



## SECTION 38 ENVIRONMENTAL REFERRAL DOCUMENT

### Koombana Bay Marine Structures







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## 1.0 INTRODUCTION

### 1.1 Proposal Overview

The South West Development Commission (SWDC) is seeking a strategic environmental assessment of separate marine structures in Koombana Bay, Bunbury. The proposed marine structures are intended to meet existing demand and future requirements for small craft maritime infrastructure and include new mooring facilities for commercial and recreational vessels, floating jetties, a boat servicing facility, improved public ablution facilities and an upgraded boat launching and storage facilities.

The Environmental Protection Authority's (EPA) Environmental Protection Bulletin No. 17: *Strategic and Derived Proposals* (EPA 2012) presents the framework for the environmental assessment of strategic proposals under the *Environmental Protection Act 1986* (EP Act). The implementation of this framework for the Koombana Bay Marine Structures proposal (the proposal) is considered the most appropriate mechanism for seeking environmental approval for the multiple marine structures proposed to be constructed as an alternative to a structure-by-structure approach.

EPA (2012) identifies the following benefits gained through the assessment of strategic proposals:

- early consideration of environmental issues providing the ability to influence the detailed design of future proposals
- ability to consider the cumulative environmental impacts of more than one proposal
- greater certainty for local communities regarding the maximum extent of cumulative environmental impacts of future developments, and greater confidence for proponents of future developments
- more flexible time frames for consideration of environmental issues
- potential efficiencies in the approvals process.

Additionally, EPA (2012) details that the assessment of strategic proposals will provide local communities with the following benefits:

- being consulted at earlier stage in the planning of future proposals, providing increased opportunity to influence decisions relating to the location and final design of those proposals
- being able to consider the cumulative impacts of more than one proposal, rather than dealing with the assessment of individual proposals.

Strategic proposals generally allow for a more comprehensive approach to community consultation through involving them in earlier stages in the environment approvals process than is possible using when applying a more traditional approach. A strategic approach also manages the potential risk of consultation burnout.

Seeking a strategic proposal environmental assessment outcome provides greater certainty for the Bunbury community and allows industry stakeholders to conduct more informed long-term planning for their own operations in Koombana Bay and the Port of Bunbury.

### **1.1.1 Liaison with the Chairman of the EPA and OEPA**

A proposal briefing was conducted for the Chairman of the EPA, Dr Paul Vogel, and officers from the Office of the EPA (OEPA) with the SWDC represented by Chief Executive Officer, Don Punch, on 14 November 2014.

The key outcomes of the briefing were that:

- Potential environmental impacts to the following sea-themed environmental factors were considered to be the critical elements of the proposal
  - coastal processes
  - marine environmental quality
  - marine fauna (e.g. dolphins).
- Potential impacts to the terrestrial themed environmental factors were considered capable of being managed through the planning and development framework under Section 48 of the EP Act.

## **1.2 Purpose of this Document**

This Section 38 Environmental Referral Document for the proposal has been prepared by the SWDC (the proponent) to meet the requirements of the EP Act on the basis that the proposal is likely to be assessed by the EPA as a strategic proposal.

This referral document aims to:

- Outline the proposed future marine infrastructure comprising the proposal.
- Identify the key sea-themed factors as well as the terrestrial factors.
- Detail environmental mitigation measures to address potential impacts.

## **1.3 Proponent Details**

The proponent of the proposal is:

South West Development Commission  
Corporate Services  
PO Box 2000  
BUNBURY WA 6231

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## 2.0 DESCRIPTION OF THE PROPOSAL

### 2.1 Proposal Location and Land Use

#### 2.1.1 Location

The proposal is situated within and immediately adjacent to Koombana Bay, and neighbours the existing Bunbury central business district, with the majority of the proposal's approximately 133 hectare project area incorporating marine waters under the jurisdiction of the Southern Ports Authority, Port of Bunbury (SPA-PoB) and the Department of Transport (DoT) Marine and City of Bunbury reserve (Figure 1).

#### 2.1.2 Existing Land Uses

The existing marine and onshore land uses within and immediately adjacent to the project area include marine and terrestrial elements.

##### 2.1.2.1 Marine Uses

- Casuarina boat harbour
- boat launch ramp
- swing moorings
- Outer Harbour shipping berths
- Inner Harbour shipping berths and industrial infrastructure
- Dolphin Discovery Centre (Koombana Bay is a known dolphin feeding and tourism area)
- Leschenault Inlet, (which supports the most southern mangroves in Western Australia and more than 60 species of migratory waterbirds)
- Crabbing in Vittoria Bay (Leschenault Estuary).

##### 2.1.2.2 Terrestrial Land Uses

- commercial / mixed use development – Marlston North
- residential development (Marlston Hill and East Bunbury)
- Koombana Bay Sailing Club House

- Dolphin Discovery Centre
- Koombana Drive – regional road
- Lucianna Park between the CBD and Koombana Channel
- Koombana Beach
- Port of Bunbury Inner and Outer Harbour facilities including
  - shipping berths
  - mineral sands – processing, storage and export/import
  - timber – storage and export
  - alumina – storage and export
  - caustic import and storage
  - woodchip storage and export
  - copper concentration storage and export.

Figure A provides an overview of the existing infrastructure within the Koombana Bay project area.

### 2.1.3 Proposal Benefits

The benefits arising from the implementation of the proposal include:

- increasing economic activity and investment within the City of Bunbury (CoB)
- promotion of further growth of the marine industry in Bunbury and the south-west region
- facilitation of the growth of fishing and aquaculture industries in a manner that may best assist achieve their respective economic potential
- assistance in providing a hub and focus for the tourism industry within the district as a “gateway” by providing a range of facilities including accommodation, interpretation (Dolphin Discovery Centre) and tourist activities
- supplementing and extending recreational facilities via an increased marine user base within Koombana Bay adjacent to the city centre
- generation of significant rate revenue, which can be directed back to the ongoing management and maintenance of the marine infrastructure.





**Figure A: Existing Infrastructure within Koombana Bay**

## 2.2 Detailed Proposal Description

### 2.2.1 Overview

The proposal has been designed to build on the existing attractions in Bunbury’s central business district and to increase the profile of the city. The high-level proposal objectives include:

- connecting the city to the waterfront
- activating the waterfront year round
- creating a strong sense of place
- creating a tourist destination
- improving / building on the existing recreational boating facilities and infrastructure.

The proposal involves the extension of existing marine structures to meet existing demand and future requirements for small craft maritime infrastructure. Included in the proposed development are new mooring facilities for commercial and recreational vessels, floating jetties, a boat servicing facility, improved public ablution facilities and an upgraded boat launching and storage facilities.

### 2.2.2 Proposed Marine Structures

The marine structures that are the subject of the proposal were identified as “Marine Facilities Initiatives” in the Koombana Bay waterfront concept plan prepared by the SWDC. Table A identifies the marine structure, the likely key engineering works that will be required to facilitate construction and approximate development footprints (where known).

It should be noted that the Casuarina Harbour Development is a DoT led proposal and is further advanced in the detailed design when compared to the Koombana Sailing Club Marina. The preliminary design and ultimate area of impact for the Koombana Sailing Club Marina will be informed by the outcomes of future investigations.

Figure 2 indicates the extensions to the existing marine infrastructure planned by the proposal.

**Table A: Key Characteristics of the Proposal**

<b>Casuarina Harbour Development</b>	
<b>Area to be Dredged</b>	To be determined, but it estimated approximately 20,000 m <sup>2</sup> of sediment may need to be removed to realign the boating channel
<b>Internal Jetties</b>	Approximately 10–13 new floating jetties
<b>Boat Pens</b>	Approximately 400 new boating pens

<b>Area of Potential Reclamation</b>	Approximately 30,000 m <sup>2</sup> of coastal / marine environment is proposed for land reclamation
<b>Area of Potential Terrestrial Disturbance from Construction</b>	Approximately 96,000 m <sup>2</sup> of existing port development is proposed for redevelopment
<b>Breakwater Footprint</b>	Approximately 13,600 m <sup>2</sup>
<b>Koombana Sailing Club Marina</b>	
<b>Area to be Dredged</b>	To be informed by the outcomes of future investigations
<b>Internal Jetties</b>	4–6 new floating jetties
<b>Boat Pens</b>	To be advised
<b>Area of Potential Reclamation</b>	Approximately 24,200 m <sup>2</sup> is proposed for land reclamation
<b>Rock Groyne Footprint and Extension</b>	Approximately 15,100 m <sup>2</sup> , to potentially extend 360 m into the marine environment

### 2.2.3 Community Consultation

The proposal is being coordinated via the Bunbury Marine Facilities Steering Committee (BMFSC). The BMFSC was established in November 2013 and it provides strategic guidance and advice to the SWDC in relation to the project. Chaired by the Hon John Castrilli, Member of the Legislative Assembly in the Bunbury electorate, the BMFSC is comprised of the following organisations:

- Bunbury Chamber of Commerce and Industries
- SPA-PoB
- Department of Planning
- DoT
- LandCorp
- SWDC
- Department of Lands
- representatives of the Bunbury Marine Facilities Alliance (BMFA) inclusive of
  - Dolphin Discovery Centre
  - Koombana Bay Sailing Club
  - Bunbury and Districts Power Boat Club.

The BMSFC developed a concept plan for the Koombana Bay waterfront that was released for public comment in January 2014. The concept plan encompassing the following initiatives:

- master plan and development of a commercial marina and tourist hub within the existing Casuarina harbour
- expand the public boat ramp and provide public toilets and wash down area
- infrastructure that will leverage new private investment in a new marina by the Koombana Bay Sailing Club which includes installing floating jetties and boat pens as well as the construction of a new clubroom and car park within the foreshore
- development of public promenades (on rock groynes or jetty structures), incorporating fishing and swimming platforms
- redevelopment of the Dolphin Discovery Centre, including the installation of jetties
- improve / upgrade pedestrian access linking the Dolphin Discovery Centre at the eastern end of Koombana Bay and the waterfront precinct at the eastern end of the Bay
- foreshore protection structures.

A briefing session to present the concept plan for public consideration and comment was held at the Lighthouse Beach Resort on 16 January 2014 with over 140 people in attendance.

A formal public submission process ran during January 2014 that was widely advertised in the local media, the SWDC website and social media. Fifty submissions were received with over 95% of the submission in favour of the concept plan and specifically marina development at Casuarina Harbour.

The concept plan was formally endorsed by the committee in February 2014 with the resultant proposal being supported by key government and community organisations including LandCorp, DoT, CoB, SPA-PoB and the BMFA.

### 3.0 RELEVANT LEGISLATION AND REGULATIONS

#### 3.1 *Environmental Protection Act 1986*

The *Environmental Protection Act 1986* (EP Act) is the key legislative tool for environmental protection in Western Australia. The EP Act is administered by the Environmental Protection Authority (EPA) and the Minister for the Environment.

##### 3.1.1 Relevant Legislation and Regulations

The proposal will be required to comply with the requirements of other relevant pieces of state legislation and regulations. Table B provides a summary of the key state legislation and regulations relevant to the marine structures.

**Table B: Key State Legislation**

<i>Aboriginal Heritage Act 1972</i>	<i>Heritage of Western Australia Act 1950</i>
Aboriginal Heritage Regulations 1974	<i>Land Administration Act 1997</i>
<i>Bush Fires Act 1954</i>	<i>Planning and Development Act 2005</i>
<i>Conservation and Land Management Act 1984</i>	<i>Port Authorities Act 1999</i>
Conservation and Land Management Regulations 2002	<i>Rights in Water and Irrigation Act 1914</i>
<i>Contaminated Sites Act 2003</i>	<i>Soil and Land Conservation Act 1945</i>
Environment Protection Regulations 1987	Soil and Land Conservation Regulations 1992
Environmental Protection (Noise) Regulations 1997	<i>Western Australian Marine Act 1982</i>
Environmental Protection (Clearing of Native Vegetation) Regulations 2004	<i>Wildlife Conservation Act 1950</i>

The proposal is subject to compliance with applicable standards and guidelines developed by the EPA to assist proponents and the public to understand the minimum requirements for the protection of elements of the environment that the EPA expects to be met during the assessment process. Table C details the key EPA standards, guidelines and state planning policies relevant to the proposal.

**Table C: Applicable EPA Standards, Guidelines and State Planning Policies**

<b>EPA Position Statements</b>
Position Statement No. 2: <i>Environmental Protection of Native Vegetation in Western Australia</i>
Position Statement No. 3: <i>Terrestrial Biological Surveys as an Element of Biodiversity Protection</i>



<b>EPA Environmental Assessment Guidelines</b>
Environmental Assessment Guideline (EAG) No. 3: <i>Protection of Benthic Primary Producer Habitats In Western Australia's Marine Environment</i>
EAG No. 5: <i>Protecting Marine Turtles from Light Impacts</i>
EAG No. 7: <i>Marine Dredging Proposals</i>
EAG No. 8: <i>Environmental factors and objectives</i>
EAG No. 9: <i>Application of significance framework in the environmental impact assessment process</i>
Draft EAG: <i>Protecting the Quality of Western Australia's Marine Environment</i>
<b>EPA Guidance Statements</b>
Guidance Statement No. 8: <i>Environmental Noise (Draft)</i>
Guidance Statement No. 29: <i>Benthic Primary Producer Habitat Protection for Western Australia's Marine Environment</i>
Guidance Statement No. 33: <i>Environmental Guidelines for Planning and Development</i>
Guidance Statement No. 41: <i>Aboriginal Heritage Assessment</i>
Guidance Statement No. 51: <i>Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia</i>
Guidance Statement No. 56: <i>Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia</i>
<b>State Planning Policies</b>
State Planning Policy 26: <i>State Coastal Planning Policy</i>
State Planning Policy 54: <i>Road and Rail Transport Noise</i>

### 3.2 **Environment Protection and Biodiversity Conservation Act 1999**

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) protects Matters of National Environmental Significance (MNES), and is administered by the Commonwealth Minister of the Environment. If an action is likely to have a significant impact on any matter of national environmental significance a referral to Department of the Environment (DotE) is required.

MNES that relate to the project area are listed Threatened species and Migratory species protected under international agreements. Other matters protected by the EPBC Act that are of relevance to the project area are Commonwealth lands, listed marine species, whales and other cetaceans.

#### 3.2.1 **EPBC Act Consideration**

It is considered unlikely that the proposal would result in significant impacts occurring to MNES to warrant referral of the proposal to the DotE under the EPBC Act.

### 3.2.2 Disposal of Dredged Material

In Australia, ocean disposal of dredged material both within and outside state and territory waters is regulated by the Commonwealth Department of the Environment under the *Environment Protection (Sea Dumping) Act 1981* and the National Assessment Guidelines for Dredging (NAGD) (CA 2009).

Given the economics of dumping dredge spoil in Commonwealth waters and the importing of clean fill compared to any treatment requirements to enable dredge spoil to be reused within the project area, it is the proponent's preference for the excavated dredge spoil be used either as engineering fill (subject to geotechnical and contamination assessment) within the proposed reclamation areas, or to replenish erosion-prone local beaches.

However, in the circumstance that spoil from the dredging works is required to be disposed at sea in Commonwealth waters a referral will be required in accordance with the Sea Dumping Act.

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## 4.0 ENVIRONMENTAL FACTOR OVERVIEW

The environmental factors relevant to the proposal have been reviewed under following key themes of sea, land, and people in accordance with the EPA's Environmental Assessment Guidelines (EAG) No. 8 *Environmental Factors and Objectives*:

- sea-themed factors
  - benthic communities and habitat
  - coastal processes
  - marine environmental quality
  - marine fauna
- land-themed factors
  - flora and vegetation
  - terrestrial environmental quality
  - terrestrial fauna
- people-themed factors
  - amenity (noise and air quality)
  - Aboriginal and European
  - human health.

### 4.1 Strategic Public Environmental Review (SPER) for the Expansion of the Inner Harbour

The following section of this report reviews a series of studies undertaken in the Koombana Bay domain for each of these themes. In 2013, GHD was commissioned by the Port of Bunbury to undertake a series of studies required to inform the Strategic Public Environmental Review (SPER) for the expansion of the Inner Harbour. These studies are complete and will be referred to the EPA in May 2015 for assessment and then be made available for public consultation. The data included in these studies are directly relevant to the Koombana Bay Marine Structures project and, once available to the public, will be available to inform the Koombana Bay Marine Structures proposal. The key GHD studies include:

- benthic habitat assessments
- marine fauna investigations
- marine environmental technical investigation (marine modelling)
- noise modelling
- air quality modelling
- terrestrial investigations (flora, fauna and wetlands)
- shorebird study
- groundwater quality investigation
- surface water quality investigation

- European heritage
- Aboriginal heritage
- delta investigations (Stages 1, 2 and 3)
- hydrodynamic modelling of Leschenault Estuary.

The study area for this project as shown in Figure B includes the existing development area, Koombana Bay, Leschenault Inlet, Leschenault Estuary and Vittoria Bay.



**Figure B: Strategic Public Environmental Review (SPER) for the Expansion of the Inner Harbour Study Area**

Further, where applicable, the environmental data and studies from the Landco Resources Berth 14A PER would also be used to inform the Koombana Bay Marine Structures proposal. The key Berth 14A PER studies includes:

- hydrodynamic and sediment transport modelling
- marine environmental quality studies
- marine sediment sampling and analysis report
- benthic habitats near Bunbury
- marine fauna studies
- groundwater assessment
- underwater construction noise impact assessment.

## 5.0 SEA-THEMED FACTORS

Informed by pre-referral discussions with the Chairman of the EPA, and the OEPA, the assessment and management of the following key sea-themed environmental factors will form the basis of this Section 38 referral:

1. Benthic communities and habitat.
2. Coastal processes.
3. Marine environmental quality.
4. Marine fauna.

### 5.1 Benthic Communities and Habitat

Benthic primary producer habitats (BPPH) are seabed communities within which algae (e.g. macroalgae, turf and benthic microalgae), seagrass, mangroves, corals or combinations of these groups are prominent components. Benthic primary producer habitats also include sections of seabed that can support these communities.

RPS notes white mangroves are present in the Leschenault Inlet and represent the most southerly occurrence of this species in Western Australia. The mangroves are within approximately 1 km of the proposed Koombana Bay marine structure project area.

Historical benthic habitat studies within Koombana Bay have adopted a range of techniques from broad-scale habitat mapping including snorkel and dive surveys to towed video surveys.

Key outcomes from the various surveys include:

- The most widespread habitat within Koombana Bay and the Leschenault Inlet is unvegetated soft sediments, with low biotic cover (<2%) and trace amounts of foliose and turf algae (Parsons Brickerhoff 2012).
- Areas of consolidated reef to the north-east of the Inner Harbour were observed to have moderate biotic cover, dominated by foliose algae (22%) and a low cover (<6%) of the canopy forming brown kelp *Ecklonia radiata* (Wave Solutions 2011).
- No significant areas of seagrass were observed within Koombana Bay (Wave Solutions 2011). However, Oceanica (2008) observed very low cover of non-meadow forming seagrass species in the inshore areas of Koombana Bay.

Figure 3 shows the mapped extent of benthic communities and habitat in Koombana Bay.

## 5.2 Coastal Processes

Koombana Bay is partially protected by a breakwater that extends seaward from Point Casuarina. Prior to the construction of the breakwater, the embayment was formed by the basalt rock outcrop off Casuarina Point and submerged reef that extends in a north-east direction. Koombana Bay has a mean depth of seven metres (m) with the dredged shipping channel, approximately 250 m wide and 13 m deep, running north to south across the bay. The north-west corner of the bay has also been dredged to create the Outer Harbour (Wave Solutions 2012a).

The key influences on coastal processes (sediment movement) within Koombana Bay include:

- Koombana Bay sediment is predominately comprised of bare sand and silt with the exception of a line of reef on the north-eastern margin of the bay. The centre of Koombana Bay is characterised by fine silt (<65 µm) while fine sand occurs along Koombana Beach
- historical anthropogenic shoreline modifications including jetties and breakwaters (Figure A)
- tidal exchange between “the Cut” connecting the Bay to the Leschenault Estuary and “the Plug” between the Leschenault Inlet and Koombana Bay
- wave heights and water level fluctuations.

### 5.2.1 Leschenault Inlet/Estuary

The project area is connected to the Leschenault Inlet through an opening locally referred to as “the Plug”.

The Leschenault Estuary is a shallow, elongated water body, lying roughly north to south and separated from the Indian Ocean by a sand dune peninsula. The estuary is approximately 25 square km and about 13.5 km long, up to 2.5 km wide, and 1.2 m to 2 m deep. During the past century, the lower reaches of the Leschenault Estuary has been significantly modified by human activity, with the result that the estuary has been divided into two water bodies:

- Leschenault Inlet, once the mouth of the Preston River, now a semi-confined water body/lagoon located immediately south of the Koombana Bay and linked via “the Plug”
- Leschenault Estuary a larger water body into which the Collie and Preston rivers flow and linked to Koombana Bay via “the Cut”
- Leschenault Inlet supports the most southern white mangroves in Western Australia.

The tidal marine exchange through the opening at “the Cut” Leschenault Estuary is locally an important factor. The tidal exchange influences both sediment movement within Koombana Bay, and water quality. Shore Coastal (2009) assessment identified an estimated 170,000 m<sup>3</sup> of sediment is estimated to accumulate annually in Koombana Bay. Over 50 per cent of this sediment is fine silt material, believed to be mobilised from the estuary via “the Cut” (Shore Coastal 2009).

The movement of sediment within Koombana Bay and its physical property will be a key consideration in quantifying the potential impacts from dredging and /or the construction of breakwaters.

The available water quality data suggests seasonally variable nutrient concentrations within Koombana Bay, with nutrient levels peaking in late winter. The likely source of the seasonal increase in nutrients locally is likely from the winter stormwater from the surrounding residential catchment. Regionally increases in nutrients are from agricultural catchment discharging in the Collie and Preston rivers then draining into the Leschenault Inlet. The water exchange between the Leschenault Inlet and Koombana Bay will need to be investigated and included in any hydrodynamic modelling assessment.

High mean wave heights and mean winter water levels appear to be the main processes driving high siltation periods (Shore Coastal 2009). A second process, causing the ongoing accumulation of fine silts in the shipping channel, has been attributed to a combination of detritus carried from seagrass and macroalgae benthic assemblages from the coastal system and fine silt discharged from the Leschenault Estuary through “the Cut” (Shore Coastal 2009).

### 5.2.2 Tides

The tides at Bunbury are micro-tidal and mixed diurnal–semi-diurnal character (although predominantly diurnal), which is typical of south Western Australia. Tides have a typical range of 0.7 m or less between highs and lows. Other fluctuations due to pressure systems, storm surges or coastal waves can create larger fluctuations in water level (Wave Solutions 2012a). The maximum high water is 1.3 m and the minimum low water is 0.0 m above Chart Datum (Naval Research Laboratory 2014).

Koombana Bay is open on the northern boundary to the adjacent ocean, allowing for large scale wind driven circulation to flush the area.

## 5.3 Marine Environmental Quality

The numerous environmental quality studies have been undertaken for the PoB as part of development of the port, previous dredging and placement of dredged material activities, and environmental compliance have identified:

- There is a correlation between rainfall and river flow from the Preston River and water quality (turbidity and nutrient levels) within Koombana Bay.
- Turbidity levels within Koombana Bay are more variable and likely to be influenced by river inflows and tidal exchange from the Leschenault Estuary, wind speed and direction, wave height, and re-suspension of bottom sediment (Wave Solutions 2012a).
- Analysis of metals in the marine sediment identified that arsenic levels were above the screening level (20 mg/kg), at the Inner Harbour, Outer Harbour and sites around Koombana Bay. The distribution of the elevated arsenic concentrations in water suggest this is naturally occurring outside of the port area (Wave Solutions 2012a).
- In addition to arsenic, previous studies have identified exceedances in nickel and cadmium in the Inner Harbour; however these exceedances have not been evident from any further studies after 2009.
- Polychlorinated biphenyls, organochlorine pesticides and aromatic hydrocarbons were below detection levels in the marine sediment quality testing.
- It is noted that GHD completed an Environmental Quality Marine Framework (WQMF) that includes Koombana Bay in 2014.

### 5.3.1 Marine Water and Sediment Quality Monitoring

The PoB has an ongoing marine water and sediment quality monitoring program as part of its long term dredge management plan. Since May 2008, monitoring of the Inner Harbour has been conducted every six months, with an annual comprehensive monitoring program that includes the Inner Harbour, Outer Harbour, shipping channel, spoil ground and ocean reference sites.

The PoB marine water and sediment quality sampling site locations in the Outer Harbour of Koombana Bay and reference sites are shown in Figure 4.

### 5.3.2 Groundwater Flow

When groundwater flows into the ocean environment it can influence the marine water quality. The key influencing groundwater aquifer is the superficial Southern Perth Basin which exhibits both fresh groundwater and brackish water quality. This aquifer is more sensitive to the effects of anthropogenic and seasonal inputs (e.g. fertilisers) from the surface.

Seasonal groundwater discharging into Koombana Bay may influence the marine water movement and water quality.

### 5.3.3 Koombana Bay Tidal Flushing

Tidal flushing investigations completed for Lanco's proposed Bunbury Port Berth 14A Expansion and Coal Storage and Loading Facility (Wave Solutions 2012a) identified the following information of relevance to the proposal:

- E-folding times<sup>1</sup> are relatively fast in the bay; ranging from four to six days, and relatively slow in the Inner Harbour; ranging from 40 to 90 days. The harbour has a restricted entrance, limiting the flushing rate.
- The month with the highest e-folding values within Koombana Bay was May. This was created by the lower winds and currents at this time of the year. The higher e-folding time or flushing of the bay results in lower dispersion rates of any turbidity plume.
- The variation of flushing rates modelled by Wave Solutions (2012a) provides a useful tool for identifying potential "hot spots" due to low water exchange. These hot spots serve as risk indicator for sites within Koombana Bay.

## 5.4 Marine Fauna

### 5.4.1.1 Marine Mammals

Bottlenose dolphins (*Tursiops* spp.) are a Listed Marine Species under the EPBC Act and have a strong local importance to Bunbury, and in particular Koombana Bay which has a resident dolphin population and the Dolphin Discovery Centre, which permits and controls dolphin feeding, swimming and wading with dolphins. Dolphin abundance varies seasonally within Koombana Bay, with greater numbers occurring during summer and autumn. Calving activity generally commences in December and peaks in February with females dolphins forming nursery groups within Koombana Bay. The birthing season is also a critical time to dolphin populations as newborn calves are particularly vulnerable to disturbance.

Whales may pass close to the Bunbury coastline during annual migrations. Furthermore, mother and calves may occupy protected waters close to shore. The coastline of Bunbury does not represent a frequent or regular habitat for the majority of whales.

### 5.4.1.2 Fisheries

The blue swimmer crab is locally an important fishery. The distribution of blue swimmer crabs extends along Western Australia's entire coast with most of the fished stock concentrated in coastal embayments between Geographe Bay and Port Hedland.

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<sup>1</sup> E-folding is an analysis of tidal flushing i.e. residence times.

The crab is known to spawn in Koombana Bay. Mean monthly densities of crabs, in nearshore, shallow waters of the Leschenault Estuary, were highest between mid-spring and mid-autumn and declined to very low or zero levels during winter and early spring (Wave Solutions 2012b).



## 6.0 LAND-THEMED FACTORS

The assessment and management of the following land-themed factors will be addressed through future Section 48 referrals for the terrestrial-based components of the derived proposals:

1. Vegetation and flora.
2. Terrestrial environmental quality.
3. Terrestrial fauna.

### 6.1 Vegetation and Flora

Since European settlement the project area has seen significant modification with clearing of most of the native vegetation within the Koombana Bay foreshore area.

The vegetation and flora surveys provided in the proposed Bunbury Port Berth 14A Expansion and Coal Storage Facility PER and the Bunbury Waterfront Project (Koombana North and Marlston North) found very few (six species) native species with no conservation significant flora species identified.

The EPA provided advice to the Department of Planning in 2008 stating that the Bunbury Waterfront Project raised “no significant terrestrial environmental issues, as such would not warrant assessment by the EPA”.

### 6.2 Terrestrial Environmental Quality

#### 6.2.1 Acid Sulfate Soils

Sediment cores were collected and analysed at the Inner Harbour (Berth 14) by Parsons Brinckerhoff (2012a) to identify the potential for soils to contain pyrite and other iron sulfides that might lead to an ASS problem if disturbed. Results from this study indicate soils within three metres of the actual ground surface are generally pH neutral or slightly alkaline and therefore a low risk for acid generating potential. However, this study identified the potential for ASS at depths below 7.0 m below ground level (BGL).

Similarly, ASS test results from Koombana North for the Bunbury Waterfront Development showed limited ASS present on site, even though the site is adjacent to the Leschenault Inlet. Cores and excavations of 3 m BGL were sampled across the site with the majority of material excavated considered non-ASS. However, the key recommendations from this study was an ASS Management Plan would need to be prepared if large-scale disturbance (excavation) was to be undertaken.

The Parsons Brinckerhoff (2008) report for the land around the Inner Harbour did identify soil at high risk of ASS if exposed. The land investigated for the 2008 study was however for land east of the Inner Harbour and is not impacted by this Project.

### 6.3 Terrestrial Fauna

Historical clearing at the Koombana Bay has resulted in the removal of the vast majority of original habitat and fauna populations. The majority of the foreshore vegetation has generally been planted (e.g. Norfolk pines and grass). Fauna habitat that does exist is limited to the foreshore east of the Koombana Sailing Club (Plate I).



**Plate I: Foreshore Vegetation on the Primary Dune Looking East Toward the Dolphin Discovery Centre**

The potential for terrestrial fauna species of conservation significance to occur in the project area is considered low due to a lack of preferred natural habitat. Due to the predominantly marine environment of the proposal it is considered unlikely that significant impacts would occur to any conservation significant terrestrial fauna species (if present).

#### 6.3.1.1 Waterbirds and Shorebirds

Waterbirds and shorebirds currently using the project area, including the Koombana Bay beach areas, are already subject to high levels of human activity. Informed by the findings of the waterbird and shorebird investigations undertaken to support the expansion of the Bunbury Port Inner Harbour, and given the predominantly marine nature of the proposal, it is considered that the implementation of the derived proposals would be unlikely to result in significant impacts to any conservation significant waterbird or shorebird species known to utilise the limited foreshore environment within the project area.

## 7.0 PEOPLE-THEMED FACTORS

The assessment and management of the following people-themed factors will be addressed through future Section 48 referrals for the terrestrial-based components of the derived proposals:

1. Amenity.
2. Heritage.
3. Human Health.

### 7.1 Amenity

The potential for noise and vibrations to affect amenity in the area is a concern for local residents and businesses. However, the Koombana Bay area is already subject to noise emissions from the port, other industrial operations and regional roads.

Cumulative noise studies have previously been conducted for the PoB for the Bunbury Port Inner Harbour Expansion. The focus of this study was to create a noise model of the cumulative noise emissions from the port operations. The study identified:

- During daytime and evenings, the dominant noise impact is from traffic noise (Australind Bypass, Koombana Drive and Estuary Drive).
- The majority of noise generated from the Inner Harbour is masked by traffic noise from regional roads.
- The expanded port would have minimal effect on ambient noise levels within adjacent urban areas.

This cumulative noise monitoring and modelling is carried out biannually, or if there is a significant change to port operations. Monitoring occurs in all lease and common use areas within the Port Reserve (Inner and Outer Harbour), Koombana Drive, Estuary drive and the Port Access Road and residential receiver locations in East Bunbury, Pelican Point and the Koombana Bay Holiday Village (BPA 2012).

Construction and operational noise generated from the marine structures project has the potential to impact the amenity of nearby residents temporarily, as well as terrestrial and marine fauna. It is important to protect the amenity of nearby residents from noise impacts resulting from activities associated with the proposal by ensuring the noise levels meet statutory requirements and acceptable standards.

## **7.2 Heritage**

### **7.2.1 Aboriginal Heritage**

A search of the Department of Aboriginal Affairs' (DAA) *Aboriginal Heritage Inquiry System* was undertaken on 22 January 2015 with no matches were recorded for the project area.

### **7.2.2 European**

A search of the Heritage Council's *inHerit* database was undertaken 22 January 2015 with no current heritage sites or reports found for the project area.

## **7.3 Human Health**

A search of the Department of Environment Regulation's (DER) *Contaminated Sites* database was undertaken on 22 January 2015 with no matches recorded for the project area.

The Marlston area has been subject to an extensive EPA approved remediation assessment and validation process.

## 8.0 ENVIRONMENTAL IMPACT MITIGATION MEASURES

Potential environmental impact mitigation measures to manage the key environmental factors have been recommended in accordance with the application of EAG No. 9: *Application of a Significance Framework in the Environmental Impact Assessment Processes*.

### 8.1 Key Environmental Factors

The assessment and potential management of the key sea-themed environmental factors will form the basis of this Section 38 referral.

Table D to Table G summarise the policy context that will be followed and potential environmental mitigation measures for these environmental factors, identified as having greater potential to be significantly impacted by the proposal.

#### 8.1.1 Other Environmental Factors

The assessment and management of the remaining environmental factors will be addressed through future Section 48 referrals for the terrestrial-based components of the derived proposals.

Table H to Table M summarise the policy context that will be followed and potential environmental mitigation measures for the remaining environmental factors, identified as having significantly less potential to be impacted by the proposal.

**Table D: Policy Context and Potential Mitigation Measures for Benthic Communities and Habitats**

<b>EPA Objective</b>	To maintain the structure, function, diversity, distribution and viability of benthic communities and habitats at local and regional scales
<b>Applicable Legislation and / or Guidelines</b>	<ul style="list-style-type: none"> <li>▪ EAG No. 3: <i>Protection of Benthic Primary Producer Habitats in Western Australia’s Marine Environment.</i></li> <li>▪ EAG No. 7: <i>Marine Dredging Proposals.</i></li> <li>▪ Draft EAG No. 15: <i>Protecting the Quality of Western Australia’s Marine Environment.</i></li> </ul>
<b>Existing Environment</b>	<p>Various studies within Koombana Bay and the Bunbury Port suggest the area is highly unlikely to support significant seagrass meadows or extensive macro algal communities. The benthic habitat is expected to be predominantly bare, un-vegetated sand. However, it is likely that the area may be important feeding or nursery grounds for blue swimmer crabs. In addition, there are white mangroves located in the Leschenault Inlet within approximately 1 km of the Koombana Bay project site.</p> <p>Management of benthic habitat (including mangroves) will depend on the outcomes from dredge requirements and hydrodynamic and sediment modelling. If there is a low dredge volume required the impacts to marine water quality and benthic habitats is also likely to be considered low.</p> <p>Benthic communities and habitat were a key environmental factor in the consideration of the Inner Harbour Expansion PER with the EPA requiring further detailed evaluation.</p> <p>Benthic communities and habitat related environmental issues (loss of seagrass and loss of benthic habitat) were also raised for the Bunbury Waterfront Project by the EPA.</p>
<b>Potential Impacts</b>	<p>The construction of the marine structures will disturb areas of shallow water that potentially provides a substrate to support marine benthic habitats and communities. There is the potential for water quality impacts during and post construction phase on the mangroves in the Leschenault Inlet. Temporary construction impacts are likely to include indirect disturbance to benthic fauna and flora in the project area, associated with increased turbidity during the dredging/pile-driving process. The tolerances of aquatic organisms to increased turbidity levels are highly variable (Wilber et al. 2005) and impacts will depend on the sediment load and duration of exposure. The impacts to benthic fauna are potentially greater if the sediments disturbed during construction contain elevated levels of contaminants, and this is not appropriately managed.</p> <p>Direct impacts associated with construction will be limited to sessile and slow-moving benthic organisms occurring in the direct path of pile driving and/or dredging.</p> <p>Operational impacts will be long-term and include the shading or smothering of benthic communities and habitat. The shading produced by the structures may preclude the growth of benthic communities and habitat in some near shore areas of Koombana Bay.</p>
<b>Proposed Investigations</b>	<p>To be confirmed after Level of Assessment determination by the EPA.</p> <ul style="list-style-type: none"> <li>▪ GHD (2014) has updated the noise modelling work and the potential buffers for the City of Bunbury. These data and modelling will be available for the EPA’s investigations.</li> <li>▪ GHD (2014) completed a benthic impact assessment for the PoB that included the Koombana Bay area. Impacts of the activity associated with this Project will be readily assessed with this data and include, if required, the cumulative impact that may occur as a result of any PoB activities.</li> </ul>

<b>Potential Management Measures</b>	<ol style="list-style-type: none"> <li>1. Quantify direct and indirect (e.g. turbidity) impacts (or potential cumulative loss) to benthic communities and habitats including the mangroves in the Leschenault Inlet from the construction marine structures and dredging in the context of EAG No. 3: <i>Protection of Benthic Primary Producer Habitats in Western Australia's Marine Environment</i>.</li> <li>2. Impacts to benthic communities and habitats will be addressed through the implementation of project specific Dredge and Spoil Disposal Management Plan (DSDMP) and Construction Management Plan (CMP). These plans will include water quality and benthic habitat monitoring which would be employed during dredging and construction phases.</li> <li>3. Management triggers for benthic habitats will be adopted in the DSDMP and CMP.             <ol style="list-style-type: none"> <li>(a) Benthic community and habitat monitoring and triggers will be established (if not already established) in cooperation with EPA.</li> <li>(b) Silt curtains will be employed, e.g. for reclamation and revetment wall works to restrict silt movement.</li> </ol> </li> </ol>
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**Table E: Policy Context and Potential Mitigation Measures for Coastal Processes**

<b>EPA Objective</b>	To maintain the morphology of the sub-tidal, intertidal and supratidal zones and the local geophysical processes that shape them
<b>Applicable Legislation and / or Guidelines</b>	State Planning Policy (SPP) 2.6: <i>State Coastal Planning Policy</i>
<b>Existing Environment</b>	Coastal landforms and processes in Koombana Bay have been substantially altered by existing coastal development and existing marine infrastructures. The Koombana Bay foreshore at its eastern end is undergoing significant regression.
<b>Potential Impacts</b>	Construction of groynes / breakwaters may have an impact upon the local landform and processes by altering local sediment movement and deposition (e.g. cause erosion on neighbouring beaches). The key risk is the shoreline and foreshore within Koombana Bay may be impacted by the proposed marine structures and require ongoing and long-term management to control localised areas of erosion or accretion.
<b>Proposed Investigations</b>	To be confirmed after Level of Assessment determination by the EPA. GHD (2014) completed a benthic impact assessment for the PoB that included the Koombana Bay area. Impacts of the activity associated with this Project will be readily assessed with this data and include, if required, the cumulative impact that may occur as a result of any PoB activities.
<b>Potential Management Measures</b>	<p>A Foreshore Management Plan (FMP) for Koombana Bay will need to be developed, in collaboration with the DoT, City of Bunbury and the PoB, to ensure that the impact of all coastal structures is accounted for and coastal processes are managed efficiently.</p> <p>The “whole foreshore” management plan will be based upon the outcomes of the coastal processes assessment. The FMP will include an analysis of foreshore monitoring and modelling results to identify any areas of sediment accretion or erosion. The FMP would also outline any long-term requirements for management such as any localised sand nourishment for instance in identified localised erosion prone areas if required.</p> <p>In assessing the management options for Koombana Bay the following adaptation measures will likely need to be considered by a coastal engineer after the coast processes assessment:</p> <ul style="list-style-type: none"> <li>▪ building design</li> <li>▪ coastal protection</li> <li>▪ beach nourishment and profile enhancement to manage the assessed erosion hazard.</li> </ul>

**Table F: Policy Context and Potential Mitigation Measures for Marine Environmental Quality**

<b>EPA Objective</b>	To maintain the quality of water, sediment and biota so that the environmental values, both ecological and social, are protected.
<b>Applicable Legislation and / or Guidelines</b>	<ul style="list-style-type: none"> <li>▪ EAG No. 3: Protection of Benthic Primary Producer Habitats in Western Australia’s Marine Environment.</li> <li>▪ EAG No. 7: Marine Dredging Proposals.</li> <li>▪ Draft EAG: Protecting the Quality of Western Australia’s Marine Environment.</li> <li>▪ Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ ARMCANZ 2000).</li> <li>▪ Australian and New Zealand National Ocean Disposal Guidelines for Dredged Material (Commonwealth of Australia 2002).</li> <li>▪ State Water Quality Management Strategy Document No. 6 (DoE 2004).</li> <li>▪ Perth’s Coastal Waters: Environmental Values and Objectives, Environmental Protection Authority Position Statement (EPA 2000).</li> </ul>
<b>Existing Environment</b>	<p>The numerous environmental quality studies have been undertaken for the PoB as part of development of the port, previous dredging and placement of dredged material activities, and environmental compliance have identified:</p> <ul style="list-style-type: none"> <li>▪ There is a correlation between rainfall and river flow from the Preston River and water quality (turbidity and nutrient levels) within Koombana Bay.</li> <li>▪ Turbidity levels within Koombana Bay are more variable and likely to be influenced by river inflows and tidal exchange from the Leschenault Estuary, wind speed and direction, wave height, and resuspension of bottom sediment (Wave Solutions 2012a).</li> <li>▪ Analysis of metals in the marine sediment identified arsenic levels were above the screening level (20 mg/kg), at the Inner Harbour, Outer Harbour and sites around Koombana Bay. The distribution of the elevated arsenic concentrations in water suggest this is naturally occurring outside of the port area (Wave Solutions 2012a) including the ocean reference sites.</li> <li>▪ Polychlorinated biphenyls, organochlorine pesticides and aromatic hydrocarbons were below detection levels in the marine sediment quality testing.</li> </ul>
<b>Potential Impacts</b>	<ul style="list-style-type: none"> <li>▪ Dredging activity may result in the smothering or removal of seagrass within or outside of Koombana Bay<sup>1</sup>.</li> <li>▪ Dredging activity will result in the creation of a turbidity plume resulting from seabed sediments becoming mobilised and resuspended in the water column. Dredging activity is likely to reduce temporarily light available to seagrass and may cause avoidance behaviour in marine fauna.</li> <li>▪ Dredging activities may potentially release ASS, metals and other toxicants into the water column that have the potential to impact upon benthic communities within the predicted dredge plume.</li> <li>▪ Dredge spoil from the project site may contain ASS.</li> <li>▪ Dredging and construction activities such as rock dumping during groyne/breakwater construction will affect turbidity levels in the immediate vicinity of these activities in Koombana Bay.</li> <li>▪ Construction of the Koombana Sailing Club Marina may create a water body with the capacity to retain marine water for extended periods. Poor flushing of the water body could create conditions suitable for algal blooms or other water quality issues, which may in turn have broader implications for water quality and ecosystem health within Koombana Bay.</li> </ul>



<b>Proposed Investigations</b>	<p>To be confirmed after Level of Assessment determination by the EPA.</p> <p>A hydrodynamic model was prepared by GHD 2014 where Koombana Bay and surrounding waters were included in the modelling domain. The impact of the activity proposed for this Project area will be readily modelled, taking into account, if required, the cumulative impact of dredging undertaken by the PoB and dredging required for construction activities associated with this proposal.</p>
<b>Potential Management Measures</b>	<ol style="list-style-type: none"> <li>1. Identify potential use, treatment and disposal methodology for dredge spoil.</li> <li>2. Manage any predicted impacts to benthic communities and habits resulting from dredging activities.</li> <li>3. Preparation of the EQMF for the area has been completed and will guide marine monitoring and standards.</li> <li>4. Impacts to marine environmental quality (through the EQMF) will be addressed through the implementation of project specific DSDMP and CMP which will include:             <ol style="list-style-type: none"> <li>(a) Water quality parameters and triggers established during the long-term marine monitoring program for the Bunbury Port Inner Harbour Structure Plan.</li> <li>(b) Samples will be assessed against ANZECC and ARMCANZ and State Water Quality Management guidelines.</li> </ol> </li> <li>5. If it is proposed to dispose of dredge material within Commonwealth waters a Sea Dumping Permit under the <i>Sea Dumping Act 1981</i> will need to be referred to the Commonwealth DotE.</li> </ol>

<sup>1</sup> The two common seagrass genera (*Halophila* spp. and *Heterozostera* spp.) found in Koombana Bay are ephemeral and dynamic species which are able to recover from disturbances, and are capable of recolonising from sediment seed stocks, drifting fragments, and adjacent specimens via runners (Paling et al. 2006).

**Table G: Policy Context and Potential Mitigation Measures for Marine Fauna – Dolphins**

<b>EPA Objective</b>	To maintain the diversity, geographic distribution, and viability of fauna at the species and population levels
<b>Applicable Legislation and / or Guidelines</b>	<ul style="list-style-type: none"> <li>▪ <i>Wildlife Conservation Act 1950</i></li> <li>▪ Guidance Statement No. 8: <i>Environmental Noise</i> (Draft)</li> </ul>
<b>Existing Environment</b>	Studies undertaken to date have identified 196 individual dolphins occurring in the region. Dolphin abundance varies seasonally, with greater numbers occurring during summer and autumn.
<b>Potential Impacts</b>	<ul style="list-style-type: none"> <li>▪ Expansion works that require the construction of breakwater, piling, reclamation and dredging present a potential risk to marine fauna, especially dolphins that inhabit Koombana Bay.</li> <li>▪ Vessel movements in the project area have the potential to collide with marine fauna, in particular fauna that are required to come to the surface to breathe (mammals, birds and reptiles).</li> </ul>
<b>Proposed Investigations</b>	<p>To be confirmed after Level of Assessment determination by the EPA.</p> <p>GHD (2014) undertook an assessment of the potential impact construction activity for the expansion of the PoB may have to marine fauna. This assessment included consultation with the Dolphin Discovery Centre and it may be readily updated to include potential impacts as they occur in the project area.</p>

<p><b>Potential Management Measures</b></p>	<ol style="list-style-type: none"> <li>1. Liaison with the Dolphin Discovery Centre concerning the management of dolphins during construction activities will be undertaken to ensure that such activities can be conducted with negligible risk to dolphins.</li> <li>2. Application of methodologies, such as socketing and/or pinning the piles during construction, to reduce underwater noise generation.</li> <li>3. Engagement of construction contractors experienced in drilling in marine environments in situations where noise and vibration impacts need to be considered.</li> <li>4. Marine fauna (dolphin) monitoring will be undertaken by dedicated marine fauna observers during dredging works or marine (groyne / jetty piling) construction works. Management of marine fauna (e.g. dolphin monitoring and siting during construction work, regulating the timing of works) will be addressed within the DSDMP and CMP.</li> <li>5. Dredge activities will be limited to winter months (April to October) to avoid the peak dolphin calving period and the majority of the blue swimmer crab spawning season.</li> <li>6. Ongoing education program for boat users will be implemented to control against the negative impacts (boat strikes) that vessel movements have on marine fauna.</li> <li>7. Release of solid and liquid wastes, their associated impacts and ways to reduce environmental impacts will be addressed as specific aspects in the CMP.</li> </ol>
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**Table H: Policy Context and Potential Mitigation Measures for Flora and Vegetation**

<p><b>EPA Objective</b></p>	<p>To maintain representation, diversity, viability, and ecological function at the species, population and community level</p>
<p><b>Applicable Legislation and / or Guidelines</b></p>	<ul style="list-style-type: none"> <li>▪ <i>Wildlife Conservation Act 1950.</i></li> <li>▪ <i>Position Statement No. 2: Environmental Protection of Native Vegetation in Western Australia Clearing of Native Vegetation.</i></li> <li>▪ <i>Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection.</i></li> <li>▪ <i>Guidance Statement No. 51: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia.</i></li> <li>▪ <i>SPP 2.6: State Coastal Planning Policy.</i></li> </ul>
<p><b>Existing Environment</b></p>	<p>The Kooibana Bay foreshore has been significantly modified since European settlement. Because of historical development there is very little remnant native vegetation existing within the Kooibana Bay foreshore area.</p>
<p><b>Potential Impacts</b></p>	<p>Although a low risk, there is the potential for the proposed marine structures (e.g. rock groynes) to influence the erosion / accretion (or coastal process) along the foreshore. These changes may impact on remnant vegetation in the foreshore environment.</p>
<p><b>Proposed Investigations</b></p>	<p>To be confirmed after Level of Assessment determination by the EPA.</p>
<p><b>Potential Management Measure</b></p>	<p>FMP will detail the long-term management of coastal processes, access / people management and revegetation of the foreshore environment.</p>

**Table I: Policy Context and Potential Mitigation Measures for Terrestrial Environmental Quality – Acid Sulfate Soils**

<b>EPA Objective</b>	To maintain the quality of land and soils so that the environment values, both ecological and social, are protected
<b>Applicable Legislation and / or Guidelines</b>	<ul style="list-style-type: none"> <li>▪ <i>Assessment Levels for Soil, Sediment and Water</i> (Department of Environment and Conservation (DEC) 2010a).</li> <li>▪ <i>Acid Sulfate Soils Guideline Series</i>.</li> <li>▪ <i>Treatment and Management of Soils and Water in Acid Sulfate Soil Landscapes</i> (DEC 2011).</li> <li>▪ <i>Identification and Investigation of Acid Sulfate Soils and Acidic Landscapes</i> (DEC 2013).</li> </ul>
<b>Existing Environment</b>	<p>ASS soils if disturbed and not managed can result in oxidation, with release of acidity and resultant water-quality impacts, and corrosive impacts to infrastructure, however the marine/estuarine setting of the project provides significant acid buffering in the form of naturally alkaline marine waters.</p> <p>Based on the recent ASS and sediment investigations undertaken by Parsons Brinckerhoff (2012a), the soils within 3 m of the ground surface were reported to be pH neutral or slightly alkaline, and have natural acid buffering capacity. The literature review has not confirmed the reactivity of sediments and their pyrite content, albeit it is expected that the majority of sediments to contain pyrite and that they would be classified as PASS.</p>
<b>Potential Impacts</b>	<ul style="list-style-type: none"> <li>▪ Acidification and release of heavy metals from ASS into the marine environment, groundwater and the Leschenault Inlet.</li> <li>▪ Deterioration of ecosystems associated with soils, groundwater, wetlands and Koombana Bay environments.</li> <li>▪ Corrosion of concrete structures such as bridges, piles, pylons, drainage pipes.</li> </ul>
<b>Proposed Investigations</b>	To be confirmed after Level of Assessment determination by the EPA.
<b>Potential Management Measures</b>	A detailed ASS investigation and Dewatering Management Plan will be prepared and implemented to the satisfaction of the DER.

**Table J: Policy Context and Potential Mitigation Measures for Terrestrial Fauna (Waterbirds / Migratory Birds)**

<b>EPA Objective</b>	To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.
<b>Applicable Legislation and / or Guidelines</b>	<ul style="list-style-type: none"> <li>▪ <i>Wildlife Conservation Act 1950.</i></li> <li>▪ Position Statement No. 3: <i>Terrestrial Biological Surveys as an Element of Biodiversity Protection.</i></li> <li>▪ Guidance Statement No. 56: <i>Terrestrial Fauna Surveys for Environmental Impact Assessment in WA.</i></li> </ul>
<b>Existing Environment</b>	Recent shorebird and waterbird surveys conducted within Koombana Bay, and the greater Bunbury area, have not identified significant numbers of waterbirds / migratory birds within Koombana Bay. It is considered that the Koombana Bay foreshore has very limited foraging or nesting habitat for these species.
<b>Potential Impacts</b>	Given the relatively limited amount of fauna habitat available within Koombana Bay when compared to the large extent of these habitats in similar or better condition remaining in the South West region, and the landholding's location in close proximity to the Bunbury central business district and the Bunbury Port, it is considered that the potential for significant impacts to conservation significant waterbird and migratory bird species identified as potentially occurring in the project area is likely to be low.
<b>Proposed Investigations</b>	To be confirmed with OEPA at the derived proposal stage.
<b>Potential Management Measures</b>	FMP will detail the long-term management of coastal processes, access / people management and revegetation of the foreshore environment. The proposed revegetation / landscape response, with a focus on planting native vegetation species, may increase the amount of habitat available for terrestrial fauna, and therefore the population and diversity of terrestrial fauna species that may utilise the area.

**Table K: Policy Context and Potential Mitigation Measures for Amenity – Noise and Vibration**

<b>EPA Objective</b>	To ensure that impacts to amenity are reduced as low as reasonably practicable
<b>Applicable Legislation and / or Guidelines</b>	<ul style="list-style-type: none"> <li>▪ Environmental Protection (Noise) Regulations 1997.</li> <li>▪ Guidance Statement No. 8: <i>Environmental Noise (Draft).</i></li> </ul>
<b>Existing Environment</b>	The project area is situated in close proximity to the Bunbury central business district, which has some residential land uses.
<b>Potential Impacts</b>	Construction activities associated with the development of the proposal have the potential to impact the amenity of the local community / businesses in the Bunbury central business district.
<b>Proposed Investigations</b>	To be confirmed with OEPA at the derived proposal stage.
<b>Potential Management Measures</b>	Noise and vibration management actions will need to be detailed in the CMP and implemented for the duration of the marina construction.

**Table L: Policy Context and Potential Mitigation Measures for Heritage – Aboriginal**

<b>EPA Objective</b>	To ensure that historical and cultural associations are not adversely affected.
<b>Applicable Legislation and / or Guidelines</b>	<ul style="list-style-type: none"> <li>▪ <i>Aboriginal Heritage Act 1972.</i></li> <li>▪ Guidance Statement No 41: <i>Assessment of Aboriginal Heritage.</i></li> </ul>
<b>Existing Environment</b>	No Registered Sites or Other Heritage Places occur within the project area.
<b>Potential Impacts</b>	Excavation / construction activities may unearth and/or damage artefacts or other items of cultural Aboriginal significance.
<b>Proposed Investigations</b>	No further investigations are required.
<b>Potential Management Measures</b>	CMP to identify the obligations of construction workers under the <i>Aboriginal Heritage Act 1972</i> with regards to the discovery of Aboriginal sites.

**Table M: Policy Context and Potential Mitigation Measures for Human Health**

<b>EPA Objective</b>	To ensure that human health is not adversely affected.
<b>Applicable Legislation and / or Guidelines</b>	<ul style="list-style-type: none"> <li>▪ <i>Contaminated Sites Act 2003.</i></li> <li>▪ DER Contaminated Sites Guidelines series.</li> </ul>
<b>Existing Environment</b>	No registered Contaminated Sites within the project area.
<b>Potential Impacts</b>	<ul style="list-style-type: none"> <li>▪ Potential for contaminated soils or groundwater to be unearthed during future construction activities.</li> <li>▪ Groundwater flow and input into Koombana Bay can have elevated nutrient loadings from the surrounding residential catchments, which can affect marine water and sediment quality, particularly in poor flushing environments, and may lead to eutrophication.</li> <li>▪ Potential for chemical / fuel releases/ spills during construction to enter the marine environment.</li> </ul>
<b>Proposed Investigations</b>	To be confirmed with OEPA at the derived proposal stage.
<b>Potential Management Measures</b>	<ol style="list-style-type: none"> <li>1. Identify potential use, treatment and disposal methodology for dredge spoil.</li> <li>2. Manage any predicted impacts to benthic communities and habits resulting from dredging activities.</li> <li>3. Licences for dewatering and discharges to be sought from DER and the Department of Water.</li> <li>4. CMP to address issues such the safe storage of any chemicals / fuel required during the construction works and contingency plans for any accidental spills.</li> </ol>

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## 9.0 REFERENCES

- 360 Environmental 2009. Bunbury Inner Harbour, Berth 14A Expansion, Preliminary Acid Sulfate Soil and Contaminant Assessment, Bunbury, February 2009.
- Bennelongia. 2008. Report on the Shorebird and Waterbird Values of the Bunbury Inner Harbour. Unpublished report prepared by Bennelongia for 360 Environmental, WA.
- Bow, B. 1999. The biogeography of the ground vertebrate fauna of the southern Swan Coastal Plain, Bunbury, Western Australia. BSc (Hons) Thesis, School of Environmental Biology, Curtin University of Technology.
- Brad Goode and Associates. 2008. An Aboriginal Heritage Survey of the Bunbury Inner Harbour Redevelopment, Western Australia. Report prepared for the Bunbury Port Authority.
- Bunbury Port Authority. 2012. Environmental Management System (EMS) Manual. Bunbury Port Authority, Rev 0.
- Department of the Environment and Heritage. 2002. National Ocean Disposal Guidelines for Dredged Material. Environment Australia, Australian Government.
- DPaW. 2014. Marine Turtles in Western Australia, DEC (Perth). Available at: <http://www.dpaw.wa.gov.au/management/marine/marine-wildlife/66-marine-turtles-in-western-australia>.
- ENV Australia. 2004. North Boyanup District Structure Plan. Unpublished report for the DPI. (Level 1 fauna survey results).
- HGM. 2002. Natural Values of 12 Sites of the Greater Bunbury Region Scheme. Tasks 1, 2 and 3. Unpublished report for WAPC.
- Harewood, G. 2008. Fauna Assessment (Level 1) Bunbury Inner Harbour. Unpublished report for 360 Environmental.
- Naval Research Laboratory Monterey. 2014. Search conducted 15 July 2014. [http://www.nrlmry.navy.mil/port\\_studies/thh-nc/australi/bunbury/text/sect6.htm](http://www.nrlmry.navy.mil/port_studies/thh-nc/australi/bunbury/text/sect6.htm)
- Oceanica. 2008. Bunbury Waterfront Project: Stage 1 Marine and Coastal Baseline Studies Marine Habitat Mapping. Report prepared for Strategen.
- Paling, E.L., van Keulen, M. and Verduin, J.J. 2006. *Seagrass Restoration in Western Australia – where are we now?* 7th International Seagrass Biology Workshop, Zanzibar, Tanzania.

- Parsons Brinckerhoff. 2011. Development of Berth 14 at Bunbury Port: Flora and fauna assessment. Report prepared by Parsons Brinckerhoff for Lanco Resources, Perth.
- Parsons Brinckerhoff. 2012a. Public Environmental Review, Bunbury Port Berth 14 A Expansion and Coal Storage Facility. Report prepared by Parsons Brinckerhoff for Lanco Resources, Perth.
- Parsons Brinckerhoff. 2012b. Technical report 13, Level 2 Surveys – Waterbirds and Western Ringtail, Bunbury Port. Report prepared for Lanco Resources, Perth.
- Quartermaine Consultants. 2005. Report on a Preliminary Archaeological Investigation for Aboriginal Sites Bunbury Port Development 2005-2007. Report to Sinclair Knight Merz (SKM).
- Shore Coastal. 2009. Bunbury Harbour Siltation Investigation. Prepared for Bunbury Port Authority.
- SKM. 2011. Bunbury Port Development, Long Term Monitoring and Management Plan. Prepared for Bunbury Port Authority.
- TME. 2009. Bunbury Port Inner Harbour Structure Plan. Bunbury: Western Australia.
- Wave Solutions. 2011. Bunbury Port Berth 14A Expansion and Coal Storage and Loading Facility (Assessment No. 1886) – Subtidal Benthic Marine Flora and Vegetation near Bunbury, Western Australia. Prepared for Lanco Resources Australia Pty Ltd.
- Wave Solutions. 2012a. Bunbury Port Berth 14A Expansion and Coal Storage and Loading Facility (Assessment No. 1886) – Hydrodynamic and sediment transport modelling, Western Australia. Prepared for Lanco Resources Australia Pty Ltd.
- Wave Solutions. 2012b. Bunbury Port Berth 14A Expansion and Coal Storage and Loading Facility (Assessment No. 1886) – Marine environmental quality studies, Western Australia. Prepared for Lanco Resources Australia Pty Ltd.
- Wilber, D.H., Brostoff, W., Clarke, D.G. and Ray, G.L. 2005. Sedimentation: Potential biological effects from dredging operations in estuarine and marine environments. DOER Technical Notes Collection (ERDC TN-DOER-E20), U.S. Army Engineer Research and Development Centre, Vicksburg, MS, USA.



## FIGURES

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**LEGEND**  
[Red outline] Marine Structures Proposal Project Area



**RPS**

Job Number: L148302  
Doc Number: 001  
Date: 10.03.15  
Scale: 1:20,000 @ A4  
Created by: MA  
Source: Cadastre - Landgate, 2014 Orthophoto - Landgate, 2013

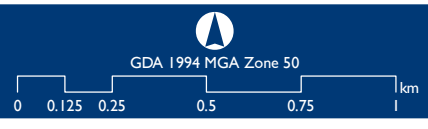




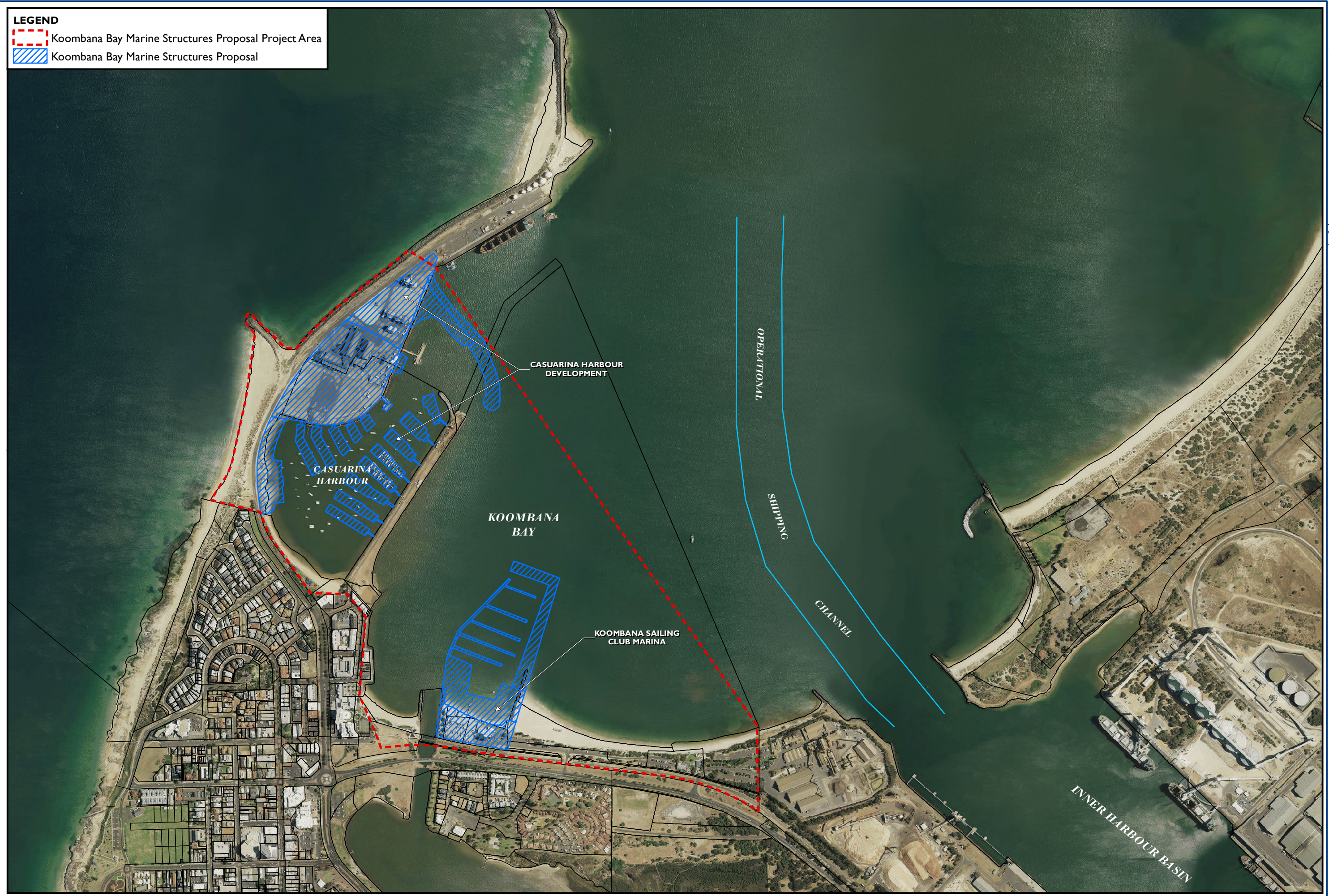
Figure 1

**Koombana Bay Marine Structures Proposal Project Area**



**LEGEND**

-  Koombana Bay Marine Structures Proposal Project Area
-  Koombana Bay Marine Structures Proposal



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**LEGEND**

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**Benthic Habitat**

- Soft Sediment
- Reef with Algae
- Soft Sediment with Turf Algae
- Soft Sediment and Reef Dredge Material
- Soft Sediment with *Halophila* and *Heterozostera* sp.
- Soft Sediment with *Halophila* sp.
- Soft Sediment with *Heterozostera* sp.
- Soft Sediment with Cobbles and Brown Algae



**LEGEND**

- Koombana Bay Marine Structures Proposal Project Area
- Koombana Bay Marine Structures Proposal

**Bunbury Port Authority Monitoring Sites**

- Marine Water and Sediment Quality Monitoring Site
- Reference Site



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