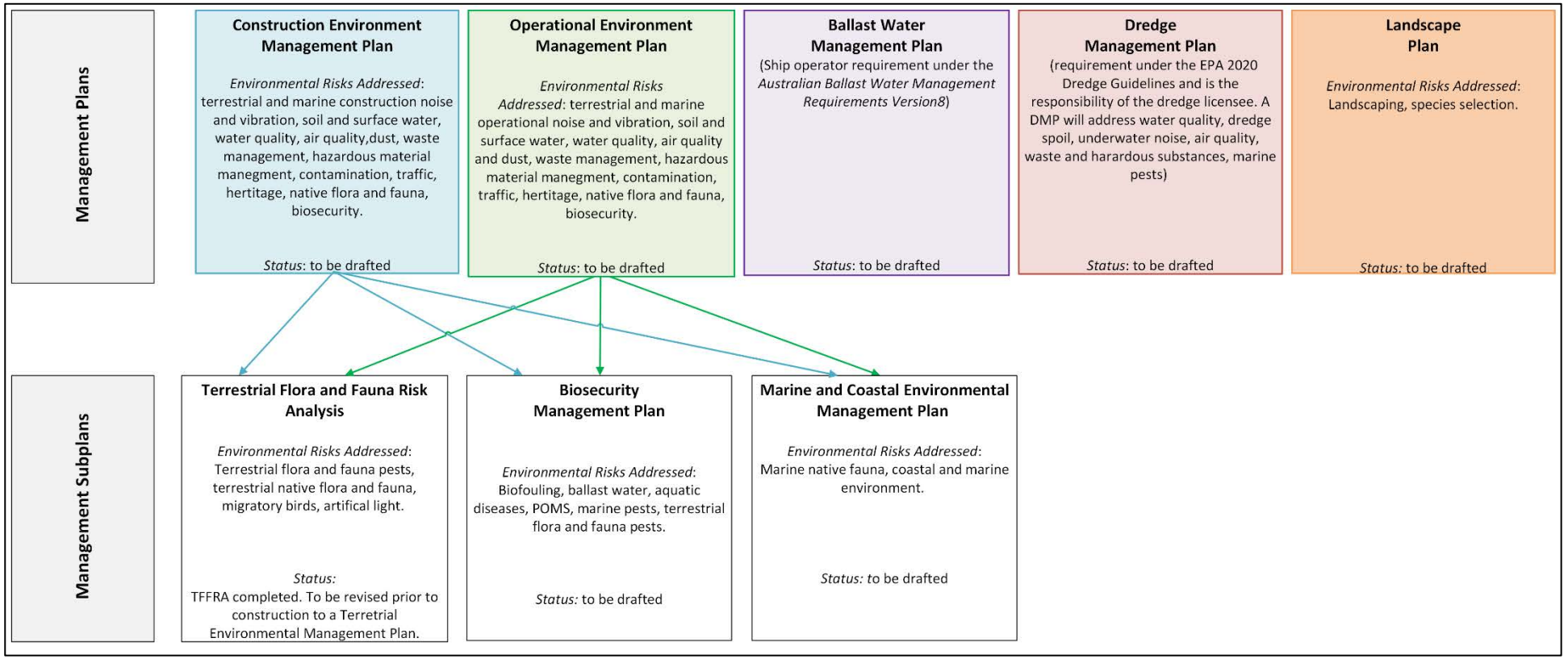

Figure 12: The Development's proposed Management Plans and their relationships to the Management subplans. The three subplans will be subordinate to both the Construction Environment Management Plan and the Operation Environment Management Plan.

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11 GLOSSARY

Table 19: Glossary

Term	Definition
Behavioural responses	Behavioural responses may cause displacement from preferred habitats, which could affect feeding, growth, predation, survival, and reproductive success (if a mammal is displaced from preferred habitat)
Benthic	Relating to the bottom of a body of water (e.g. sea or lake) or the organisms that live there.
Fish swim bladders	All fishes have ears to detect sound and convey sensitivity to gravity and to linear and angular acceleration. The adaptations that provide fish with additional sensitivity to sound pressure are gas-filled structures near the ear and/or extensions of the swim bladder that functionally affect the ear. The enclosed gas changes volume in response to fluctuating sound pressure, generating particle motion. In fishes where the swim bladder is near the ear (or connected to it mechanically as in the *Otophysi)*, the particle motion radiated from the bladder is sufficiently large to cause the sensory epithelium to move relative to the otolith. Fishes with these adaptations generally have lower sound pressure thresholds and wider frequency ranges of hearing than do the purely particle motion-sensitive species
Hearing threshold	The hearing threshold represents the lowest signal level an animal can detect at a particular frequency, usually referred (and measured) as the threshold at which an animal will indicate detection 50% of the time
Impulsive sound	Transient sound that has extremely short duration and a high peak sound pressure level
Land-based of the subject site	The SCY land-based portion of the subject site is located on the north-eastern side of the Lefevre Peninsula in Port Adelaide, South Australia.
Marine-based portion of the subject site.	The SCY marine based portion of the subject site is located on the within the Port River of the Lefevre Peninsula in Port Adelaide, South Australia. This includes any reference to the Northern Dredging Area (NDA).
Masking	The presence of man-made sounds may make it difficult to detect biologically significant sounds against the noise background. Masking of sounds from predators may result in reduced survival. Masking of sounds used for orientation and navigation may affect the ability to find preferred habitats and in the case of fish, spawning areas, affecting recruitment, growth, survival, and reproduction
Microalgae	Macroalgae (macroscopic algae, filamentous or thalloid) are the major flora of the littoral zones of many lakes, streams, and shallow estuarine and marine waters (Benavides, J & Castro, C 2023).
Motorised vessel	As stipulated by the *National Parks and Wildlife (Protected Animals—Marine Mammals) Regulations 2010,* a motorised vessel means a vessel that has a motor or engine as its principal source, or 1 of its principal sources, of motive power.
Non-impulsive sound	Continuous sounds occur without pauses and examples include shipping noise and dredging
Perfluorooctane sulfonic acid (PFOs)	PFOs are a type of Per- and poly fluorinated alkyl substances (PFASs). PFASs and their derivatives are man-made chemicals and have been used in a wide range of industrial

	processes and consumer products, including in aqueous film forming foams (AFFF) for firefighting, in chromium plating (in plastic etching and as a mist suppressant to protect workers from toxic hexavalent chromium fumes) in medical imaging (e.g. x-ray films), in various fabric and cooking applications and potentially in aviation hydraulic fluid (DCCEEW 2016).
Polychlorinated Biphenyls (PCBs)	PCBs are mixtures of various isomers based on biphenyl. PCBs are amongst a broader group of harmful persistent organic pollutants (POPs) that are toxic, persist in the environment and animals, bioaccumulate through the food chain and pose a risk of causing adverse effects to human health and the environment. (DCCEEW n.d.)
Permanent Threshold Shift	Permanent threshold shift (PTS) is a permanent reduction in hearing sensitivity caused by irreversible damage to the sensory hair cells of the ear.
Prescribed vessel	As stipulated by the *National Parks and Wildlife (Protected Animals—Marine Mammals) Regulations 2010*, prescribed vessel means any of the following vessels: (a) a personal watercraft; (b) a vessel used to engage in water skiing; (c) a vessel used to engage in parasailing; (d) a hovercraft; (e) a hydrofoil; (f) a wing-in-ground effect craft.
Prey species	Prey species are animals which are hunted, killed and eaten by other animals, which are called predators.
Subject Site	The SCY subject site is located on the north-eastern side of the Lefevre Peninsula in Port Adelaide, South Australia.
The Development	The Nuclear-Powered Submarine Construction Yard.
Temporary Threshold Shift	Temporary threshold shift (TTS) is a temporary reduction in hearing sensitivity as a result of exposure to sound. Exposure to high levels of sound over relatively short time periods can cause the same amount of TTS as exposure to lower levels of sound over longer time periods. The duration of TTS varies depending on the nature of the stimulus.
Vessel	As stipulated by the *National Parks and Wildlife (Protected Animals—Marine Mammals) Regulations 2010*, a vessel means a boat or other craft, or a device, that is designed— (a) to be operated or used on or in water; and (b) to be navigated or manoeuvred by a person who has control over its speed and direction of movement.

APPENDIX A – NOISE AND VIBRATION PRELIMINARY SAFETY ZONES

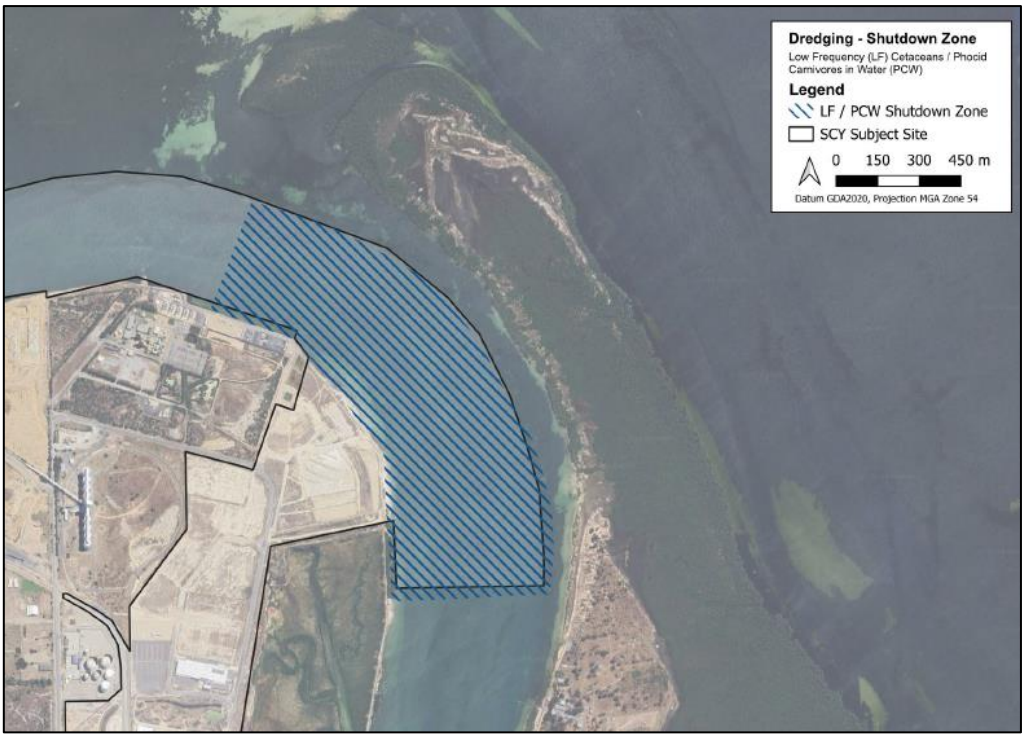

Figure 13: Shut-down zone for low frequency cetaceans and phocid pinnipeds (in water) from dredging activities.

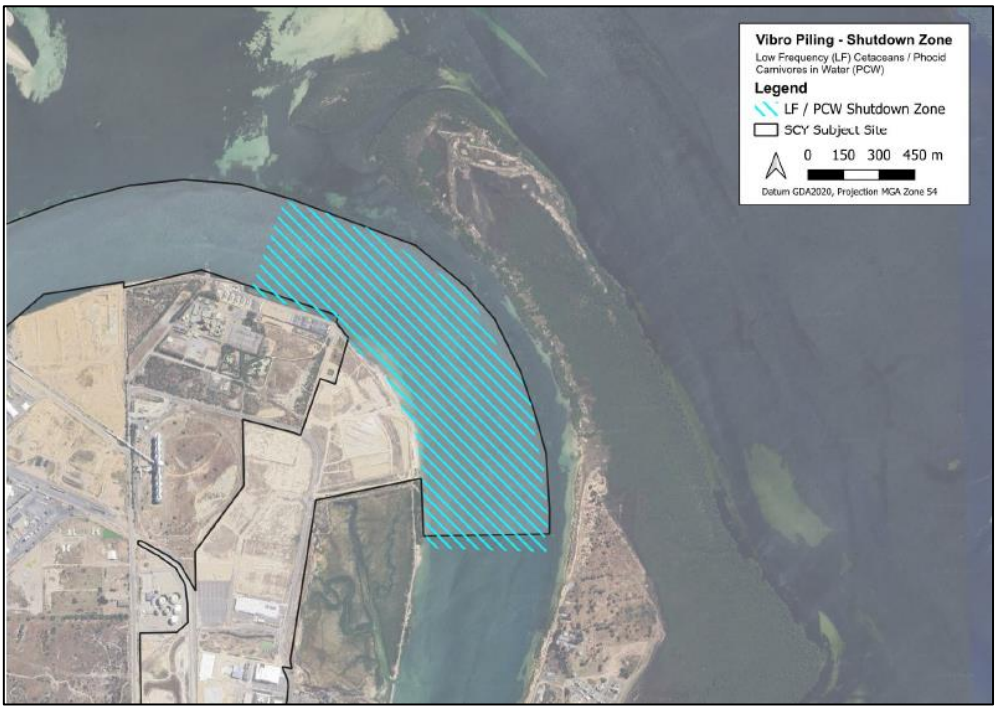

Figure 14: Shut-down zone for low frequency cetaceans and phocid pinnipeds (in water) from vibro-driven piling activities.

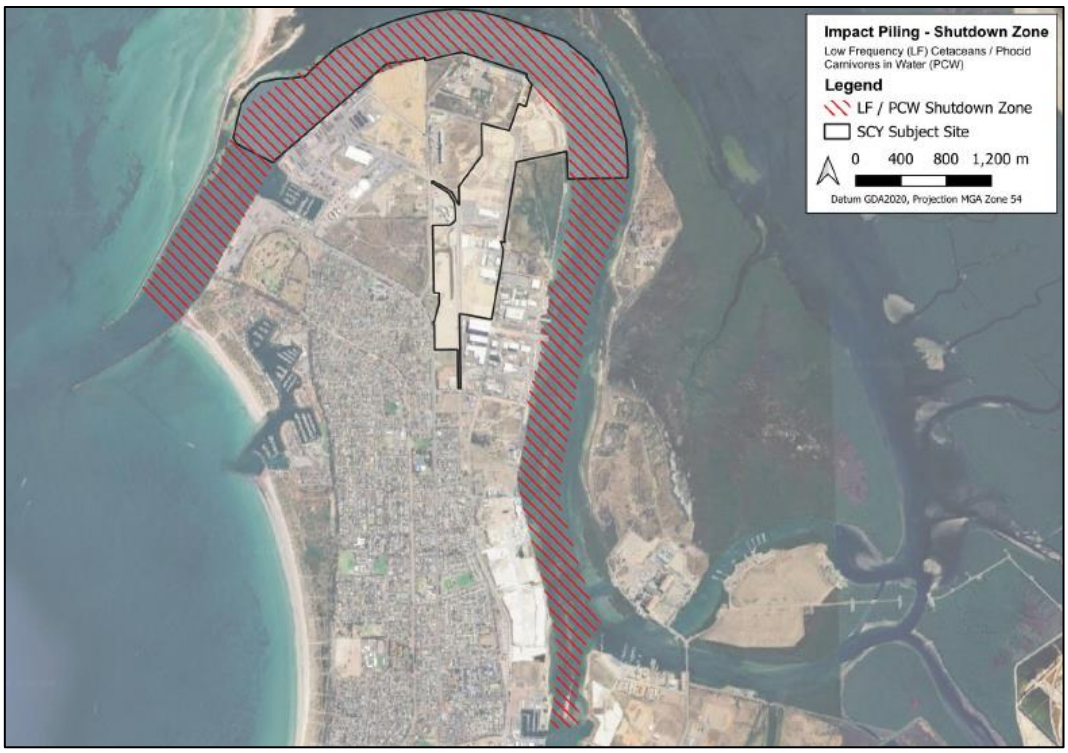

Figure 15: Shut-down zone for low frequency cetaceans and phocid pinnipeds (in water) from impact-driven piling activities.

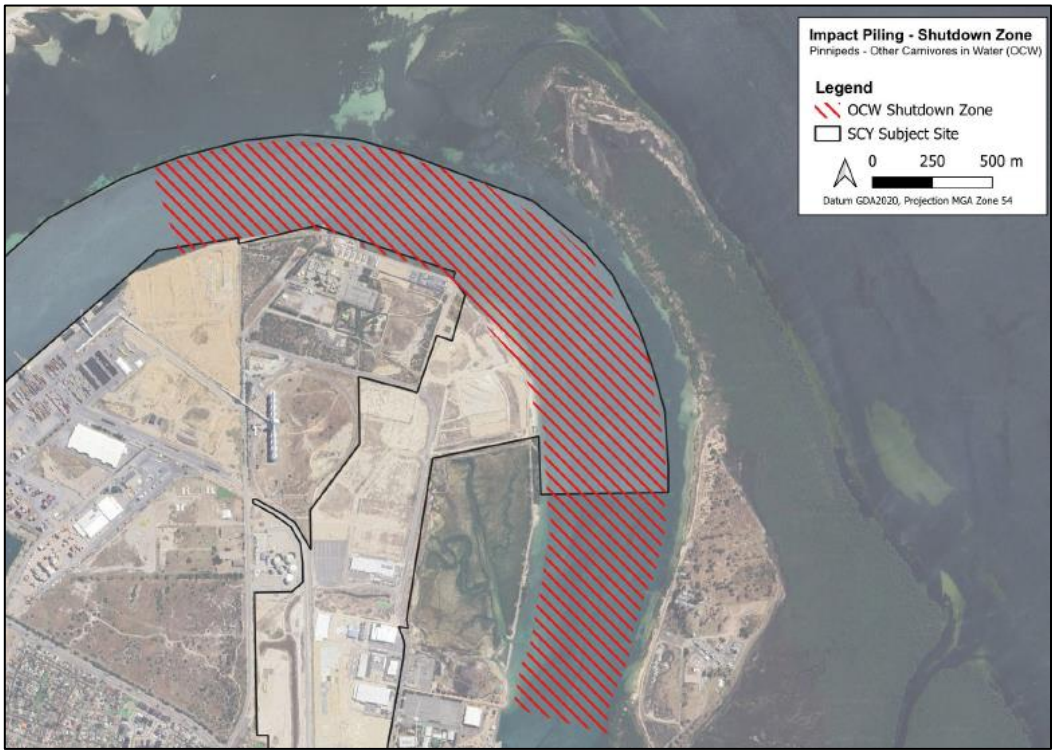

Figure 16: Shut-down zone for pinnipeds – other carnivores (in water) from impact-driven piling activities.

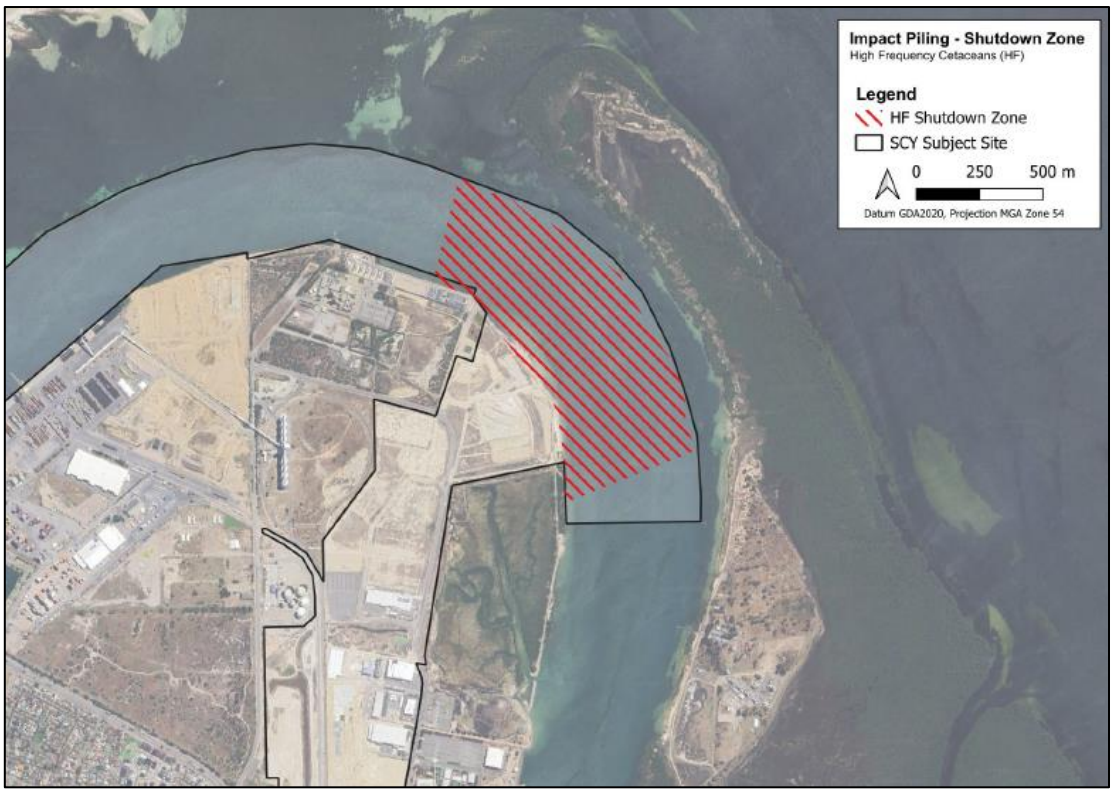

Figure 17: Shut-down zone for high frequency cetaceans from impact-driven piling activities.

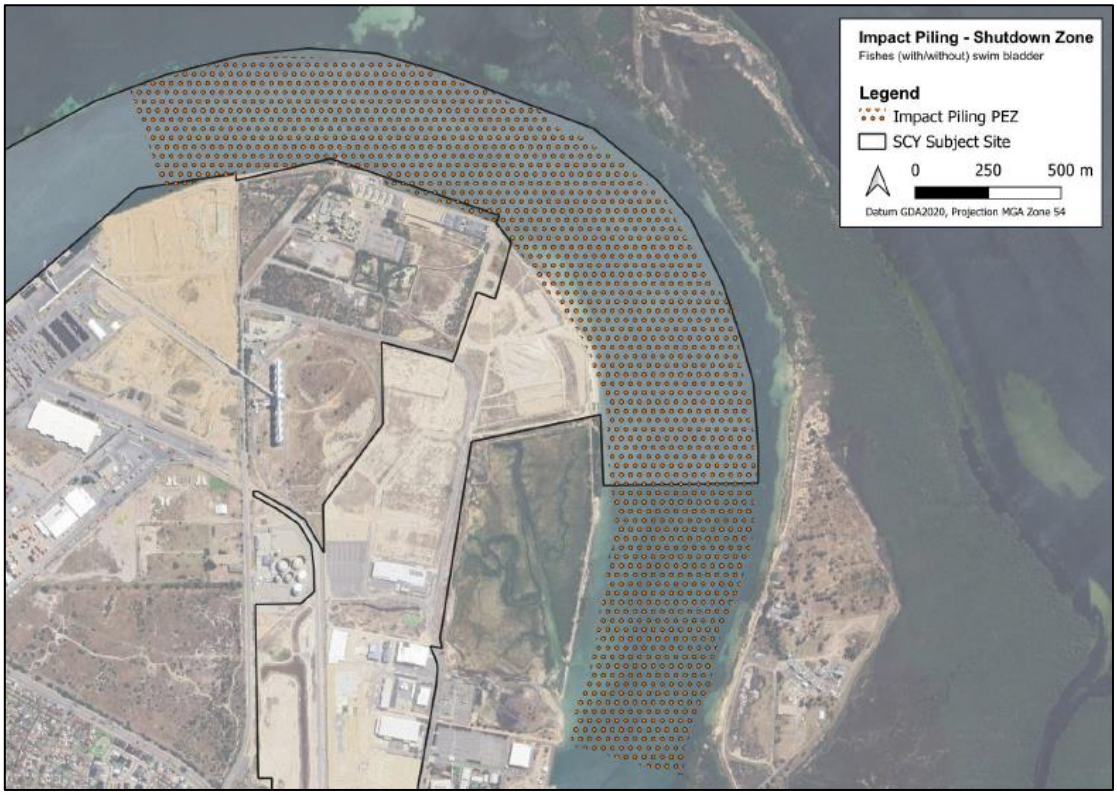

Figure 18: Potential effects zone for fishes (with/without swim bladders) from impact-driven piling activities.

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