Koombana Bay and Casuarina Drive Master Plan
Consultant Team
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1.0 introduction
1.0 Introduction

Purpose of this Report

The Koombana Master Plan Report has been prepared for the City of Bunbury as part of the Bunbury Marine Facilities project. The key objective of this report is to provide the City of Bunbury with a plan for the development of the Koombana Bay and Casuarina foreshore project areas considering:

- Landscape Master Plan
- Coastal Hazard Risk Planning Report
- Civil Design Concept for roads, car parks and service infrastructure
- Irrigation Strategy

The Master Plan has been developed with the City of Bunbury in conjunction with the following Project Working Group:

- South West Development Commission;
- Department of Lands;
- LandCorp; and
- Bunbury Marine Facilities Alliance.

Study Area

The Koombana Master Plan considers two key study areas within the Bunbury Marine Facilities project area. For the purposes of this report, the project areas will be referred to as the Koombana Bay Precinct and the Casuarina Harbour Precinct.

Koombana Bay Precinct

The Koombana Bay project area extends from ‘The Plug’ in the west to the Cristal Global port operation in the east. It is bounded by Koombana Drive in the south and Koombana Bay in the north. The Dolphin Discovery Centre is located within the project area and has plans for redevelopment that are considered in this report.

Casuarina Harbour Precinct

The Casuarina Harbour project area swaddles Casuarina Drive between the LandCorp developments at Marlston and the Outer Harbour. The west and east boundaries are ocean and Harbour foreshores respectively.
1.0 Introduction

Project Vision

The Master Plan creates a landmark, foreshore gateway to Bunbury that is vibrant, accessible, resilient and tells the local stories.

The project has the following high level design objectives:
- Improve social spaces along the foreshores supporting the development of the marine components
- Improve the tourism appeal of Bunbury
- Create an accessible and connected waterfront
- Connect with and respond to adjacent development plans
- Assess and plan for coastal vulnerability
- Establish sustainability and resilience design principles to minimise environmental impacts
- Plan for future development through provision of services

The Koombana Master Plan, as one part of the Bunbury Marine Facilities project, will create a regionally significant coastal precinct within the Greater Bunbury region.
1.0 Introduction

Planning Context and Land Ownership

The Koombana Master Plan is located within the Western Australian Planning Commission's City of Bunbury Town Planning Scheme No. 7. The TPS identifies land within the:

- Koombana Beach Foreshore as Regional Open Space and Railway
- Casuarina Beach Foreshore as Regional Open Space and Local Distributor Road
1.0 Introduction

Project Context

The Master Plan is being developed as part of the Bunbury Marine Facilities project which is replacing industrial infrastructure from the Harbour areas of central Bunbury. This suite of development projects are designed to improve public amenity areas, tourism, stimulate the recreational and commercial boating industry and improve the linkages between the CBD and the waterfront.

The adjacent plan highlights the importance of the project areas in relation to the Bunbury Marine Facilities projects. To ensure an integrated design outcome, the Master Plan will consider:

- Interfaces with adjacent land and water-based development
- Programming and existing use throughout the wider precinct
- Connections, access and parking on a precinct level
- Provision of services through the project area to adjacent developments
- Impacts of the Master Plan on coastal processes

The Master Plan report has been developed in consultation with the project teams responsible for the planning, design and delivery of these adjacent precincts. It considers and responds to the current thinking and design of these areas. The design of the Master Plan will need to evolve as it is implemented to ensure it continues to work in harmony with the adjacent developments as their design becomes more apparent.
2.0 analysis
2.0 Site Analysis

Beach Character

The experiences of the foreshores are highly varied and primarily influenced by the beach character. They are a critical element in the analysis of the project areas as they exert influence over the character of the foreshores and how people use them. The beach characters present a range of foreshore and coastal experiences to select from within walking distance of the CBD. The key experiences of the beach character are defined by:

- **Koombana Bay** is protected from the prevailing winds and generally has calm waters with a wide sandy beach. The bay is vulnerable to north westerly weather systems which cause rough waters.
- **Casuarina Harbour** is characterised by protected, still and calm water with a sandy beach. This will be strengthened when the breakwaters are extended as part of Casuarina Boat Harbour Project.
- **BP Beach** is an exposed ocean environment highly influenced by the prevailing weather conditions. It can range from calm to rough and provides a brush with the wild within the heart of Bunbury. It has a wide sandy beach with a back drop of dune vegetation.
- **The Leschenault Inlet** is a highly protected estuarine environment with calm waters and foreshore parklands.

Opportunities

The Master Plan presents the opportunity to reinforce the existing beach character within the project areas by:

- Improving Koombana Bay’s foreshore amenity areas and reducing coastal vulnerability.
- Improving Casuarina Boat Harbour beach by increasing the quality of the sandy beach.
- Strengthening the natural character of BP Beach by a natural approach to vegetation, access and landscape interventions.
Coastal Processes

Koombana Bay is a highly modified natural environment with complex coastal processes resulting in eroding and depositing of sand. The natural flow of water generally moves in a northerly direction and around Koombana Bay in a clockwise direction. This generally results in sand being deposited at the northern and western ends of beaches and eroding from the eastern.

Opportunities

The natural coastal processes present some unique opportunities to the foreshore precinct, including:

- creating a wide sandy beach at the BP Beach groyne and the eastern end of Koombana Foreshore.
- providing sand for beach nourishment.
- preventing and mitigating the effects of erosion.

Note: The coastal processes and mitigation recommendations are analysed in detail in the appended MR Associates CHRMAP report..
2.0 Site Analysis

Landscape Character

The precinct areas are highly modified environments with areas of remnant vegetation, revegetation and landscape plantings. The key landscape characters of the precinct can be defined as:

- Parkland – open grass, park land trees and structured landscapes.
- Dunal – dune vegetation (Quindalup Complex) and beach sand.
- Bush – endemic trees and understorey (Vasse Complex).
- Estuarine – mangrove, rushes and samphire.

The atmosphere of the precincts is influenced and reinforced through the landscape character. For example, BP Beach’s ocean character is strengthened by the natural dune setting and creates a unique atmosphere when compared to the parkland of Casuarina Harbour.

Opportunities

The unique landscape characters present an opportunity to strengthen the study areas by:

- Carefully considering the transition from the estuarine and bush to the parkland character along the Koombana Drive entry will create a clear arrival to the foreshore precinct.
- Extending the parkland character into the Koombana Foreshore Precinct to connect to Koombana Drive, the Leschenault inlet and CBD foreshore landscape characters creating a clear central parkland precinct.
- Increasing the foreshore amenity and facilities in Casuarina Harbour.
- Strengthening the dunal landscape of the BP Beach will reinforce the wild ocean character.

01. BP Beach sand dune vegetation
02. Casuarina Harbour degraded dune vegetation
03. Casuarina Harbour Parkland vegetation
04. Koombana Bay Parkland vegetation
05. Leschenault Inlet Estuarine vegetation
06. Bush vegetation
2.0 Site Analysis

History and Narrative

The history and heritage of the Bunbury region provides many opportunities to inform the narrative of the landscape. Some of the history of Bunbury includes:

- Leschenault Inlet: the inlet has been highly modified by man throughout the past century to convert the waters into a modern port. The relationship of Koombana Bay to the inlet has changed as various modifications have altered the connection points of the two water bodies. The inlet also has an ecologically significant mangrove population.
- Aboriginal Heritage: stories of the local Noongar people including the Ngarngungudditj Wargal, or Hairy Faced Snake, who shaped the land in the Bunbury region (source: John Sara, from Bunbury Port Authority website, date unknown) and the naming of the Koombana Bay, derived from the Noongar words koomba (spouting wales) and ana (bay) (source: unverified story).
- Bunbury Settlement: the story of the settlement of Bunbury including key people such as Captain Nicolas Baudin, Dr. Alexander Colke, Lt. Preston and Lt. Henry William St. Pierre Bunbury (source: Bunbury Port Authority, 2015)
- Port and Industrial: key elements of the operational port are still visible and present on site and throughout the precinct and include railways, jetty’s, ship loaders, warehouses and lighthouses.
- Shipwrecks: reclaimed land along the Koombana Foreshore at Bunbury contains the remains of at least 12 shipwrecks protected as maritime archaeological sites under the Western Australian Maritime Archaeology Act 1973 (Koombana Bay Foreshore Maritime Archaeological Project, August 2013)

Opportunities

Opportunities exist to tell the history of Bunbury through the landscape, these include:

- Environmental and ecological history and development.
- Noongar history and use of the site.
- Maritime history of landings, settlement and shipwrecks.
- Industrial and port history of development and infrastructure including rail, berths and buildings.
- The telling of the stories can take the users on a journey through Bunbury’s past and can be used to inform art, lighting, signage, structures, materials and forms.
2.0 Site Analysis

Social Spaces

Koombana Bay is a unique piece of coast in the south west. It provides the community with choice of numerous land experiences along the foreshore to marine experiences from the clear, calm sheltered waters of the bay, the protected Harbour area or the wild ocean of BP Beach. It provides many different recreation pursuits from barbecuing, walking, paddling, building sand castles, fishing, watching the wildlife right through to the active pastimes of running, swimming and playing beach volleyball. It is a multi-use foreshore area with a playground for everyone. It forms the social hub of the community.

The social spaces within the study areas are highly influenced by the beach character. The still waters of Casuarina Harbour are suitable for children, the wide beaches and calm waters of Koombana Bay are great for swimming and beach sports while the wild ocean of BP Beach attracts surfers, fisherman and thrill seekers. Understanding how the community uses the public space, moves between them and when they use them will inform the design and programming of the project areas.

Opportunities

Opportunities exist to improve existing and create new social spaces by:

- Considering the existing and proposed programming of the foreshores and design public facilities to improve social interaction.
- Considering the beach and landscape character of the foreshores and how they influence use and how use should influence the spatial design.
- Planning for social use through the day, week and season to create a network of uses through time.
2.0 Site Analysis

Experience of Arrival

The drive into Bunbury along Koombana Drive is a significant part of the arrival experience into Bunbury. It shows the best of what Bunbury has to offer: the tranquil mangroves, the lapping beach, holiday parks, marine tourism, waterfront dining, the beach, sailing and boating, the Leschenault inlet, the Indian Ocean and the active Port. This sequence of arrival helps define Bunbury's identity for locals and tourists alike and orients them within the central precinct.

Opportunities

The experience of arrival needs to be considered as part of a wider sequence that begins outside of the project areas. The Master Plan presents the opportunity to strengthen the experience of arrival by:

- Considering the sequence of arrival and the key views into and through the project areas.
- Consider how glimpsed and closed views frame the arrival.
- Framing key view corridors through the project areas to landmarks, icons or key precincts.
- Creating intrigue among tourists to encourage a stop and increase length of stay.
- Creating new landmarks to improve orientation and identity.

1. Leschenault inlet
2. Koombana drive looking west
3. Koombana Drive looking north across the bay
4. The Plug
5. Casuarina Harbour
6. BP Beach
2.0 Site Analysis

Access and Parking

Koombana Bay has good access by major roads that connect to the central Bunbury precinct. Koombana Drive is a wide road way that encourages higher vehicle speeds and doesn’t safely cater for cyclists. Casuarina Drive has a strong avenue character that terminates at the informal BP Beach car park. Beyond this point the road is poorly defined, with no shoulders, informal street parking and no footpath.

The foreshore precincts have a diversity of car parking options, however analysis of these reveals:

- Key foreshore areas given to vehicles, not people.
- Inefficient car parking configurations.
- Insufficient car parking at key locations causing informal, overflow parking often on busy road shoulders.
- Large, expansive car parks that create visual and physical barriers.
- Car parks do not incorporate best practice for sustainable design principles.

Opportunities

Significant opportunities exist to improve access and parking to the project areas including:

- Investigating lane configuration along Koombana Drive to slow traffic speed and provide for cyclists.
- Continuing the avenue character of Casuarina Drive.
- Considering the placement of car parks to give key areas to people, not vehicles, while ensuring ease of access and parking.
- Formalising car parking areas where informal parking is already occurring.
- Creating new parking areas associated with new amenity areas.
- Setting the character of car parking areas in keeping with the landscape character. The dune or parkland character can be used to set the character of the car park to create a unified precinct.
- Creating new access points from car parking to the foreshore precincts in keeping with the landscape character.
- Ensuring new parking areas work with environmental processes: storm water can be captured, treated and infiltrated; permeable pavements can be used; large areas of hard stands avoided to prevent urban heat island effects and trees strategically planted to provide natural shade and cooling.

1. Formal sealed car park at Koombana Bay
2. Formal sealed arrival to Dolphin Discovery Centre
3. Formal, on-street car parking, Bonnefoi Boulevard
4. Formal, unsealed car park, Casuarina Drive
5. Informal, unsealed car park, Casuarina Drive
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Connectivity

The walkability of central Bunbury is a key asset in creating a vibrant and diverse precinct. There are a vast range of experiences available including the mangrove boardwalk, foreshore walks, coast walk, the CBD and the estuary. Koombana Bay is a highly desirable place to walk around and take in the views, walk to the beach or a café and is well connected to residential and tourism catchments.

Analysis of the current network within the project areas reveals footpaths that:
- have poor connectivity with the wider network.
- terminate within the site and/or don’t connect to a destination.
- are in various levels of condition.
- are not of a uniform material or size.
- create conflicts between pedestrians, bicycles and vehicles.

Encouraging travel to the foreshore precinct by foot and bike on a well designed and connected network will give benefits to the community including reduced vehicle and parking pressures, improved health, a vibrant precinct with people on the street and a strong sense of community.

Opportunities

The network for pedestrians and vehicles must be considered in the context of the Bunbury network. Key opportunities exist to create a connected foreshore precinct by:
- Completing the path network through the project areas and connecting to the wider network to encourage travel to site by foot and on bike.
- Creating a pleasant walking environment with shaded trees, key views and vantage points, places to pause, moments of intrigue and destinations.
- Considering where tension exists or will be created between pedestrians, bicycles and vehicles.

01. Mangrove boardwalk
02. Koombana foreshore path
03. Koombana foreshore path
04. Path connecting CBD to Koombana Beach
05. The Plug footbridge
06. Marlston waterfront path
07. Casuarina Harbour path

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Analysis Key Issues

The analysis has identified the key underlying issues of the precinct which fall into three broad categories and poses the following questions.

Experience
_ What is the landscape character and how does this influence the atmosphere of the foreshore?

Programme
_ How does the spatial quality of the foreshore encourage community interaction?

Access
_ How does the network facilitate the use of public space?

These three intertwined themes will be explored in the project vision and form the foundation of the master plan.

Character of landscape

key issues:
_ current landscape character is diffuse with no clear identity;
_ public realm and landscape within the project areas is of low quality.

Outcome:
Defining the landscape character of each foreshore will create a strong identity and atmosphere for public space.

Community interaction

key issues:
_ current spatial network does not provide enough public space for community use;
_ facilities for large scale public events is not adequate;

Outcome:
Creating a clearly defined hierarchy of space with flexibility of use will encourage vibrancy and community interaction.

Low quality, car dominated space

key issues:
_ foreshore areas are currently dominated by cars;
_ pedestrian linkages are of low quality and form an incomplete network;
_ pedestrian access across roads is often poor and not safe.

Outcome:
Improving the quality and legibility of the vehicle and pedestrian network will encourage public use.
2.0 Site Analysis

Case Studies

**Margaret River Surfers Point**
Completed 2013
The upgrade of Margaret River Surfers Point has created a world class recreation, environmental and tourism precinct, capable of hosting large surfing events while still respecting the unique natural elements of the site. An in depth understanding of community values, expectations and local traditions was developed through consultation and translated into a master plan. Key design objectives include maintaining the panoramic views of the surrounding landscape, celebrating surf culture and local stories, connection to the coast from Rilebutts through to the Rivermouth, providing refuge and shelter from the elements, places for recreation in all weather, environmentally sensitive design to enhance and regenerate the fire damaged landscape, integrating built form and landscape outcomes and accommodating major events. The sensitive integration of public art is a major element of the project with pieces to be discovered rather than stand above the landscape values of the site.

**Cardwell Foreshore**
Completed 2014
The Cardwell Foreshore was revitalised following the devastation left by cyclone Yasi. RPS built on past master planning completed by others to document and deliver construction drawings and an art and interpretive strategy for the 4km stretch of foreshore. The Girimay people were consulted extensively and worked closely with local community members to develop a series of integrated interpretive elements for the project that link the coastal promenade.

**Cairns Cityport South Foreshore**
Completed 2014
The foreshore precinct builds on master planning for strategic port land and involves redefining Cityport South, ensuring it balances social, environmental and economic priorities. It adds vibrancy to the life of the Cairns City by establishing a series of distinctive spaces that attracts people to the waterfront. Maximising the civic values of the Public Space Works and interfacing these with the future development of the precinct was a primary commercial outcome. The history of the maritime industry is interpreted through the materials and art narrative of the foreshore.

All projects and images by RPS
3.0 concept plan
3.0 Concept Plan

Foreshore Character

The foreshore landscapes are defined by the character of the water. The open ocean creates a different atmosphere to the bay and again to the inlet. It is important to understand the character of the foreshore when designing the master plan and how it influences experience, programme and access.
Experience

The atmosphere of the foreshore's are influenced by the landscape character, urban interfaces, views and land use. How people experience these spaces is defined by the character and the master plan will seek to amplify the existing atmosphere to strengthen the identity.

- Koombana Bay is characterised by the open views of the bay and the foreshore parkland. The concept aims to connect the experience of the foreshore precinct to the peaceful, protected waters of the bay, the wide sandy beach and the grass parkland.

- Casuarina Harbour’s calm and peaceful waters are defined by the urban interfaces, playgrounds, calm water and bobbing boats in the background. This enclosed space creates a unique family oriented atmosphere.

- BP Beach's open ocean is complemented by the strength of the dune backdrop creating a wild ocean escape on the doorstep of the CBD. The master plan will reinforce this character, ensuring the wild ocean experience is retained.

Social interaction is facilitated and encouraged by the quality of the public space available to the community. A key aim of the master plan is to identify existing uses and opportunities for new uses, and create a spatial layout and quality that flexibly caters to a range of passive and active programmes.

- Koombana Bays wide sandy beach, protected aspect and foreshore parkland creates a dynamic spot for beach sports, events, recreation, community gathering and play. The calm waters lend themselves to water sports making it the go to beach for Bunbury. The master plan will aim to significantly improve the usability of the foreshore by improving the parkland, picnic facilities, event programming, cafe facilities and amenities to provide for high use and facilitate events.

- Casuarina Harbour’s protected waters and foreshore parkland with playgrounds and BBQ’s encourages a families. The intimate parkland character will be extended by a series of smaller parks along the foreshore, creating an enclosed network of space that can be occupied and used in a range of manners.

- BP Beach’s programme is about interaction with the wild, open ocean. The restrained approach of the master plan will maintain the flexibility of the beach for the varying uses undertaken throughout the year.

Access

The access, parking and movement of people is considered at a precinct wide network level. The movement between the CBD, the foreshore's, the inlet and the entertainment precincts needs to be considered on a holistic level. The master plan will consider how people access the precinct and ensure it provided for in a way that is integrated with the established experience and programme.

- The pedestrian and cycling network is considered extremely important as a high quality network will encourage alternate transport to the precinct and decrease parking pressure. The pedestrian experience will be strongly linked to the character of the foreshore, Koombana Bay will have a generous bay front promenade, Casuarina Harbour an esplanade and BP Beach a dune top boardwalk connected to the open ocean.

- The dominance of cars in the foreshore precincts will be removed and priority given to people. Car parking will be integrated into the landscape to improve the character and visual amenity.
3.0 Concept Plan

Character of the landscapes

ocean
connected to the ocean

bay
connected to sand

inlet
connected to the CBD

natural systems

blowing in the wind

escapism to nature

sand

ocean sports

promenade

beach sports

community events

bbq

evenings

lookouts

Koombana Bay and Casuarina Drive Master Plan City of Bunbury
3.0 Concept Plan

Opportunities Plan

Legend
- Civic Space - Plaza
- Parkland
- Dune Revegetation
- Beach
- Car Parking
- Pedestrian Route
- Dune Boardwalk
- Destination, Activator or Icon
- Key Views
- Fast Rail Corridor
- Streetscape Improvements
- Pedestrian Connection
3.1 Concept Plan - Koombana Bay

Koombana Bay Master Plan

Legend
1. Landmark arrival bridge connecting Koombana Bay Foreshore to Koombana North and Marlston Waterfront Precinct.
2. Shared Path connecting into the Bunbury Network.
3. Railway heritage walk.
5. Foreshore promenade and parkland.
6. Cafe and amenity building’s.
7. Feature landscape containing parking cells.
8. Playground.
9. Public promenade on extended rock groyne incorporating viewing, fishing and swimming platforms, disabled access and public jetty
10. Foreshore access road.
11. Dolphin Discovery Centre refurbishment project area
12. Arrival landmark.
13. Long vehicle parking with caravan dump station.
14. Lot 881 development area.
15. DPAW Development Area (Subject of Feasibility Study).

Note:
The City is currently undertaking a feasibility study for a roundabout access into the site at the junction of Koombana Drive and Lyons Cove. This will be incorporated into the detail concept phase of works if it is the preferred configuration.
The City is investigating the potential to have a designated helicopter landing area within the precinct. The long vehicle parking area has been identified as the preferred site.
3.1 Concept Plan - Koombana Bay

landscape plan 1:2000 at A3
3.1 Concept Plan - Koombana Bay

Foreshore Parkland

Key objectives:
- Create a waterfront promenade connecting the parkland to the beach;
- Provide a range of social spaces including picnic shelters, BBQ facilities and informal seating areas;
- Opportunities for play including beach play;
- Maintain the wide sandy beach for recreation and organised sports such as beach volleyball;
- Provide space for a café and new amenity block;
- New amphitheatre and shade structure for events;
- Provide linkages to the wider precinct; and
- Remove the dominance of cars.
3.1 Concept Plan - Koombana Bay

Foreshore Programme

Key objectives:
- Provide a flexible community space that can be used for a range of purposes;
- The sheltered amphitheatre can be used for concerts, events and as stands for beach sports;
- A flexible plaza and grass area for pop-up food markets; and
- Orientation to maximise views onto bay and shelter from the prevailing weather conditions.
3.1 Concept Plan - Koombana Bay

Narrative Strategy

The history, heritage and stories of the site will be told through the landscape and used to inform art, lighting, signage, structures, materials and forms.

Key objectives:
- Show the environmental and ecological history and development of the Bunbury region;
- Tell the Noongar stories and history of the site;
- Create a landmark arrival bridge to connect Koombana foreshore to Marlston;
- Maritime history of landings, settlement and shipwrecks;
- Industrial and port history of development and infrastructure including rail, berths and buildings; and
- Utilise the existing rail tracks to create a heritage walk.

Landmark arrival bridge

Integrate Aboriginal heritage

Maritime and Port Heritage of shipwrecks, the port and lives lost at sea

Environment and nature

Rail heritage walk
The master plan seeks to decrease the dominance of car parking both visually and physically by creating parking cells located in feature planting. This better connects Koombana Drive to the bay via opening up key views and linking the parkland and streetscape.

**Key Objectives:**
- Adopting water sensitive urban design principles including flush kerbs, side draining roads into biofiltration and passive irrigation of parklands;
- Reduced asphalt areas to decrease heat island effects;
- Feature brick paved parking bays to create a softer aesthetic and create a visually skinny road to help reduce traffic speed;
- Provision for shade trees to naturally cool and create a parkland atmosphere in the car park; and
- Integrating rail heritage via a pedestrian walkway.

1. Asphalt pavement
2. Feature brick pavement
3. Railway track walkway
4. Shade trees in car park
5. Bioretention basins
6. Feature planting
3.0 Concept Plan - Casuarina Harbour

Casuarina Harbour Master Plan

Legend
1. Foreshore parkland with shelters, BBQ’s and children’s play.
2. Integrated connection to Harbour and Marlston development. (to be
developed further pending final design).
3. On street angle parking access.
4. Casuarina plaza with cafe pavilion and amenity building connected to BP Beach.
5. Waterfront promenade connection to Harbour development with pavilions
   and shade structures.
7. Harbour development (currently under design by Others).
8. Casuarina Drive boulevard extended
9. Car parking integrated into dune landscape
10. Dune top boardwalk with lookout nodes.
11. Revegetated dune system.
12. Beach access.

Note:
The Outer Harbour development and DOT Harbour access points will be
incorporated into the detail concept phase of design works.
3.0 Concept Plan - Casuarina Harbour

landscape plan 1:2000 at A3
3.0 Concept Plan - Casuarina Harbour

Foreshore Parkland

Key objectives:
- Create a promenade connecting the Marlston development to the Harbour development;
- Provide a range of social spaces including picnic shelters, BBQ facilities and informal seating areas;
- Create a sequential playscape catering from toddlers to teens with a range of land and water based experiences;
- Integrate the art and narrative strategy to create playful elements;
- Create a new plaza space with a cafe and amenity block servicing the Harbour and beach. Plaza scale is suitable for market stalls or food vans;
- Connect the linkages to the wider precinct; and
- Create new parking opportunities that are in character with the landscape.
3.0 Concept Plan - Casuarina Harbour

BP Beach Strategy

Key Objectives:
- Maintain and enhance the wild ocean character by revegetating the dunes, creating sensitive coastal access and respecting the horizon;
- Create linkages to Casuarina Harbour;
- Formalise access and parking for vehicles in dune character parking cells;
- Create dune top boardwalk to connect the pedestrian network to the ocean and create a new experience; and

Sand Management Strategy

The works at BP Beach will focus on reducing sand drift across the dunes and road towards Casuarina Harbour. Implementing a sand management strategy is a key component for the success of the foreshore works and the Casuarina Harbour development. The strategy will implement a combination of methods focussing on reducing the amount of sand exposed for drift, capturing the sand on BP Beach and creating wind breaks, these will include:
- Reducing the width of the beach by maintaining the sand trap to reduce the amount of sand exposed to erosion. This sand can be used to replenish the sand at other locations within the project area or associated works areas.
- Improving the dune vegetation cover by revegetation planting to help capture the sand in vegetation, reduce wind speed across the dune and stabilise the dunes through roots and vegetation. The extent of the dune will also be extended towards the coast to reduce the width of the beach decreasing the amount of sand exposed to erosion. This can be implemented prior to any capital works through City resources and the Marlston Coastcare Group.
- Creating a wind block at the base of the dunes to capture sand prior to it blowing over the dune. This can be a simple post and rail fence with a wind break fixed to its base. This will also help the establishment of the dune vegetation highlighted above by limiting access to people. Tree planting along Casuarina Drive and the foreshore will create supplementary wind breaks further reducing wind speed.

These strategies will be further developed in the detail concept phase of design works to manage the impacts of sand drift. It is important to note that due to the exposed nature of the beach environment and high winds sand drift will occur and periodic maintenance will be required.
3.0 Concept Plan - Casuarina Harbour

Car Parking and Access Strategy

The master plan creates a range of new parking opportunities along Casuarina Drive servicing Casuarina Harbour and BP Beach. Car parking is located in landscape treatments reflective of the character to decrease its both visual and physical prominence.

Key Objectives:
- Adopting water sensitive urban design principles including flush kerbs and side draining roads into biofiltration;
- Asphalt areas are kept to a minimum and parking bays are paved in feature brick to create a softer aesthetic;
- Provision for shade trees in the road and parking to continue the boulevard character, provide shade and naturally cool; and
- Integrating rail heritage via a pedestrian walkway.
3.0 Concept Plan - Casuarina Harbour

Foreshore Programme

Key objectives:
- Provide a flexible community plaza that can be used for a range of purposes such as markets, food stalls etc.
4.0 implementation
4.0 Implementation

Planting Strategy

Key objectives:
- Instil the natural character of the region in the landscape to create a strongly Western Australian identity;
- Create a resilient and diverse landscape with wildflowers, seasonal colour, texture, scents and contrast; and
- Retain existing trees and vegetation to maintain the mature landscape.
Materials and Furniture Strategy

Key objectives:
- Utilise local materials to create a material and colour palette in harmony with the region;
- Use natural materials and materials in their raw form to complement the ruggedness of the coastal environment;
- Create incidental street furniture through walls, embankments and art;
- Recycle artefacts and memorabilia such as ship moorings to create a unique and personal identity; and
- Use a dynamic lighting strategy to highlight landmarks, provide amenity and create an attractive evening atmosphere.

Natural materials

Concrete pavement with shells

Natural materials

Incidental furniture

Dynamic lighting strategy
4.0 Implementation

Irrigation Strategy

All landscaped areas the subject of the development, are required to be watered from the main irrigation system in accordance with the following:

- Water for the irrigation system is to be sourced from the groundwater bores constructed into the Yarragadee aquifer underlying the site.
- All sprinklers and equipment utilised shall be of a commercial quality designed for the duty and maintenance minimization.
- All trees shall be receive supplementary watering and shall be connected to a separate valves of the irrigation system. Where a tree is to be watered in conjunction with the landscape area in which the tree is installed, the flow rate of the bubbler shall be varied in accordance with the precipitation rate of the landscape sprinklers, so that all trees receive an equivalent volume of water during an irrigation cycle.
- Wherever possible, sprinklers shall be positioned so as to minimise overspray onto non-planted areas.
- Turf areas shall be watered independently of other areas.
- Similar-use areas (e.g. Turf) having sprinklers with different water application rates shall be grouped and watered separately from other areas.
- Generally, all irrigation is to be undertaken at night, between the hours of 8:00PM and 8:00AM, in a contiguous period of 8 hours maximum, on six (6) occasions per week, with 50% of the irrigated areas watered three (3) times per week.

Please refer to Section 5.2 Water Supply and Irrigation Strategy Report for full details.

Drainage Strategy

The aim of drainage management for the subject land is to treat all necessary drainage water and detain stormwater before it is discharged into the soil profile. Flows up to the 1 Year ARI storm events off roads will be treated to reduce nutrients, sediments and other contaminants prior to discharge to natural systems.

Water Sensitive Urban Design

The objective of the WSUD concept is to manage, protect and conserve the total water cycle of the local environment and the greater catchment.

Stormwater Management

- Bioretention gardens and soak wells will be used to treat the majority of the 1:1 ARI event.
- Soak wells and WSUD will attenuate and either infiltrate or discharge stormwater at predevelopment rates.

Ecosystem Protection

- The WSUD elements used on site will treat stormwater; improving the water quality prior to it entering downstream ecosystems via the groundwater system.

Groundwater Management

- Inflows to the groundwater are to be treated in bioretention gardens and soak wells to improve the quality of water prior to it entering the groundwater.
4.0 Implementation
4.0 Implementation

Service Corridor

Casuarina Drive
The figure below shows the location of existing service take off points within Casuarina Drive that could be utilised for any future service extensions should they be required. An indicative service corridor has been shown for the length of the foreshore development, this reflects typical statutory service alignments as depicted in the Figure 2. The size and configuration of this corridor is subject to detailed design once servicing requirements are identified and a full assessment of the current and future servicing needs of the Casuarina Drive foreshore as well as the Outer Harbour. The existing sewer, water, gas and power services are expected to be sufficient for any requirements of the Casuarina foreshore development. Service upgrades may be required if an allowance is to be made for any future development of the outer harbour, once the scale and intended use of such development is known.

Koombana Foreshore
Existing services for Power, Water and telecommunications are already present within the Koombana Foreshore precinct. It is expected that locations/alignments of these services can be modified/adjusted to suit the final design of the Koombana Foreshore. It is not expected that any upgrades/additional services will be required based on the proposed concept being of a similar use as exists currently.

Dial Before You Dig
Service location information has been attained for both project sites via Dial Before You Dig. This information will inform the detailed phase of the concept report.
4.0 Implementation