360 environmental

Cottesloe Pier

Preliminary Environmental Impact Assessment

Prepared for:

Cottesloe Pier Pty Ltd

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people • planet • professional

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Executive Summary

Cottesloe Pier Pty Ltd proposes to construct a pier as an extension to the existing Cottesloe groyne. The key objectives of the project are to provide a group of related structures that will enhance the public domain of the Cottesloe beachfront and provide amenity for current and future generations.

360 Environmental Pty Ltd (360 Environmental) was commissioned to undertake a Preliminary Environmental Impact Assessment (PEIA) for the proposed Cottesloe Pier Project (the Project).

The Project consists of an underwater observatory and café with promenade area and associated public facilities, including a swimming area and fishing jetty. Potential environmental impacts are assessed against the Environmental Protection Authority (EPA) objectives to ensure they can be met (refer Table A for summary). The environmental factors that require consideration are:

- Benthic Communities and Habitat
- Coastal Processes
- Marine Environmental Quality
- Marine Fauna
- Flora and Vegetation
- Terrestrial Environmental Quality
- Heritage.

Table A: Summary of Relevant Factors, Objectives and Management

Theme	Environmental Factor	Environmental Objective	Potential Impact	Proposed Management	Likely Significance of Impact
Sea	Benthic Communities and Habitat	To maintain the structure, function, diversity, distribution and viability of benthic communities and habitats at local and regional scales.	Potential indirect impact from reduced water clarity.	Water quality monitoring during seabed disturbing construction activities.	Meets EPA's Objectives with applied management measures
	Coastal Processes	To maintain the morphology of the subtidal, intertidal and supratidal zones and the local geophysical processes that shape them.	Potential to impact longshore sediment transport.	Minimise seabed footprint and hard features (majority of structure on piles so flow is not inhibited). No further management required.	Meets EPA's Objectives

	Marine Environmental Quality	To maintain the quality of water, sediment and biota so that the environmental values, both ecological and social, are protected.	Potential to impact water quality by:
			• pile driving and other construction activities
			• waste/discharge from:
			  ○ construction activities
			  ○ operations
			  ○ public use
				Management measures to be implemented include:
				• sediment contamination investigation
				• water quality monitoring
				• construction site briefings
				• no refuelling onsite
				• spill procedures
				• waste management.
					Meets EPA's Objectives with applied management measures

	Marine Fauna	To maintain the diversity, geographic distribution and viability of fauna at the species and population levels.	Potential impact by: • pile driving (underwater noise) • construction activities in the nearshore environment.	Management measures during piling will include: • safety zones • a Marine Mammal Observer (MMO) • pre-start survey • soft start procedure.	Meets EPA's Objectives with applied management measures

Theme	Environmental Factor	Environmental Objective	Potential Impact	Proposed Management	Likely Significance of Impact
Land	Flora and Vegetation	To maintain representation, diversity, viability and ecological function at the species, population and community level.	Clearing resulting in: • potential loss of conservation significant flora species (if present onsite) • partial loss of conservation significant vegetation types • spread of weeds and pathogens.	Management measures during site clearing and construction include: • minimise footprint • site induction • clearly identify exclusion zones • retain areas of vegetation where possible • maximise the use of local native vegetation species in landscaping and revegetation areas.	Meets EPA's Objectives with applied management measures
	Landforms	To maintain the variety, integrity, ecological functions and environmental values of landforms.	The project is not expected to impact landforms.	No management required.	Meets EPA's Objectives
	Subterranean Fauna	To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.	The project is not expected to impact subterranean fauna.	No management required.	Meets EPA's Objectives
	Terrestrial Environmental Quality	To maintain the quality of land and soils so that the environment values, both ecological and social, are protected.	Potential to impact soils by waste/discharge from: • construction activities • operations of cafes and restaurants • public use once opened	Management measures include: • site inductions • no refuelling onsite • spill procedures • waste management.	Meets EPA's Objectives with applied management measures
	Terrestrial Fauna	To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.	Considering the highly disturbed nature of the terrestrial environment, the proposal is not expected to impact on terrestrial fauna.	No management required.	Meets EPA's Objectives

Theme	Environmental Factor	Environmental Objective	Potential Impact	Proposed Management	Likely Significance of Impact
Water	Hydrological Processes	To maintain the hydrological regimes of groundwater and surface water so that existing and potential uses, including ecosystem maintenance, are protected.	Considering the nature of the structure proposed, it is not expected to impact hydrological regimes of groundwater or surface water.	No management required.	Meets EPA's Objectives
	Inland Water Environmental Quality	To maintain the quality of groundwater and surface water, sediment and biota so that the environmental values, both ecological and social, are protected.	The proposal is not expected to impact inland environmental quality. Marine water quality is discussed in the appropriate section.	No management required.	Meets EPA's Objectives
Air	Air Quality and Atmospheric Gases	To maintain air quality for the protection of the environment and human health and amenity, and to minimise the emission of greenhouse and other atmospheric gases through the application of best practice.	The proposal is not expected to impact air quality.	No management required.	Meets EPA's Objectives
People	Amenity	To ensure that impacts to amenity are reduced as low as reasonably practicable.	Reduced visual amenity and recreational activities during construction. The project will enhance the visitor experience in the region.	Manage impacts to visual amenity and recreation by: • 3D imagery for stakeholder and community engagement • fencing to block construction site • informative signs to notify public • constructing timing (March-December)	Meets EPA's Objectives

THEME	ENVIRONMENTAL FACTOR	ENVIRONMENTAL OBJECTIVE	POTENTIAL IMPACT	PROPOSED MANAGEMENT	LIKELY SIGNIFICANCE OF IMPACT
	Heritage	To ensure that historical and cultural associations, and natural heritage, are not adversely affected.	Potential to disturb artefacts within a registered site under the *Aboriginal Heritage Act 1972*.	Management measures will include: • liaison with Aboriginal communities and native title claimants • Section 18, if required • Ground disturbing works monitored for skeletal or archaeological material • Site briefing on unexpected finds procedures.	Meets EPA's Objectives with applied management measures
	Human Health	To ensure that human health is not adversely affected.	The proposal is not expected to impact human health.	No management required.	Meets EPA's Objectives

Further detail on the relevant key factors is provided in Section 5.

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Acronyms

ACMC	Aboriginal Cultural Material Committee
AHA	*Aboriginal Heritage Act 1979*
AHD	Australian Height Datum
AHIS	Aboriginal Heritage Inquiry System
ASS	Acid Sulfate Soils
BPPH	Benthic Primary Producer Habitat
CEMP	Construction Environmental Management Plan
DPaW	Department of Parks and Wildlife
DRF	Declared Rare Flora
EAG	Environmental Assessment Guideline
EPA	Environmental Protection Authority
EP Act	*Environmental Protection Act 1986*
EPBC	Environment Protection and Biodiversity Conservation
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EV	Environmental Value
EQO	Environmental Quality Objective
FHPA	Fish Habitat Protection Area
MMO	Marine Mammal Observer
PEC	Priority Ecological Community
PEIA	Preliminary Environmental Impact Assessment
PMST	Protected Matters Search Tool
TEC	Threatened Ecological Community
WC Act	*Wildlife Conservation Act 1950*

1 Introduction

1.1 Proponent Information

Cottesloe Pier Pty Ltd (CPPL) is the proponent for the Cottesloe Pier Project.

The project concept was conceived in 1997 by a group of specialist architects at Lawrence J Scanlan & Associates Pty Ltd, led by Lawrence Scanlan, who was involved in the design of the refurbishment of Indiana Tea Rooms (now Indiana). From 1997-2012 the concept was developed and further progressed with the formation of CPPL in 2013. The company consists of a group of local like-minded business individuals who came together with a common objective to deliver a beneficial project for local visitors, tourism and local businesses.

1.2 Background

360 Environmental Pty Ltd (360 Environmental) was commissioned to undertake a Preliminary Environmental Impact Assessment (PEIA) and assist in obtaining the necessary environmental approvals for the proposed Cottesloe Pier Project. The PEIA assesses the potential environmental impacts of the proposed project, and offers management and mitigation measures to minimise impacts to ensure the Environmental Protection Authority's (EPA's) objectives can be met.

1.3 Project Objective

The objectives of the project are to enhance the public domain of the Cottesloe beachfront and provide an amenity for current and future generations. Tourism Western Australia (WA) recently identified redevelopment in the Cottesloe area as one of WA's top tourism priorities and this was re-iterated during the consultation process (refer Section 6).

1.4 Legal Framework

1.4.1 Key Legislation

Key pieces of legislation and guidance material relevant to the project includes:

- *Environmental Protection Act 1986* (EP Act)
- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- *Aboriginal Heritage Act 1972* (AHA)
- *Contaminated Sites Act 2003*
- *Environmental Protection (Noise) Regulations 1997*
- *Wildlife Conservation Act 1950* (WC Act)

- *Fish Resources Management Act 1994*
- *Fish Resources Management Regulations 1995*
- *State Planning Policy No. 2.6: State Coastal Planning Policy 2013*
- EPA guidelines and procedures, specifically the following Environmental Assessment Guidelines (EAGs):
    - EAG 1 Defining the Key Characteristics of a Proposal (EPA 2012)
    - EAG 3 Protection of Benthic Primary Producer Habitats In Western Australia's Marine Environment (EPA 2009)
    - EAG 8 Environmental principles, factors and objectives (EPA 2015a)
    - EAG 9 Application of a significance framework in the EIA process (EPA 2015b)
    - EAG 15 Protecting the Quality of Western Australia's Marine Environment (EPA 2015c)

1.5 Principles of Environmental Protection

The following sections outline the details of the Project considering the principles set out in section 4A of the EP Act and described in EAG 8 (EPA 2015a).

1.5.1 The Precautionary Principle

CPPL designed the project to ensure:

- Care is taken to avoid serious or irreversible damage to the environment
- The project footprint has been designed to pose the lowest risk to the environment, by avoiding areas of high environmental significance
- Protection and enhancement of the environmental values
- Minimal impact on the natural environment
- Conservation of natural resources and minimisation of energy consumption and waste.

1.5.2 The Principle of Inter-generational Equity

CPPL will ensure the health, diversity and productivity of the environment is maintained whilst providing a benefit for future generations through improved recreational amenity and increased environmental awareness.

1.5.3 The Principle of the Conservation of Biological Diversity and Ecological Integrity

The project design has considered biological diversity and ecological integrity, and has avoided areas of high biological and ecological significance. The project will be

undertaken in areas that have been subject to historic clearing and CPPL is committed to minimising the impact on the natural environment.

1.5.4 Principles relating to improved valuation, pricing and incentive mechanisms

CPPL has considered all environmental factors in the valuation of assets and services during design of the project. The project has been designed to achieve the environmental goals utilising the most cost effective methods with a view to managing the full life cycle of providing goods and services. The project will provide employment during construction and once complete and open to the public.

1.5.5 The Principle of Waste Minimisation

Waste will be minimised wherever possible throughout the construction phase of the project. CPPL is committed to conserving natural resources and minimising energy consumption and waste.

1.6 Marine Environmental Quality

The Environmental Protection Authority (EPA) has developed an environmental quality management framework (EQMF) to protect and maintain the quality of the State's marine environment, which is based on the principles and guidelines of the National Water Quality Management Strategy (NWQMS). In the WA marine environment there are five recognised environmental values (EVs), each with their own Environmental Quality Objective (EQO):

Ecosystem Health

- EQO: maintain ecosystem integrity at a high level of ecological protection

Fishing and Aquaculture

- EQO: seafood (caught or grown) is of a quality safe for eating
- EQO: water quality is suitable for aquaculture purposes

Recreation and Aesthetics

- EQO: water quality is safe for primary contact recreation (e.g. swimming and diving)
- EQO: water quality is safe for secondary contact recreation (e.g. boating and fishing)
- EQO: aesthetic values of the marine environment are protected

Industrial Water Supply

- EQO: water quality is suitable for industrial use

Cultural and Spiritual

- EQO: cultural and spiritual values are protected

(EPA 2015c)

1.7 Alternatives Considered

1.7.1 Requirement

The Town of Cottesloe has identified a need to update its existing infrastructure and further develop new opportunities for tourism along the beach and waterfront. The council appreciates the need to enhance existing public amenities and develop new facilities to service current and future generations who visit the area.

1.7.2 Goal

The intention of the project is to enhance the public domain of the Cottesloe beach front, providing heightened visitor experience for generations to come. The project is considered to achieve several goals within the Cottesloe area.

1.7.3 Location

The location was selected due to the existing groyne access and consideration for environmental impacts, including minimal vegetation clearing and avoiding benthic primary producer habitat.

1.7.4 Timing

The construction timing will suit environmental and social impacts, including scheduling construction activities to avoid significant whale migration periods and times of peak beach use (i.e. summer).

1.7.5 Implementation

The project is proposed to be constructed during autumn and winter to ensure it is ready for public use by the following summer.

2 Project Overview

2.1 Site Location

The proposed facility is located adjacent to Marine Parade in Cottesloe, along and extending beyond the existing rock groyne. The location of the site is shown in Figure 1.

2.2 Proposal Summary

The Project consists of an underwater observatory and café with promenade area and associated public facilities, including a swimming area and fishing jetty.

Figures A and B display the proposed site overview and finished elevations.

2.2.1 The Boardwalk

The connection between Marine Parade and the pavilions will be via the existing concrete walkway which is proposed to be upgraded to a boardwalk. The boardwalk will create a sense of arrival and aesthetic appeal, with additional facilities including public seating, drinking fountains and outdoor showers.

2.2.1 The Main Pavilions

The architectural design of the building will embody social values and aspirations, embracing the elements of the natural landscape. The pavilion will be relaxed and modern, encompassing dining options and other public amenities including a promenade deck and fishing platform.

2.2.1 Underwater Observatory

Located approximately 125 m from the shore and at least 25 m beyond the end of the existing groyne, the Underwater Observatory will descend over 6 m beneath the water's surface providing visitors the opportunity to view the seabed environment and marine life, which may include the *Phycodurus eques* (leafy sea dragon), other local fish, including Port Jackson and Wobbegong sharks, and crustaceans. Incorporated into the design is the installation of underwater lights to allow night time visitation and night scuba diving potential.

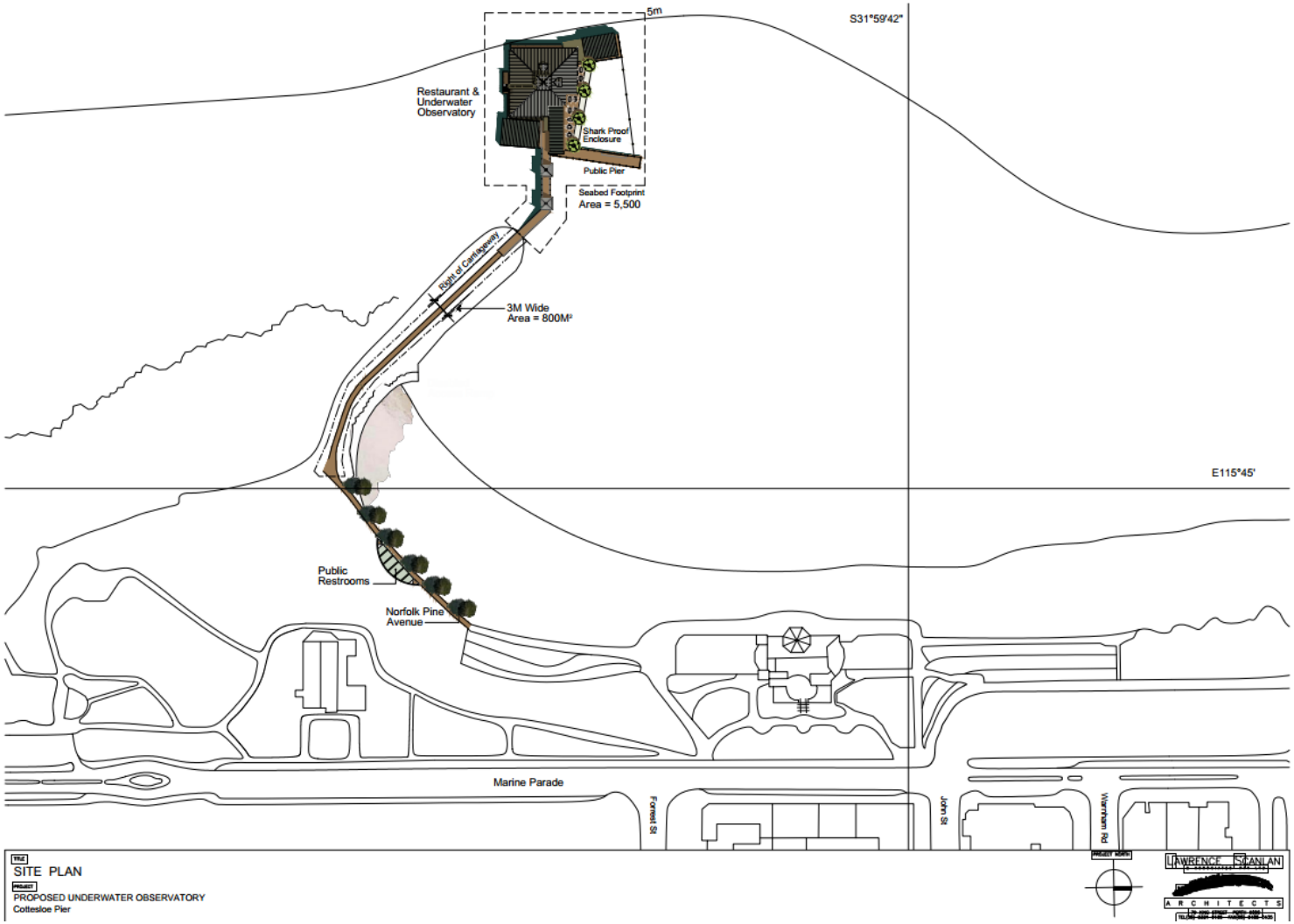


Figure A: Site Overview

Figure B: Finished Elevations

2.2.2 Swimming Area

The enclosure of the swimming area that is bounded by the piles of the main structure and the public pier would incorporate an environmentally safe swimming enclosure (eco barrier, or similar). This type of enclosure will be able to remain in place all year (through all weather conditions) due to the fixed structure it will be anchored to.

2.2.3 Learning Experience

The development will provide an ideal opportunity to showcase Cottesloe's rich history in various forms, including photographic and written archive material. In addition, through consultation with and participation from the local custodians it is planned that part of the interactive display of the history of Cottesloe Beach will include the telling of indigenous stories and their connection with the area.

2.2.1 Boutique Hotel Suite

Given the design and scale of the building it has been possible to introduce a luxury hotel suite with 270° views along the coast.

2.2.2 Public Ablution Facilities

The requirement for additional ablution facilities has been recognised by the Cottesloe Council. The proposal includes plans for change room and toilet facilities, which will be located part way along the boardwalk and set back into the escarpment with a view to minimise the loss of beach area.

2.3 Construction Methodology

The proposal will involve the construction of a reinforced concrete deck atop steel (concrete filled) pylons. Timber decking will be fixed above the concrete providing a marine boardwalk experience. A steel, lightweight structure will be erected above the deck clad in weatherboarding with extensive verandahs to ensure utilisation of the beach vista. A corrugated iron roof will complete the structure and incorporate a lookout tower, to be utilised by the Cottesloe Surf Life Saving Club.

The underwater observatory will sit at the westernmost extent of the structure. The seabed in this location is bare sand and the process will involve a clean granite bed laid directly on the seabed. A concrete caisson is then floated into position and settled onto the granite bed. Once in place, the holes are drilled into the seabed through the concrete caisson ring beam, thus eliminating any disturbance to the seabed.

The majority of the primary construction will be delivered and erected from an ocean barge.

2.4 Sustainability

The design and building construction methodology proposed will result in a high level of sustainability and aim for carbon neutrality where possible by considering:

- the incorporation of solar panels
- the use of high levels of insulation
- utilising high levels of cross ventilation
- utilising high levels of carbon capture embedded in the extensive use of timber products
- the use of recycled aggregate in the concrete
- the use of vacuum sewerage to reduce water usage
- the use of thermal differentials from the sea water to pre-cool fresh air inputs to the mechanical air-conditioning.

2.5 Key Characteristics

Table 1 outlines the key characteristics of the proposal.

Table 1: Key Characteristics of the Proposal

Key Characteristic	Project Detail
Total Area	Up to 6,500 m^2
Seabed lease area	Up to 5,500 m^2
Access easement (for services)	Up to 1,000 m^2
Pylons	Up to a maximum of 60 concrete filled steel pylons (up to 700 mm diameter*)
Deck	Precast concrete.
Structural Materials	Pre-fabricated galvanised structural steel and timber primary structure. Remainder will be lightweight, pre-fabricated timber sub-frames and timber tiling to reduce wet trades and onsite waste to a minimum. The majority of the structure will be recyclable at the end of its design life.
Design Life	100 years.
Construction Timing	36 weeks duration (March to December), as follows: March – pile driving/concrete deck (4-8 weeks) May – primary shell (20 weeks) November – fit out (8 weeks)
Sustainability	Design brief to target a six star green star equivalent performance.

Key Characteristic	Project Detail
Project Component	Underwater observatory, cafés, promenade, fishing deck, swimming area, and single hotel suite.

*Preliminary design indicates 600 mm diameter pyl6ons.

2.6 Zoning

The project is located partially within State Marine Waters and the Town of Cottesloe. The project area is currently zoned “Waterways” (Indian Ocean) and “Parks and Recreation” (onshore component) under the Metropolitan Region Scheme (Figure 2).

2.7 Current Land Use

The project area extends from nearshore to onshore. The site is currently used by the public for a variety of activities; nearshore for swimming and fishing, and onshore for social and recreation activities. A beach use study concluded that the peak time for all activities (including sunbathing, swimming, walking, boarding and kayaking) is January (Blackweir & Beckley 2004)

3 Marine Environmental Setting

3.1 Bathymetry

The nearshore bathymetry and onshore geomorphology of the site is dominated by Spearwood Ridge of Tamala Limestone, which forms the north–south trending shoreline. Holocene coastal sedimentation in this region has formed minor stable dunes and pocket beaches flanking the seaward side of the Spearwood Ridge (Searle & Semeniuk 1985).

The bathymetry of the Cottesloe shoreline adjacent the project area is gradual and increases to a depth of 6 m (minimum) at the location of the proposed underwater observatory, which will be located at least 25 m beyond the end of the existing groyne (see Figure 3).

3.2 Longshore Sediment Transport

Various studies have looked at long term sediment transport trends over the metropolitan region, and the general consensus is that on average the coastline north of the Swan River is accreting (with localised erosion in certain areas) (Rao 2011; Bowyer 1987; Elliot et al. 2005).

Rao (2011) demonstrated that by combining historical information on beach change patterns, historic hydrodynamic information, and characteristics of a particular coastline, it is possible to identify 'factors' that contribute the most to the changes seen along the shoreline. It was found that the Cottesloe region has been relatively stable, with a very small accretion trend over the past 40 years. This is likely due to the fact that the stretch of coast from Leighton, south Cottesloe to north Cottesloe, is perched (sand over rock). In winter, when the beach recedes, the underlying rock is exposed in several areas which acts as a shield to erosion.

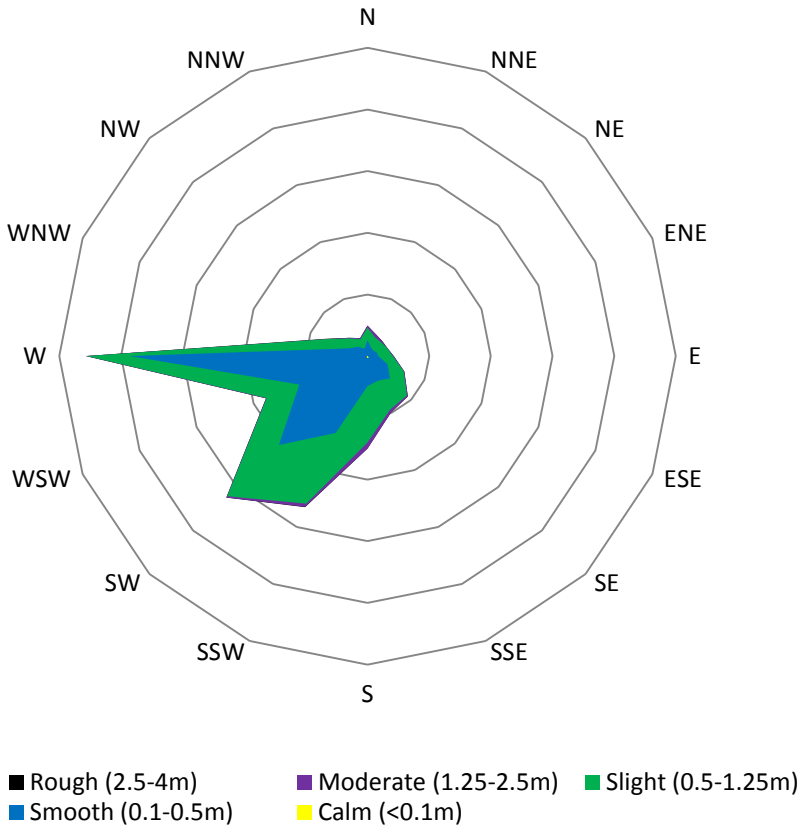
The location, being sheltered in the lieu of Rottnest Island, also appears to have limited the effect that wave activity and currents (combining to affect longshore drift) affects the coast (Travers 2007). Rao (2011) observed a trend that south of Swanbourne, beach change tended to be determined by the geomorphology, i.e. being a perched system with offshore reefs (an exception is south of Leighton, near Port Beach, which is open to the gap between Rottnest and Garden Island).

3.3 Metocean Conditions

3.3.1 Waves

Much of the coastline of this sector is sheltered from the direct impact of swell and storm-wave activity by the extensive chain of reefs formed by the Five Fathom Bank and Garden Island Ridges. As a result of wave refraction and attenuation, wave energy at the shoreline tends to be low (Pattiaratchi et al. 1997). Graph 1 represents wave height,

frequency and direction recorded at a logger located approximately 700 m southwest of the project area (refer Figure 1 for location of metocean logger).



Graph 1: Wave intensity, direction and frequency (5% graduations) distribution for the period 18/5/13 – 22/12/13 at a wave logger located approximately 700 m SW of the Project (intensity scale was prepared in accordance with the Douglas Sea Scale).
(source data: Centre for Water Research 2014, University of Western Australia, on behalf of 360 Environmental)

3.3.1 Wind

The synoptic wind climate of Perth is controlled by the annual variation in the location of the mid-latitude anti-cyclonic belt. The influence of local-scale effects is also of considerable importance, in particular the diurnal sea breeze cycle that occurs during summer. During summer months, winds are typically quite persistent in intensity and the dominant wind direction is easterly in the morning and south to south-westerly in the afternoon. During winter months, winds exhibit more variable intensities and the dominant wind direction is westerly, though northerly winds frequently occur. General characteristics of the wind of the Perth Metropolitan Region are shown in Figures A1 and A2. At any given time, conditions at Cottesloe will be slightly different to those recorded in Perth, however overall seasonal patterns are similar.

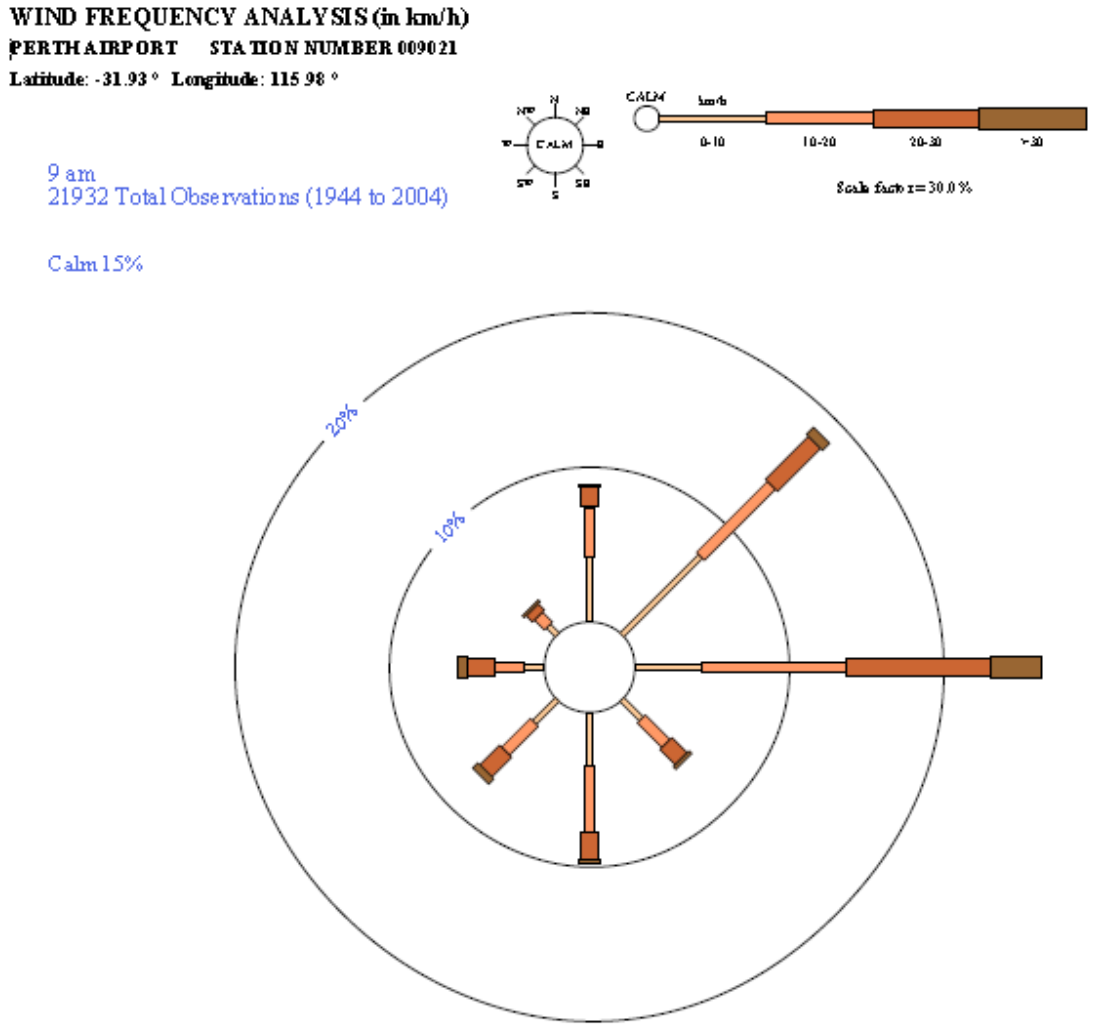


Figure A1: Wind Rose of the Perth Metropolitan Region at 9am
(source: Bureau of Meteorology 2014)

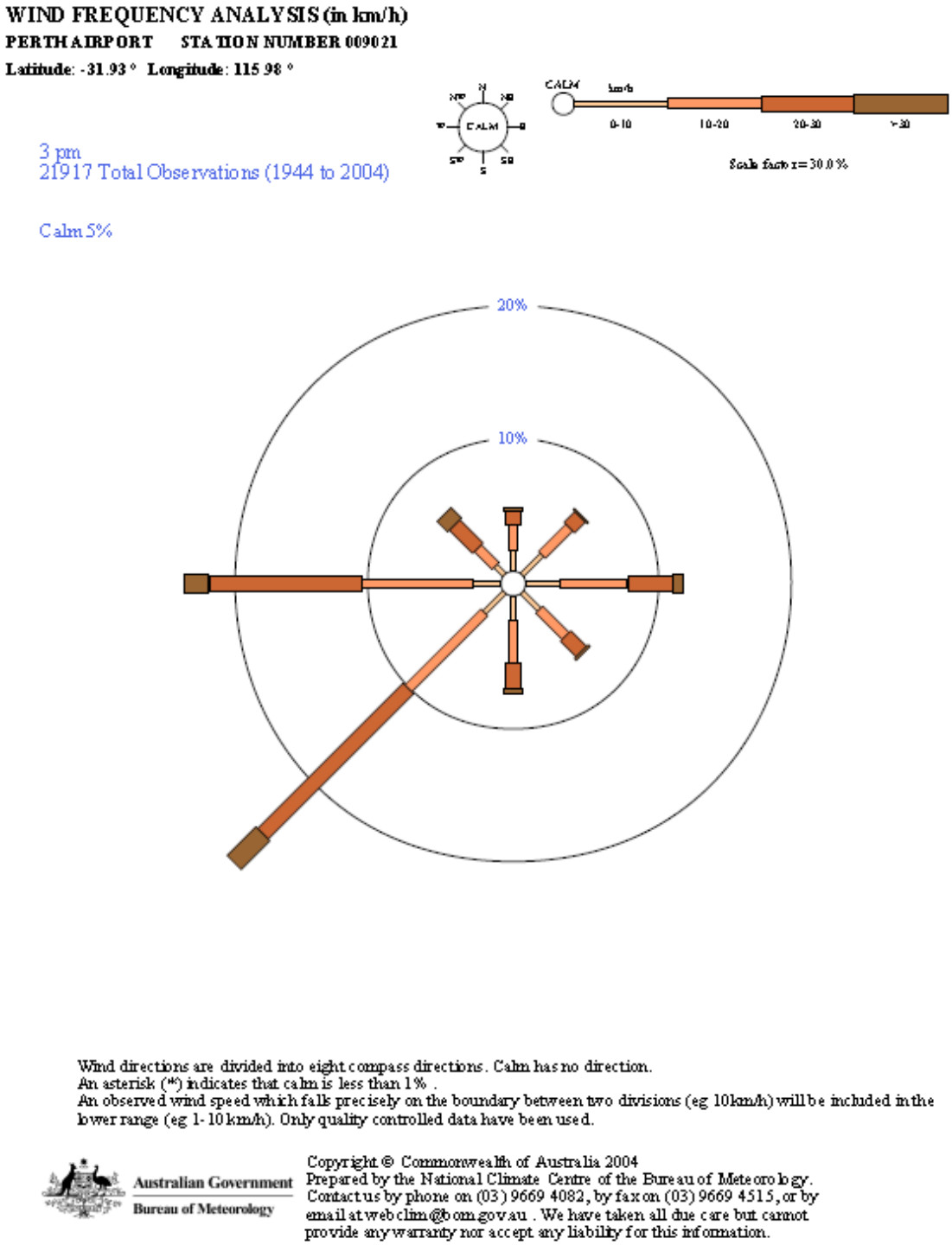


Figure A2: Wind Rose of the Perth Metropolitan Region at 3pm
(source: Bureau of Meteorology 2014)

3.3.1 Tide

The tidal range is between 0.1 m and 0.9 m along the coast adjacent to the site, but is typically 0.5 m, and tides are predominantly diurnal. Sea level is also influenced by the

passage of anti-cyclonic pressure systems, storm surges and other long period forcing, including seiching and continental shelf waves (DEP 1996).

3.4 Benthic Habitat

Benthic Primary Producer Habitats (BPPH) are seabed communities within which algae (e.g. macroalgae, turf and benthic microalgae), seagrass, mangroves, corals or mixtures of these groups are prominent components. BPPH also include areas of seabed that can support these communities (EPA 2009).

A review of high resolution aerial imagery (Google Earth 2015) indicates that there is no algae, seagrass, or coral within the project footprint. There is a rocky reef system with macro-algal communities adjacent to the south side of the groyne, with associated rock fragments further offshore, and there appears to be large seagrass communities further offshore, approximately 150 m from the end of the existing groyne. The proposed structure will extend to the northwest of the groyne, but will not extend beyond 50 m from the end of the existing groyne (i.e. removed from nearest BPPH by ~100 m).

3.5 Fauna

The review of the Department of Parks and Wildlife (DPaW) database, a search of the Protected Matters Search Tool (PMST), and a search of NatureMap returned records for several species of conservation significance that potentially occur in the marine environment adjacent to the project area (Figure 4). Table 2 outlines the significant species and the complete search results are provided in Appendix A.

Table 2: Conservation Significant Marine Fauna Relevant to the Project

TAXA	CONSERVATION STATUS	LIKELIHOOD
Fish		
Grey Nurse Shark (*Carcharias taurus*)	Vu	Possible
Great White Shark (*Carcharodon carcharias*)	Vu, Ma, Mi	Likely
Whale Shark (*Rhincodon typus*)	Vu, Ma, Mi	Possible
Mackeral Shark (*Lamna nasus*)	Ma, Mi	Possible
Southern Pygmy Pipehorse (*Acentronura australe*)	Ma	Possible
Gale's Pipefish (*Campichthys galei*)	Ma	Possible
Upside-down Pipefish (*Heraldia nocturna*)	Ma	Possible
Western Spiny Seahorse (*Hippocampus angustus*)	Ma	Possible
Short-head Seahorse (*Hippocampus breviceps*)	Ma	Possible
West Australian Seahorse (*Hippocampus subelongatus*)	Ma	Possible
Rhino Pipefish (*Histiogamphelus cristatus*)	Ma	Possible
Australian Smooth Pipefish (*Lissocampus caudalis*)	Ma	Possible
Prophet's Pipefish (*Lissocampus fatiloquus*)	Ma	Possible
Javelin Pipefish (*Lissocampus runa*)	Ma	Possible
Sawtooth Pipefish (*Maroubra perserrata*)	Ma	Possible

Taxa	Conservation Status	Likelihood
Western Crested Pipefish (*Mitotichthys meraculus*)	Ma	Possible
Bonyhead Pipefish (*Nannocampus subosseus*)	Ma	Possible
Leafy Seadragon (*Phycodurus eques*)	Ma	Possible
Common, Weedy Seadragon (*Phyllopteryx taeniolatus*)	Ma	Possible
Pugnose Pipefish (*Pugnaso curtirostris*)	Ma	Possible
Gunther's Pipehorse (*Solegnathus lettiensis*)	Ma	Possible
Spotted Pipefish (*Stigmatopora argus*)	Ma	Possible
Widebody Pipefish (*Stigmatopora nigra*)	Ma	Possible
Hairy Pipefish (*Urocampus carinirostris*)	Ma	Possible
Mother-of-pearl Pipefish (*Vanacampus margaritifer*)	Ma	Possible
Port Phillip Pipefish (*Vanacampus phillipi*)	Ma	Possible
Longsnout Pipefish (*Vanacampus poecilolaemus*)	Ma	Possible
Reptiles		
Loggerhead Turtle (*Caretta caretta*)	En, Ma, Mi, S1	Possible
Green Turtle (*Chelonia mydas*)	Vu, Ma, Mi	Possible
Leatherback Turtle (*Dermochelys coriacea*)	En, Ma, Mi	Possible
Flatback Turtle (*Natator depressus*)	Vu, Ma, Mi	Possible
Shark Bay Seasnake (*Aipysurus pooleorum*)	Ma	Unlikely
Spectacled Seasnake (*Disteira kingii*)	Ma	Unlikely
Yellow-bellied Seasnake (*Pelamis platurus*)	Ma	Possible
Birds		
Australian Lesser Noddy (*Anous tenuirostris melanops*)	Vu, Ma, S1	Unlikely
Southern Royal Albatross (*Diomedea epomophora*	Vu, Ma, Mi	Unlikely
Northern Royal Albatross (*Diomedea epomophora sanfordi*)	En, Ma, Mi	Unlikely
Amsterdam Albatross (*Diomedea amsterdamensis*)	En, Ma, Mi	Unlikely
Tristan Albatross (*Diomedea exulans exulans*)	En, Ma, Mi	Unlikely
Wandering Albatross (*Diomedea exulans* (sensu lato))	Vu, Ma, Mi	Unlikely
Yellow-nosed Albatross (*Diomedea chlororhynchos*)	S1	Possible
Indian Yellow-nosed Albatross (*Thalassarche chlororhynchos*	S1	Possible
Grey-headed Albatross (*Thalassarche chrysostoma*)	S1	Possible
Southern Giant Petrel (*Macronectes giganteus*)	En, Ma, Mi, P4	Possible
Northern Giant Petrel (*Macronectes halli*)	Vu, Ma, Mi	Possible
Wilson's Storm Petrel (*Oceanites oceanicus*)	Mi	Possible
Australian Painted Snipe (*Rostratula australis*)	En	Unlikely
Australian Fairy Tern (*Sternula nereis nereis*)	Vu	Possible
Shy Albatross (*Thalassarche cauta cauta*)	Vu, Ma, Mi	Unlikely
White-capped Albatross (*Thalassarche cauta steadi*)	Vu, Ma, Mi	Unlikely
Black-browed Albatross (*Thalassarche melanophris*)	Vu, Ma, Mi, S1	Unlikely
Campbell Albatross (*Thalassarche melanophris impavida*)	Vu, Ma, Mi	Unlikely
Fork-tailed Swift (Apus pacificus)	Ma, Mi	Possible
Flesh-footed Shearwater (*Puffinus carneipes*)	Ma, Mi	Possible

TAXA	CONSERVATION STATUS	LIKELIHOOD
Hutton's Shearwater (*Puffinus huttoni*)	S1	Unlikely
Bridled Tern (*Sterna anaethetus*)	Ma, Mi	Unlikely
Caspian Tern (*Sterna caspia*)	Ma, Mi	Likely
Roseate Tern (*Sterna dougallii*)	Ma, Mi	Possible
Great Egret (*Ardea alba*)	Ma, Mi	Unlikely
Cattle Egret (*Ardea ibis*)	Ma, Mi	Unlikely
White-bellied Sea Eagle (*Haliaeetus leucogaster*)	Ma	Possible
Pacific Gull (*Larus pacificus*)	Ma	Possible
Osprey (*Pandion haliaetus*)	Ma	Possible
Little Shearwater (*Puffinus assimilis*)	Ma	Unlikely
Painted Snipe (*Rostratula benghalensis* (sensu lato))	En, Ma, Mi	Unlikely
Mammals		
Blue Whale (*Balaenoptera musculus*)	En, Ma, Mi	Possible
Southern Right Whale (*Eubalaena australis*)	En, Ma, Mi, S1	Likely
Humpback Whale (*Megaptera novaeangliae*)	Vu	Likely
Australian Sea-lion (*Neophoca cinerea*)	Vu	Likely
New Zealand Fur Seal (*Arctocephalus forsteri*)	Ma	Likely
Bryde's Whale (*Balaenoptera edeni*)	Ma, Mi	Possible
Pygmy Right Whale (*Caperea marginata*)	Ma, Mi	Possible
Dusky Dolphin (*Lagenorhynchus obscurus*)	Ma, Mi	Possible
Orca, Killer Whale (*Orcinus orca*)	Ma, Mi	Possible
Minke Whale (*Balaenoptera acutorostrata*)	W/C	Possible
Common Dolphin (*Delphinus delphis*)	W/C	Possible
Risso's Dolphin (*Grampus griseus*)	W/C	Possible
Spotted Dolphin (*Stenella attenuata*)	W/C	Possible
Indian Ocean Bottlenose Dolphin (*Tursiops aduncus*)	W/C	Likely
Bottlenose Dolphin (*Tursiops truncatus s. str.*)	W/C	Likely

En Listed as Endangered under the *EBPC Act 1999*
Vu Listed as Vulnerable under the *EBPC Act 1999*
Mi Listed as Migratory under the *EBPC Act 1999*
Ma Listed as Marine under the *EBPC Act 1999*
W/C Listed as Whales and Other Cetaceans under the *EBPC Act 1999*
S Scheduled under the *WC Act 1950*
P Listed as Priority by the DPaW

There are a number of other fish species protected under the *Fish Recourses Management Act 1994*. Of particular interest to this proposal are significant marine fauna, including cetaceans (whales, dolphins and porpoises), pinnipeds (seals, sea lions and walruses), turtles and fish (including sharks and sea dragons). The significant birds listed are not likely to be impacted by the project due to their transient nature.

3.5.1 Breeding Habits

Common bottlenose dolphins are known to calve all year round, but more commonly in spring and summer (DRI 2014).

Sea lions calve all year round on islands in the southwest of Australia (DoE 2014a), but are not known to utilise the coast in the vicinity of the proposal.

Whales migrate north along the coast to breed in the warmer water of Western Australia's north-west, with the peak northern migration occurring in June. The whales return via the Perth coast with their calves from September to November (Jenner et al. 2001).

Shark breeding is sporadic, for example white sharks reproduce only once every two to three years (DoE 2014b).

Turtle nesting is not recorded along the Perth coast adjacent to the proposal site.

The majority of the bird species listed are known to occur offshore and breed on offshore islands, not in the vicinity of the proposal site.

3.6 Conservation

The proposal site is within the Cottesloe Reef Fish Habitat Protection Area (FHPA) (Figure 5), which is managed by the Department of Fisheries.

The Cottesloe Reef FHPA extends approximately 4.4 km along the coast from a point 300 m south of the artificial surfing reef at the Cable Station to the southern boundary of North Street, Cottesloe, and westwards to 800 m from the high watermark. The Cottesloe reef system was listed as an FHPA under Section 115 of the *Fish Resources Management Act 1994* in 2001 following a proposal by the Cottesloe Marine Protection Group (DoF 2010).

The FHPA was established for the following purposes: (i) the conservation and protection of fish, fish breeding areas, fish fossils or the aquatic ecosystem; and (ii) the management of fish and activities relating to the appreciation or observation of fish.

3.7 Heritage

A search of the Aboriginal Heritage Inquiry System (AHIS) returned an "Other Heritage Place" category listing: Stored Data. ID 3776: Indian Ocean (Mythological).

Cockburn Sound & the Perth Islands were reported as a site under the AHA and called 'Indian Ocean'. This report was based upon a creation myth pertaining to a battle between a Shark, a Crocodile (analogous to Waugal) and a Whale as told by Ken Colbung to Dr Barrie Machin in 1989.

The Aboriginal Cultural Materials Committee (ACMC) have defined that Place ID 3776: Indian Ocean does not meet the definition of a site under section 5 of the AHA and accessioned the reported place as 'stored data' upon the Aboriginal sites register.

Figure 6 shows the location of heritage listings.

4 Terrestrial Environmental Setting

4.1 Topography

The project is located within the low lying coastal area and the majority will occur at sea level (refer Figure 3). Topography of the site varies from sea level in the west to 5 m Australian Height Datum (mAHD) in close proximity to the shoreline and the onshore portion of the project may intersect with this contour, particularly the public ablution amenities.

4.2 Climate

The climate of the south western region of Western Australia is characterised by the Koppen Climate Classification as 'Dry Subtropical', featuring long, hot, dry summers, and mild, rainy winters. The dominant rainfall mechanisms are frontal systems caused by cold fronts associated with the low pressure systems that extend across southern Australia between May and October. During the summer months, thunderstorms and ex-tropical cyclones can bring intense rainfall.

4.3 Geology and Soils

The coast adjacent to the project area is dominated by the following (refer Figure 7):

- Quindalup South System: Coastal dunes and scrub, of the Swan Coastal Plain, with calcareous deep sands and yellow sands.
- Spearwood System: Sand dunes and plains. Yellow deep sands, pale deep sands and yellow/brown shallow sands.

4.4 Acid Sulfate Soils

The closest records of acid sulfate soil (ASS) risk areas (both medium and high) are located over 1 km east of the project area (refer Figure 8), onshore adjacent to the Royal Freshwater Bay Yacht Club and within the Swan River.

4.5 Contamination

The closest recorded contaminated site is located approximately 1 km east of the project area (see Figure 9). The site was classified on 21/05/2012 as "Contaminated – remediation required". The site is classified as contaminated due to the presence of hydrocarbons (i.e. petrol/diesel/oil) in the soil and groundwater beneath the site. This site has been used as a petrol station from 1955 to present.

4.6 Fauna

The review of the DPaW database search of threatened fauna within a 5 km radius of the site identified 47 species of conservation significance, the majority of records, particularly

migratory birds, have been covered within the Marine Fauna section of this report (Section 3.4) (see Figure 4).

NatureMap and PMST searches were also conducted and results can be found in Table 3 below, and Appendix A.

Table 3: Conservation Significant Terrestrial Fauna Relevant to the Project

TAXA	CONSERVATION STATUS	LIKELIHOOD
Birds		
Malleefowl (*Leipoa ocellata*)	Vu	Unlikely
Australasian Bittern (*Botaurus poiciloptilus*)	En	Possible
Forrest Red-tailed Black Cockatoo (Calyptorhynchus banksii naso)	Vu	Unlikely
Carnaby's Cockatoo (*Calyptorhynchus latirosris*)	En, S1	Unlikely
Rainbow Bee-eater (*Merops ornatus*)	Mi	Likely
Mammals		
Western Ringtail Possum (*Pseudocheirus occidentalis*)	Vu	Unlikely
Western Quoll, Chuditch (*Dasyurus geoffroyi*)	Vu, S1	Unlikely
Quokka (*Setonix brachyurus*)	Vu	Unlikely

En Listed as Endangered under the *EBPC Act 1999*
Vu Listed as Vulnerable under the *EBPC Act 1999*
Mi Listed as Migratory under the *EBPC Act 1999*
Ma Listed as Marine under the *EBPC Act 1999*
S Scheduled under the *WC Act 1950*

4.7 Vegetation and Flora

The site lies within the Cottesloe Complex: Central and South, which typically consists of a mosaic of woodland of *E. gomphocephala* and open forest of *E. gomphocephala - E. marginata - Corymbia calophylla*; closed heath on the limestone outcrops (Heddle et al. 1980).

The review of the DPaW database identified 28 Declared Rare Flora (DRF) and Priority flora previously recorded within a 10 km radius of the project area (Figure 10). This includes four taxa listed as 'Threatened' and 24 taxa listed as 'Priority' by DPaW. Five of the 28 taxa are also listed under the EPBC Act. NatureMap and PMST searches were also undertaken for the site and the results can be found in Table 4 and Appendix A.

Table 4: Conservation Significant Vegetation and Flora Relevant to the Project

TAXA	CONSERVATION STATUS	LIKELIHOOD
Chorizema varium	En, S1	Unlikely
Caladenia huegelii	En, S1	Unlikely
Centrolepis caespitosa	En, P4	Unlikely
Drakaea elastica	En, S1	Unlikely
Diuris micrantha	Vu, S1	Unlikely
Calothamnus graniticus subsp. leptophyllus	P4	Unlikely
Dodonaea hackettiana	P4	Unlikely
Jacksonia sericea	P4	Possible
Hydrocotyle lemnoides	P4	Unlikely
Hypolaena robusta	P4	Unlikely
Thysanotus isantherus	P4	Unlikely
Angianthus micropodioides	P3	Unlikely
Beyeria cinerea subsp. cinerea	P3	Possible
Hibbertia spicata subsp. leptotheca	P3	Possible
Lasiopetalum membranaceum	P3	Unlikely
Pimelea calcicola	P3	Possible
Schoenus capillifolius	P3	Unlikely
Stylidium maritimum	P3	Unlikely
Thelymitra variegata	P3	Unlikely
Acacia benthamii	P2	Unlikely
Adiantum capillus-veneris	P2	Unlikely
Amanita griseibrunnea	P2	Unlikely
Fabronia hampeana	P2	Unlikely
Melaleuca viminalis	P2	Unlikely
Poranthera moorokatta	P2	Possible
Eucalyptus x mundijongensis	P1	Unlikely
Typhonium peltandroides	P1	Unlikely
Picris compacta	Extinct	N/A

En Listed as Endangered under the *EBPC Act 1999*
Vu Listed as Vulnerable under the *EBPC Act 1999*
S Scheduled under the WC Act 1950
P Listed as Priority by the DPaW

The review of the DPaW threatened ecological community (TEC) and priority ecological community (PEC) database searches identified the following TECs and PECs occurring in the surrounding area:

- *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands, Swan Coastal Plain (Vulnerable), which is within 1.5 km.
- Subtropical and Temperate Coastal Saltmarsh (Priority 1), which is within 6.2 km.

- Northern Spearwood shrublands and woodlands (Priority 3) which is within 1.7 km.
- Acacia shrublands on taller dunes (Priority 3), which is within 3.8 km.
- Southern *Eucalyptus gomphocephala – Agonis flexuosa* woodlands (Priority 3), which is within 4.3 km.
- Wooded wetlands which support colonial waterbird nesting areas (Priority 2), which is within 8.6 km.

4.8 Conservation

There are no Regional Parks, Conservation Reserves, National Parks or Bush Forever sites within the proposal area.

4.9 Heritage

In Western Australia, the AHA protects places and objects customarily used by or traditional to the original habitants of Australia. A register of such places and objects is maintained under the AHA, however all sites are protected under the AHA whether they are registered or not.

A search of the Aboriginal Heritage Inquiry System (AHIS) revealed that registered site 435; Moonderup (Ceremonial, Mythological), occurs within the proposal site (Figure 6).

During mid to late summer, the *Noongar* people used to frequent the place called *Mudurup* (registered name: Moonderup), directly translating to "place of the yellow-finned whiting", which is now known as Cottesloe Beach. The ceremonial site of *Mudurup* is considered as one of the most important mythological coastal sites on the Swan Coastal Plain. The limestone rock formation of *Mudurup* allows underground freshwater springs to flow into the sea that *Noongar* believe were created by, and continue to be embodied by, the mythological *Waugal* or Rainbow Serpent. The *Waugal* is believed to embody all freshwater systems, including rivers, wetlands and lakes in and around the Swan Coastal Plain (MacIntyre 2004).

A search of the PMST revealed several other registered and indicative places, predominantly houses, within 1 km of the proposal site (Appendix A), but not within the site.

Two native title claims exist over the area as summarised:

- Registered claim – Whadjuk People (WAD242/2001).
- Not registered – Single Nyungar Claim (Area 1) (WAD6006/2003) represented by South West Aboriginal Land and Sea Council.

5 Environmental Impacts and Management

This section provides further information to the summary provided in Table A.

5.1 Benthic Communities and Habitat

5.1.1 Environmental Objective

To maintain the structure, function, diversity, distribution and viability of benthic communities and habitats at local and regional scales (EPA 2015a).

5.1.2 Potential Impact

Further to a review of the EPA's Environmental Assessment Guideline No. 3 (EPA 2009) and the lack of presence of seabed communities within the project area, the project is not expected to cause cumulative irreversible loss of, or serious damage to, benthic primary producer habitat (BPPH).

The proposal has the potential to indirectly impact BPPH, including nearby reef habitat, in surrounding areas during pile driving and other construction activities that interfere with the seabed increasing suspended solids and releasing potential contaminants.

5.1.3 Proposed Management

The proposed management measures that will be implemented during the project include water quality monitoring, which is discussed in Section 5.3 and will be developed further in the project Construction Environmental Management Plan (CEMP).

5.2 Coastal Processes

5.2.1 Environmental Objective

To maintain the morphology of the subtidal, intertidal and supratidal zones and the local geophysical processes that shape them (EPA 2015a).

5.2.2 Potential Impact

The project has the potential to impact the subtidal zone by influencing the longshore sediment transport leading to erosion and accretion along the adjacent coastline. The impact of longshore sediment transport is most apparent when a hard feature (natural or man-made) interrupts sediment flow resulting in contrasting patterns of accretion/erosion on the forward and leeward sides of the feature.

Some examples of this can be seen at City Beach, Trigg, Sorrento and Hillarys Boat Harbour. The pattern observed indicates that sediment flow is generally in the northward direction (although seasonal variations exist) (Rao 2011).

The shoreline south of Swanbourne has shown minimal impact on longshore transport as a result of hard features, due to a combination of its sheltered location, and geomorphology (Rao 2011). A feature such as the pier, constructed on pylons, is not expected to have a significant impact on sediment transport.

5.2.3 Proposed Management

The proposal consists of a structure set upon piles and does not include any major solid structures, such as rock groynes, which are known to influence sediment movement. The underwater observatory is the only solid structure and a preliminary engineering assessment undertaken by Arup as part of the project indicated that this structure will have negligible impact on swell and therefore is not likely to impact coastal erosion or accretion processes. The impact of the pylons was also deemed negligible.

The seabed footprint will be minimised to ensure that any impact to coastal processes is minimal and that coastal morphology is maintained. The Town of Cottesloe commenced a five year Coastal Monitoring Project in 2014 (following a Coastal Vulnerability Study released in 2008); these surveys will be reviewed by the Client to ascertain any changes in erosion or accretion and whether they can be attributed to the project.

No further management measures are expected to be required.

5.3 Marine Environmental Quality

5.3.1 Environmental Objective

To maintain the quality of water, sediment and biota so that the environmental values, both ecological and social, are protected (EPA 2015a).

5.3.2 Potential Impact

The proposal has the potential to impact marine environmental quality by the following activities:

- pile driving and other construction activities that interfere with the seabed increasing suspended solids and releasing potential contaminants
- construction equipment (e.g. barge) contamination (e.g. spills)
- biosecurity risk via potential marine pests introduction by construction vessels
- waste from the project once complete and utilised by the public.

Water quality decline has the potential to impact the Cottesloe FHPA, which extends along the coast adjacent to the project.

5.3.3 Proposed Management

The proposed management measures that will be implemented during the project are:

- a sediment investigation prior to pile driving to ensure there are no contaminants of potential concern (part of a geotechnical investigation)
- water quality monitoring, specifically for turbidity and light attenuation, within nearby seagrass communities to ensure acceptable light availability
- ensure that all site personnel are briefed on waste procedures prior to commencing any activities
- no refueling of equipment to occur on site
- ensure there are protocols in place in case of a hydrocarbon spill
- all vessels will be inspected in accordance with biosecurity requirements prior to entry into the FHPA during construction
- pier piles will be protected with an approved antifoul paint
- ensure that waste is managed appropriately during the public use of the project following completion, including a zero tolerance for discharge to the sea.

Management measures, including the requirement for a silt curtain, will be further developed in the project CEMP in consultation with regulatory agencies, including Department of Fisheries, Department of Parks and Wildlife, and Department of Transport.

5.4 Marine Fauna

5.4.1 Environmental Objective

To maintain the diversity, geographic distribution and viability of fauna at the species and population levels (EPA 2015a).

5.4.2 Potential Impact

The proposal has the potential to disturb conservation significant marine fauna, particularly during piling activities.

Cetaceans and pinnipeds are of particular concern during construction activities and are known to occur in the vicinity of the proposal. Piling noise varies with the size of the pile being installed and the pile driving method used. The most common pile driving method and the method likely to be used during this project is impact pile driving, where a pile is hammered into the ground by a hydraulic ram.

The majority of the sound energy typically occurs at lower frequencies between 100 Hz and 1 kHz. Factors that influence the source level include the size, shape, length and material of the pile, the weight and drop height of the hammer, and the seabed material and depth. An animal is most sensitive to sounds at frequencies where its absolute threshold of hearing is lowest (DPTI 2012). Table 5 below outlines the estimated auditory bandwidth of marine fauna expected to occur in the vicinity of the proposal area.

Table 5: Marine mammal functional hearing groups, estimated auditory bandwidth, listed species under the EPBC Act that may occur in WA state waters (Southall et al. 2007)

FUNCTIONAL HEARING GROUP	ESTIMATED AUDITORY BANDWIDTH	LISTED SPECIES THAT ARE KNOWN TO, LIKELY TO, OR MAY OCCUR IN WATERS ADJACENT TO PROJECT AREA
Low-frequency cetaceans (all baleen whales)	7 Hz to 22 Hz	Southern Right Whale (*Eubalaena australis*) Humpback Whale (*Megaptera novaeangliae*) Blue Whale (*Balaenoptera musculus*) Pygmy Right Whale (*Caperea marginata*) Minke Whale (*Balaenoptera acutorostrata*) Bryde's Whale (*Balaenoptera edeni*)
Mid-frequency cetaceans (majority of toothed whales)	150 Hz to 160 kHz	Bottlenose Dolphin (*Tursiops truncatus*) Common Dolphin (*Delphinus delphis*) Dusky Dolphin (*Lagenorhynchus obscurus*) Orca, Killer Whale (*Orcinus orca*) Spotted Dolphin (*Stenella attenuata*) Indian Ocean Bottlenose Dolphin (*Tursiops aduncus*) Risso's Dolphin (*Grampus griseus*)
High-frequency cetaceans (other toothed whales)	200 Hz to 180 kHz	None that may occur.
Pinnipeds (seals and sea lions)	75 Hz to 30 kHz	Australian Sea-lion (*Neophoca cinerea*) New Zealand Fur Seal (*Arctocephalus forsteri*)

Noise, in certain circumstances, can impact the vestibular, reproductive and nervous systems, as well as other tissues and organs (Erbe 2013b).

The construction activities also have the potential to impact spawning fish within the West Coast Bioregion. The majority of species spawn during the summer months, but some do spawn during the proposed construction period, including King George Whiting and Baldchin Grouper.

The operation of the underwater observatory may impact marine fauna species if artificial lighting is used underwater.

5.4.3 Proposed Management

All seaside construction activities have the potential to impact on marine fauna, however for this project the key activity is pile driving. The following management measures, derived from Erbe 2013a, will be implemented during pile driving activities:

- safety zones – real time mitigation measures are implemented within a zone around pile driving activities. There will be a shutdown zone immediately adjacent to the source of piling, a low power zone and observation zone at increasing radii from the source
- a Marine Mammal Observer (MMO) will be present during piling activities to monitor safety zones

- pre-start survey, where the observation zone is surveyed for up to 30 minutes prior to the commencement of activities to determine presence of fauna
- if animals enter the low power or shutdown zones operations will be switched to low power or shutdown, respectively. Operations can re-commence once fauna have left and after an additional pre-start survey and/or soft-start is implemented.

All construction staff will be briefed on the management measures in place to protect marine fauna, including impact management via human contact and vessel strike, and will adhere to the project specific CEMP and be undertaken in accordance with the EPA guidelines. If artificial lighting is to be utilised, research would be undertaken in consultation with relevant agencies (EPA/DPaW/DoF) to ensure that a satisfactory outcome is achieved for the project and the fauna in the marine environment.

5.5 Flora and Vegetation

5.5.1 Environmental Objective

To maintain representation, diversity, viability and ecological function at the species, population and community level (EPA 2015a).

5.5.2 Potential Impact

Approximately 0.012 ha will need to be cleared to facilitate the building of the public ablution block. No other vegetation is proposed to be cleared during the construction of the proposed infrastructure. Based on the desktop survey, vegetation clearing may have the following potential minor impacts on the immediate environment:

- potential loss of conservation significant flora species (if present on site)
- partial clearing of conservation significant vegetation types (if present on site)
- spread of weeds and pathogens.

5.5.3 Proposed Management

Vegetation clearing will be undertaken in accordance with best practice management, and only within detailed mapped areas. Operators will undergo an induction before clearing is undertaken, which includes an overview of any significant flora and vegetation identified on site. In addition, the following measure will be implemented:

- clearly identify areas to be excluded from clearing, through the use of signage and fencing
- retain areas of vegetation where possible
- maximise the use of local native vegetation species in landscaping and revegetation areas.

A permit to clear native vegetation will be sought if the proposal is not formally assessed.

5.6 Terrestrial Environmental Quality

5.6.1 Environmental Objective

To maintain the quality of land and soils so that the environment values, both ecological and social, are protected (EPA 2015a).

5.6.2 Potential Impact

The proposal has the potential to impact terrestrial environmental quality by the following activities:

- construction equipment (e.g. trucks) contamination (e.g. spills)
- waste resulting from:
    - construction activities
    - operations of cafes and restaurants
    - public use once opened.

5.6.3 Proposed Management

The proposed management measures that will be implemented are:

- ensure that all site personnel are briefed on waste procedures prior to commencing any activities
- no refuelling of equipment to occur on site
- ensure there are protocols in place in case of a hydrocarbon spill
- ensure that waste is managed appropriately during the public use of the project following completion, including a zero tolerance for unauthorised discharge.

Waste and spill response management will be further developed in the project specific CEMP in consultation with regulatory agencies.

5.7 Amenity

5.7.1 Environmental Objective

To ensure that impacts to amenity are reduced as low as reasonably practicable (EPA 2015a).

5.7.2 Potential Impact

The visual amenity and some recreational activities will be impacted during construction, including:

- construction equipment visible moving adjacent the groyne during the construction phase
- offshore barge present during pile driving for supply of construction materials
- reduced ability for recreation (walking and fishing) on the existing groyne, due to presence of construction equipment
- aquatic recreation (e.g. swimming, surfing, and kayaking) ability reduced in the vicinity to the construction activities for public safety
- noise impacts to beach users and local residents
- user conflict once complete (particularly between swimming and fishing activities).

Once completed the pier will enhance the amenity of the area and has been designed to complement existing facilities, such as Indiana.

5.7.3 Proposed Management

The impact to amenity will be managed by:

- construction timing – limited to the "off season" for beach use (peak beach use in January [Blackweir & Beckley 2004]) with the majority of construction activities planned for winter (March – December)
- construction activities undertaken in accordance with *Environmental Protection (Noise) Regulations 2007* and will not occur outside the hours of 7am-7pm on weekdays
- transport of materials along the groyne to be kept to a minimum
- fencing where appropriate
- informative signs to inform the public what is occurring on site and what the pier will look like once complete
- consideration of fishing limitations to maintain user safety.

Impacts to recreational activities will be minimised as far as practicable, with public safety remaining the primary focus. Community engagement will continue for the duration of the project.

5.8 Heritage

5.8.1 Environmental Objective

To ensure that historical and cultural associations, and natural heritage, are not adversely affected (EPA 2015a).

5.8.2 Potential Impact

The key potential impact is the disturbance of artifacts within an AHA registered site, particularly during construction of the ablution amenity.

5.8.3 Proposed Management

To mitigate disturbance to potential surface or subsurface cultural material within the registered site: *Moodoorup*, the following will be implemented:

- Once the design footprint is available (after avoiding known areas of Aboriginal heritage and archaeological material where possible) consult with Aboriginal communities and native title claimants
- Determine the need for a Section 18 AHA approval
- Ground disturbing work to be monitored for skeletal or archaeological material
- Site workers briefed on cultural significance of the area and appropriate procedures in the event of a discovery of an artefact or burial site.

6 Consultation

Table 6 provides an overview of the consultation undertaken to date and a summary of the comments received on the proposed project. Letters of support are included in Appendix B.

Table 6: Stakeholder Consultation Summary

STAKEHOLDER	COMMENTS
Department of Regional Development & Lands	Two letters sent (30 November 2012 and 1 February 2013), meetings, no formal response to date.
State Land Services	Letter sent 1 February 2013, response letter received 18 March 2013 noting receipt and allocation to a project officer, but no formal response to date.
Tourism WA	Formal response received 28 February 2013: Supported in Principle – Tourism WA recently identified Cottesloe beach redevelopment as one of the WA's top tourism priorities. It was noted that the proposal seeks to establish a facility which provides a variety of experiences and the venue has potential to expand the current experiences in Cottesloe.
Recfishwest	Formal response received 25 February 2013: Formal support offered. Special mention given to the level of thought for the recreational fishing community included in the proposal and suggested a reef structure beyond the piles. Expressed excitement in the potential of the underwater observatory for educational opportunities.
Office of the EPA Kathryn Schell	Provided comment on this PEIA in May 2014. Key concerns were management of significant impacts and suggested engaging in pre-referral discussions following PEIA review.
Department of Fisheries	Generally supportive of the proposal, with consideration given to: • Biosecurity/marine pest management • Anchoring within the FHPA (not allowed under the *Fish Resources Management Regulations 1995*) • Potential impacts to fish during piling • Potential impacts to species under the *Fish Resources Management Act 1994* • Potential smothering to nearby reef by suspended solids • Potential impact to hydrodynamics • Potential impact to fish behaviour as a result of artificial lighting • Potential impact to spawning fish • Details of intended use of a shark proof enclosure. The Department also requested the opportunity to review future documents relating to the project and to be kept up to date with progress.
Department of Transport	No in principle objection to the proposal. Requested to be kept updated with progress of the proposal.

STAKEHOLDER	COMMENTS
Department of Parks and Wildlife	Generally supportive of the proposal, with consideration given to: • Fish Habitat Protection Area • Ocean Processes, particularly longshore sediment movement • Possible use conflict – swimming and fishing • Pile driving and management of impacts to fauna • Shark proof enclosure (Eco Shark Barrier suggested) • Contingency plans for potential pollution incidents • Facilities and education to reduce litter – suggested the possibility of a plastic free facility.
Department of Lands	Meeting held in July 2015 to discuss the proposal, with the following requests to further progress the development: • Provide written responses from stakeholders • Provide evidence of community consultation • Forward the Business Case to provide a basis for valuation • Notification that proposal is likely to be a State lease agreement with Town of Cottesloe and sub-lease with the developer • Access may be required via a public access easement pursuant to Section 195 and 196 of the *Land Administration Act 1997* over Class A Reserve 6896 • Cottesloe town site boundary may need to be extended to include the proposal, but this can occur at a later date • Native title will require consideration, depending on the outcome of the South West Native Title Settlement.
Department of Mines and Petroleum	The proposal does not impact any mining tenement, geothermal title, or petroleum title and raises no access concerns regarding mineral or petroleum resources, geothermal energy, or basic raw materials. No objections to the proposal and necessary approvals under *The Mining Act 1978* have been given.
Town of Cottesloe	Submission was issued June 2014, presentation and Q&A session with council staff and councillors was held November 2014. Establishment of project web page and social media sites.
Government correspondence	Meetings held with: • Hon Michael Sutherland MLA; Speaker of the Legislative Assembly • Hon Elani Evangel MLA • Hon Terry Redman MLA; Minister for Regional Development; Lands • Hon Julie Bishop MP; Minister for Foreign Affairs • Senator Hon David Johnston
Other correspondence	Meetings held with: • Patricia Carmichael – member Cottesloe Coast Care & SOS Cottesloe Inc; former Cottesloe Councillor • Kevin Morgan – former Mayor of Cottesloe Council
The following correspondence occurred in 2013.	
Cottesloe Surf Life Saving Club	Contacted and discussed but no formal response.
Recfishwest	Contacted and discussed; no negative issues raised.

STAKEHOLDER	COMMENTS
Cottesloe Coastcare Association	Individual members approached; no negative issues raised.
Blue Waters Cafe	Contacted and discussed; no negative issues raised.
Post Newspaper	Contacted and discussed; no negative issues raised.
Cottesloe Council	Several councillors approached; no negative views expressed.
Cottesloe Surf Riders Association	Several members of the surfing community approached were supportive in principal; sought assurances about the impact on the winter wave which has been addressed by the Marine Engineer.
Sculptures by the Sea	Contacted and discussed; no negative issues raised.
Members of Parliament Colin Barnett (Premier) Terry Waldren (Minister for Sport and Recreation)	Contacted and discussed; no negative issues raised.

7 Conclusion

360 Environmental does not consider there will be any unmanageable, significant environmental impacts resulting from implementation of the proposal. To progress the project, the following items will require further consideration:

- Community Interest – consultation with the local community will be required prior to the finalisation of design and commencement of the project. This aspect is important given the nature and location of the proposal.
- Environmental Approvals:
    - consultation with the Office of the Environmental Protection Authority and submission of a referral under Section 38(a) of the *Environmental Protection Act 1986*; and
    - consideration of a referral to the Department of Environment under the *Environment Protection and Biodiversity Conservation Act 1999* to ensure impacts to matters of national significance are assessed.
- Aboriginal Heritage – consultation with traditional owners and, once construction design and methodology is finalised, an assessment on the requirement of a Section 18 application under the AHA.
- Geotechnical Investigation – this investigation will be required to ensure the seabed is suitable for the proposed structure. Concurrent with this investigation, sediment and infauna samples may be taken and analysed to ensure there is no contamination present and that there are no significant benthic infauna in the vicinity of the project area.
- Flora and Vegetation – It is recommended that a level 2 survey be undertaken in accordance with Guidance Statement 51 to ensure that no conservation significant species or communities are located within the proposed cleared areas, within the footprint of the ablution block, given the presence of a TEC within 2 km of the site. Undertaking the survey in spring is the most appropriate time as species are readily identifiable.

Prior to the construction phase of the project, a Construction Environmental Management Plan will be prepared, including implementation of the following:

- Water quality monitoring to ensure the health of the FHPA is protected and to ensure sufficient light availability for nearby seagrass communities.
- MMO during pile driving activities to ensure minimal impact to conservation significant marine fauna, particularly cetaceans and pinnipeds.
- Information sessions for all construction workers to ensure complete knowledge of the following:

- heritage importance of the project site and protocols for notification of authorities if any artefacts are disturbed
- conservation significant flora and fauna in the vicinity
- waste/spill procedures.

8 Limitations

This report is produced strictly in accordance with the scope of services set out in the contract or otherwise agreed in accordance with the contract. 360 Environmental makes no representations or warranties in relation to the nature and quality of soil and water other than the visual observation and analytical data in this report.

In the preparation of this report, 360 Environmental has relied upon documents, information, data and analyses ("client's information") provided by the client and other individuals and entities. In most cases where client's information has been relied upon, such reliance has been indicated in this report. Unless expressly set out in this report, 360 Environmental has not verified that the client's information is accurate, exhaustive or current and the validity and accuracy of any aspect of the report including, or based upon, any part of the client's information is contingent upon the accuracy, exhaustiveness and currency of the client's information. 360 Environmental shall not be liable to the client or any other person in connection with any invalid or inaccurate aspect of this report where that invalidity or inaccuracy arose because the client's information was not accurate, exhaustive and current or arose because of any information or condition that was concealed, withheld, misrepresented, or otherwise not fully disclosed or available to 360 Environmental.

Aspects of this report, including the opinions, conclusions and recommendations it contains, are based on the results of the investigation, sampling and testing set out in the contract and otherwise in accordance with normal practices and standards. The investigation, sampling and testing are designed to produce results that represent a reasonable interpretation of the general conditions of the site that is the subject of this report. However, due to the characteristics of the site, including natural variations in site conditions, the results of the investigation, sampling and testing may not accurately represent the actual state of the whole site at all points.

It is important to recognise that site conditions, including the extent and concentration of contaminants, can change with time. This is particularly relevant if this report, including the data, opinions, conclusions and recommendations it contains, are to be used a considerable time after it was prepared. In these circumstances, further investigation of the site may be necessary.

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