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Town of Cottesloe





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1. Executive Summary

The Cottesloe Foreshore Renewal is a project advanced by the Town of Cottesloe with the aim to revitalise the Cottesloe Foreshore Precinct with improved amenities, pedestrian accessibility and the effective planning of the public open spaces.

This Report and the masterplan drawings act as a guiding document for future works to the Cottesloe Foreshore between Forrest Street and Eric Street. The designs herein are loosely based on the Cottesloe Foreshore Redevelopment Plan, developed in 2012 following an extensive Enquiry by Design process.

The Report and Masterplan were developed with inputs from elected council members of the Town of Cottesloe, government departments and local stakeholders. A copy of the engagement schedule about the public consultation is enclosed as Appendix 2.

The critical elements that form the Masterplan design, are illustrated in further detail in this report include:

- A coastal promenade to connect the public spaces along the foreshore and provide for ocean viewing areas at key points;
- Transformation of Marine Parade into an urban promenade whereby vehicles, pedestrians and cyclists share the streetscape; and
- Generous areas of shaded parklands, equipped with recreational infrastructure such as fitness equipment, a play space, picnic settings and barbecues.

While the designs presented herein are landscape focussed, the approach is underpinned by a sequence of research and technical studies. These cover issues such as universal access, vehicular activity, hard and soft materials, sustainability, stormwater and drainage, lighting, heritage and culture, placemaking and the long term maintenance and management of the precinct.

The Masterplan proposes small moves and design interventions that will enhance the foreshore precinct, unify the different zones along the foreshore, and provide a renewed and integrated environment while respecting and maintaining the character and identity of Cottesloe Foreshore and Cottesloe Beach







2. Design Approach

The Cottesloe Foreshore Renewal Masterplan (the Masterplan) offers the opportunity to enhance the existing condition of the Cottesloe Foreshore and beach to create an asset that is the most notable point of pride in the community.

The proposed works will better the experience of the activities enjoyed by residents and visitors to Cottesloe, whilst being sympathetic to Cottesloe's heritage and coastal environment.

Beach

The focus and pride of Cottesloe is the beach. The Masterplan proposes little change to this area. Some shade structures on the sand toward the Groyne are proposed with one shelter having universal access from the adjacent path.

The dunes will continue to be rehabilitated by Coastcare, and will be protected by formalised beach access and viewing areas.

Promenade

A new promende in the form of boardwalk is proposed along the upper edge of the dunes. As the busiest area for walkers, runners and cyclists, the new boardwalk will be of generous width to accommodate for its high usage, as well as extending out at points to create breakout areas with seating, shade and showers.

The boardwalk will be constructed from a sustainable, low maintenance material.

Public Open Space

A seamless transition between the boardwalk and adjacent parklands, the public open space will provide amenity such as a renewed playground, updated outdoor exercise equipment and generous grassed areas. The public open space will be well shaded by new and existing trees, and the existing limestone terraces will remain in their current format.

Marine Parade RAFT

The Masterplan proposes the stitching together of the east and west sides of Marine Parade by creating a unified slow traffic environment where cars would proceed below a posted speed limit of 30km/h. This creates a streetscape which is a part of the foreshore, rather than being separated from it. A treatment of high quality paving, planting and street furniture is to be applied along Marine Parade between Forrest and Napier Streets, and at the intersection of Eric Street and Marine Parade.

A slight diversion of Marine Parade is proposed for the section in front of John Black Dune Park to create a more generous area of parkland adjacent the coast.

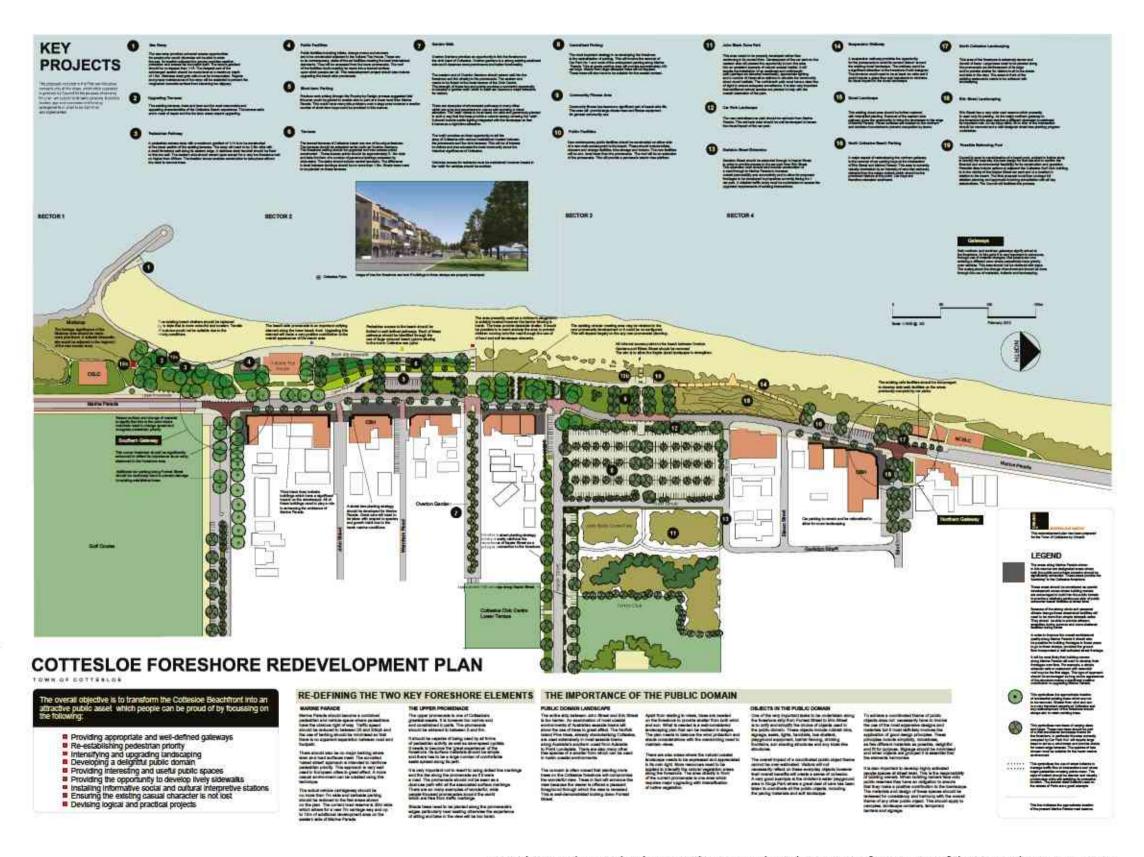




Methods of Approach

The Masterplan was developed as a framework to identify and addresses key challenges of the urban and landscape settings that is within Cottesloe Foreshore Precinct. The method of approach includes review of previous studies of the foreshore area, and understand the aspirations of the Town of Cottesloe, the local community and stakeholders. The methodology adopted is as follows:

- 1. Review findings from Enquiry by Design exercise The Enquiry by Design document was commissioned by the Department of Planning and Infrastructure in association with the Town of Cottesloe. The process involved a series of workshops with the local community, to draw out their aspirations for the Cottesloe Foreshore Precinct. The key findings from the Enquiry by Design exercise, and which formed the Cottesloe Forshore Redevelopment Plan (pictured right) are:
 - Provide wider pathways for improved pedestrian experience and opportunities for alfresco dining;
 - Provide universal access to the beach and grass terraces;
 - Reduce the impact parking along Marine Parade and enhance visual amenity; and
 - Retain and preserve the interface between the foreshore and the beach.
- 2. Identify sites of significance
- Conduct a site analysis including identification of opportunities and constraints
- 4. Develop key design principles
- Develop the Masterplan drawing including a set of concept diagrams illustrating the design rationale
- Outline the design considerations that were taken into account in the development of the Masterplan, including the development of a palette of materials, finishes, trees and planting.

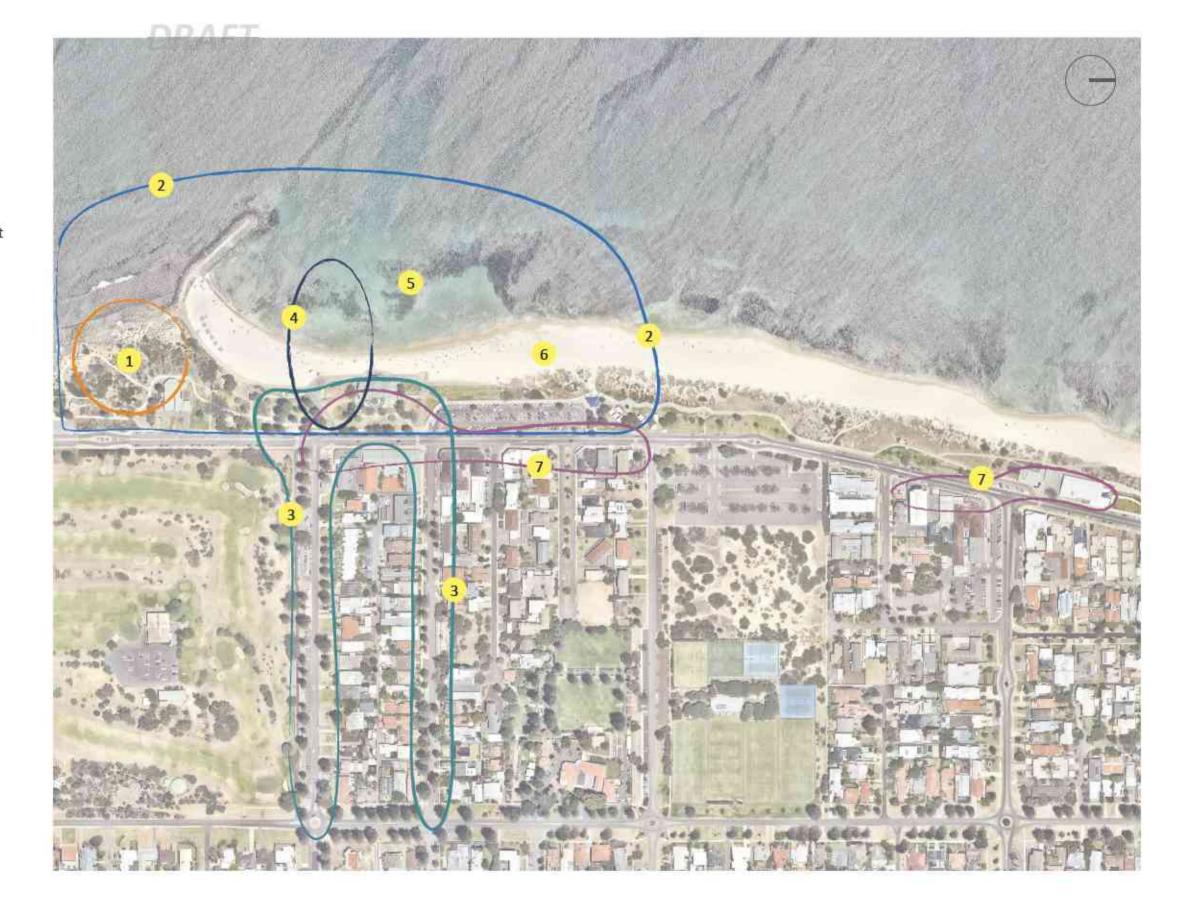


3. Sites of Significance

Key

- 1. Mudurup Rocks *
- 2. Cottesloe Beach Precinct #
- 3. Norfolk Island Pine Precinct #
- 4. Vestige of Original Jetty and Site of Pavilion #
- 5. Cottesloe Beach Pylon #
- 6. Peter's Pool
- 7. Cottesloe Commercial & Recreational Precinct

Refer Appendix 1 for details on the proposed methods of interpretation for the above sites of significance.



- * Aboriginal heritage sites
- # Listed heritage sites

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Mudurup Rocks

Cottesloe is known to Noongar people as Mudurup meaning 'place of whiting', it derives from the Nyungar mudu meaning whiting + up, meaning 'place of'. The distinctive natural formation of the place that is now known as Mudurup Rocks are the remaining vestige associated with Aboriginal culture and the significance of the site as a seasonal hunting ground and food gathering.

Indigenous oral history states that Mudurup was one of the traditional haunts (or in Noongar terms the 'run') of the Australian Raven or Wardung.

Moonderup (commonly called Mudurup) is listed on the Department of Aboriginal Affairs Heritage Site Database as a place of ceremonial and mythological significance.

The site of the Mudurup Rocks are still used as a fishing spot but more so as a popular surfing and paddling area.



Cottesloe Foreshore Precinct

The Cottesloe Foreshore Precinct is both a local and regional beach environment within an established and historic seaside suburb. It is internationally recognised for its clean, sandy beaches, Norfolk Island pine trees, shaded lawns and grassed terraces close to the water.

It is also well known for its beachfront strip along Marine Parade which includes the Indiana Teahouse. the Cottesloe Beach Hotel and the Ocean Beach Hotel. The foreshore offers a range of public and recreational activities while remaining a tranquil place with a sense of openness.

The coastline, landform and vegetation of Cottesloe provide a distinctive natural landscape setting, which underpins its identity as a suburb with prime ocean frontage. Marine Parade and the beachfront buildings are set above the beach providing a unique character, offering views from vantage points back toward the ridge and limiting the impact of built form along Marine Parade when viewed from the beach. The coastal landscape is a mix of revegetated dunal areas and grassed terraces and verges.

One of the distinct character of the beach is that it is part of the suburb of Cottesloe, compared to other Perth beaches where the beach guite distant to the residential and commercial areas. Visitors travelling by car, bus or train will journey through the suburb before reaching the beach. It is this close





relationship between beach and town that most likely gives rise to the local feeling that this is a local community beach and highly sought after residential suburb.

Cottesloe Beach is however a regional asset to be enjoyed by all. The rail service to the Town Centre provides access to the beach for a significant number of Perth's residents and visitors who use Forrest Street as a pathway to the beach.

A portion of the Cottesloe Reef has also been declared a Fish Habitat Protection Area under the Fish Resource Management Act (1994), reinforcing the value of its marine environment and its importance to the community.

The foreshore and beach area, over the years, have been host to various cultural and sporting events which has become an integrated part of the local culture and contributes to the history and contemporary character of Cottesloe.



Norfolk Island Pine Precinct

Cottesloe Foreshore Precinct is very often associated with its iconic rows of Norfolk Island pine trees planted along the residentail street verges and beach front. Even though these iconic trees are not native to the area, they have helped to define and establish the character of the Precinct. In addition to the Cottesloe Foreshore Precinct, a Norfolk Island Pine Precinct has been identified and included as part of Cottesloe heritage sites. The portions of the Norfolk Island Pine Precinct that forms part of the Masterplan are the sections along Napier and John Streets.



Vestige of Original Jetty and Site of Pavilion

Despite the growing attraction of Cottesloe's clear waters and pristine sands, it was not until the completion of a wooden English-type pier that Perth's favourite beach reached new heights of popularity. With the official opening of the jetty and the carnival-like atmosphere created on the beaches alongside of it, people flocked from all corners the State to spend their summer holidays on that pleasant section of the coast. The Jetty was completed in 1906 and located on the beach front facing Forrest Street.

The Jetty was demolished in the early 1950's due to being unsafe after being continually affected by environmental and climatic factors.

The Jetty and its popularity drew more visitors to Cottesloe Foreshore Precinct, which in turn led to the growth of commercial and recreational activities such as stalls, kiosks, tearooms and the Bathing Pavilion. The Pavilion was built following an architectural competition and became an icon of Cottesloe's foreshore.



Cottesloe Beach Pylon

The Beach Pylon also known as Foreman's Folly is one of three pylons built to anchor a shark net following a fatal attack in 1925. Two were destroyed by storms in 1937. Since then it has become an iconic landmark and popular diving platform for beach users.



Peter's Pool

The place known as Peter's Pool is a 860 meters length of beach stretching from Eileen Street to Overton Gardens. Peter's Pool is a popular swimming spot at Cottesloe Beach because of the protective reef surrounding the gap between the reefs, one of the nicest places to swim along the northern portion of Cottesloe Foreshore Precinct.





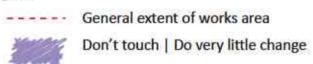
Cottesloe Commercial & Recreational Precinct

Key buildings and 'institutions' have developed and thrived as part of the Cottesloe Foreshore Precinct. The businesses and hotels inturn provide the facilities and amenities to support the recreational activities generated by their proximity to the beach and urban environment adjacent to the Cottesloe Foreshore Precinct.

4. Site Analysis

Analysis Diagrams DRAFT

Legend



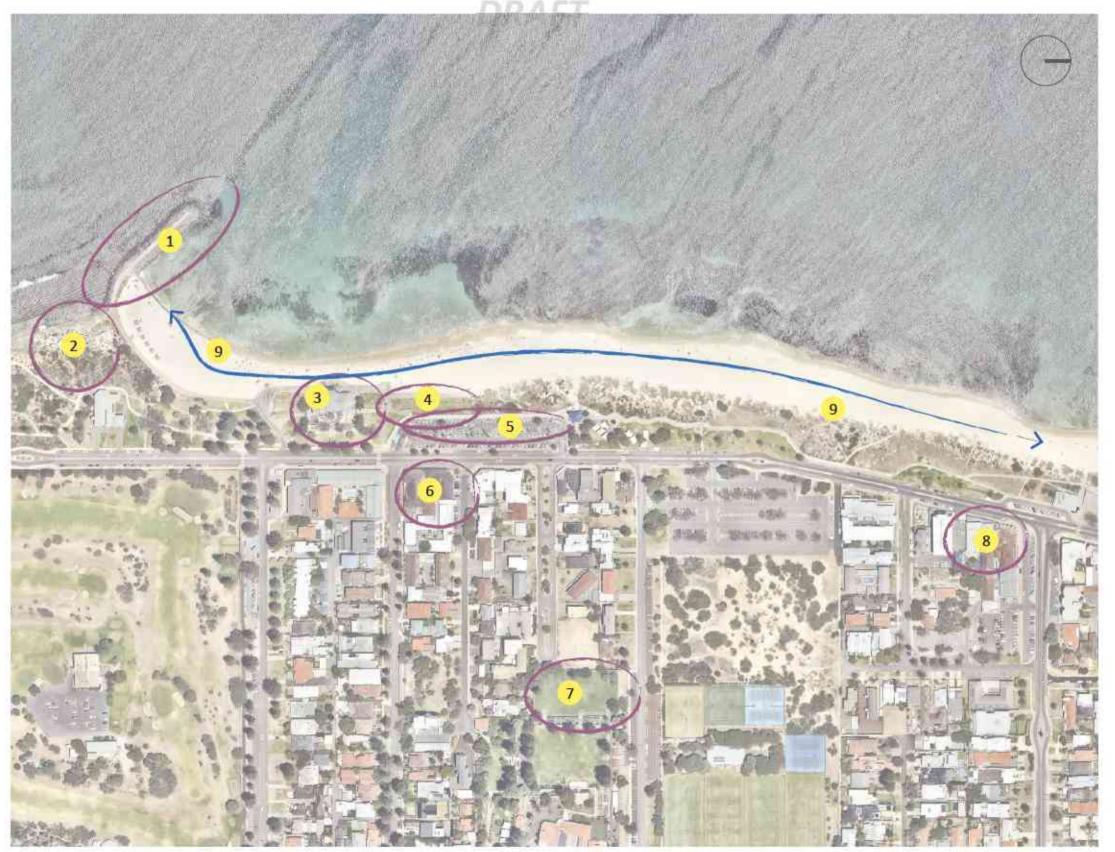
Key

- 1. Cottesloe Groyne
- 2. Mudurup Rocks
- 3. Cottesloe Surf Life Saving Club
- 4. Lottery-west funded terraces
- 5. Groups of existing trees
- 6. Forrest Street car park
- 7. Indianna Tea House
- 8. Historic Terraces
- 9. Existing buildings
- 10. Dune vegetation

Existing Elements to be Retained



Points of Interest



Key

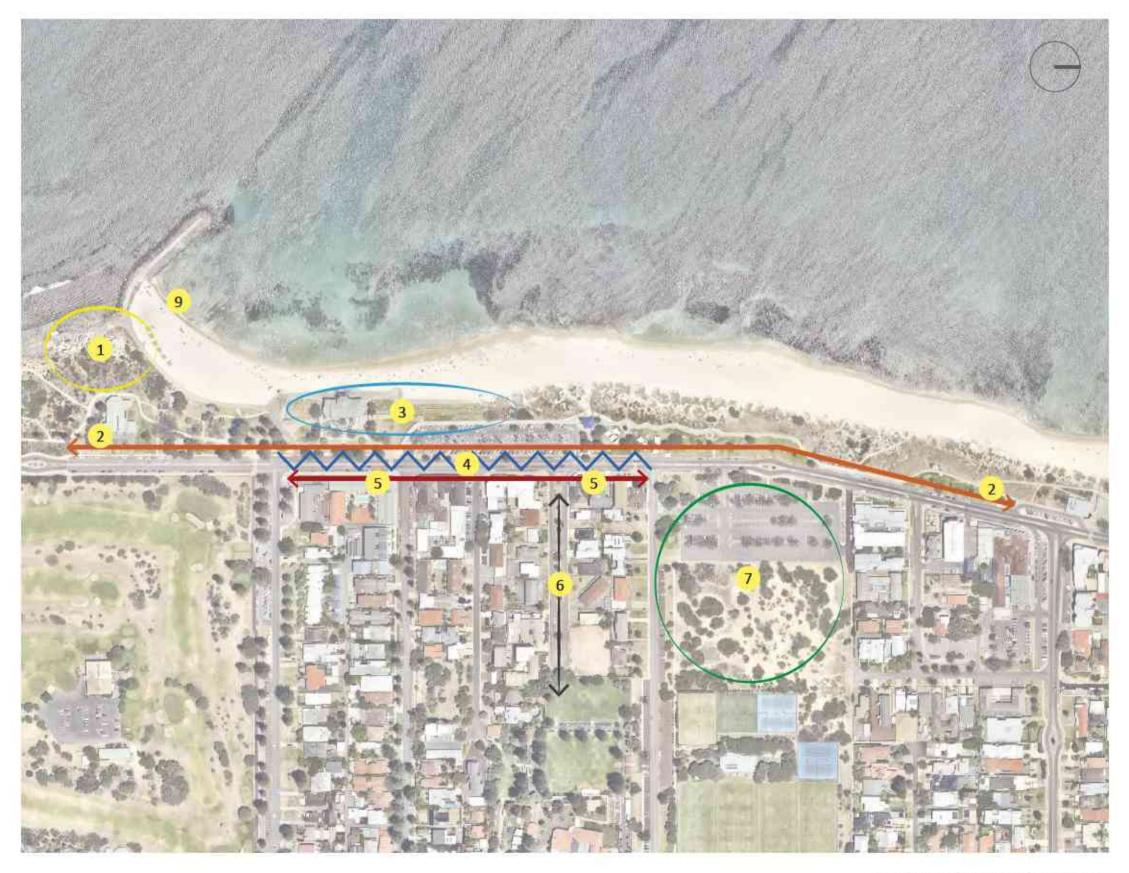
- Cottesloe Groyne
- 2. Mudurup Rocks
- 3. Indianna Tea House
- 4. Historic Terraces
- 5. Views from car park
- 6. Cottesloe Beach Hotel
- 7. Cottesloe Civic Centre Gardens
- 8. Ocean Beach Hotel
- 9. Cottesloe Beach

Opportunities

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Key

- 1. Provide interpretation around Mudurup Rocks
- 2. Enhanced coastal promenade
- Reinvigorate Historic Terraces & Indianna Tea House
- Stitch together east & west side of Marine Parade
- 5. Create an alfresco zone along Marine Parade
- 6. Connect foreshore with Civic Centre Gardens
- Generous availability of car parks and John Black-Dune Park, located on higher area with coastal views



5. Key Design Principles

The Masterplan seeks to embed the overall design principles into the approach for the paving, urban furniture and structures design within the streetscape and wider public realm environment through:

Consistency

Ensure a sense of coherence and legibility through a consistent approach to the design and detailing of the spaces.

Create a well-balanced, consistent palette of materials and design responses to simplify and reduce costs of subsequent maintenance/ replacement activities.

Understand that consistency still leaves room for place-specific distinctiveness where appropriate.

Consider the number and variety of streetscape and public realm elements to achieve a balance between providing for the needs of all users and maintain overall visual order and coherence.

Materials

Use robust and durable materials and construction methodologies to deliver high quality, attractive and durable spaces.

Select materials and design responses that embody simple, classic solutions that are enduring and provide a 'timeless' aesthetic.

Use materials that have been sourced with due regard to their environmental impact in their performance and manufacture.

Use materials that exceed the performance specifications attributes including structural and tensile strength, water absorption, and anti-slip resistance within a coastal environment.

Use materials and sign responses that are flexible and adaptive to change.

Seek to minimize the number and variety of materials used.

Maintenance RAFT

Deliver durable design responses that utilise fit for purpose, low-maintenance materials and componentry.

Ease of cleaning and cost of reinstatement.

Ensure that those tasked with subsequent maintenance and management of the streetscape and public realm are included in the design process and understand the expectations for ongoing maintenance performance levels.

Streets for the People

To create safe, accessible and pleasant streets and public spaces for people through a consistent streetscape layout, traffic calming interventions and incorporation of CPTED design principles and national standards.

Promote Activity

To encourage a wide range of activities to enhance vibrancy and diversity to achieve safe, accessible and legible streetscapes and public open space design.

Visual Appearance

To avoid visual clutter through a consistent approach of streetscape design and to establish an attractive environment that promotes clear messages for pedestrians, cyclists and drivers.

Identity and Information

To enhance the distinctive and recognisable identity for the Cottesloe Foreshore Precinct through consideration of the character of the streetscape and development of the base grid to provide a cohesive context for the key precinct areas.

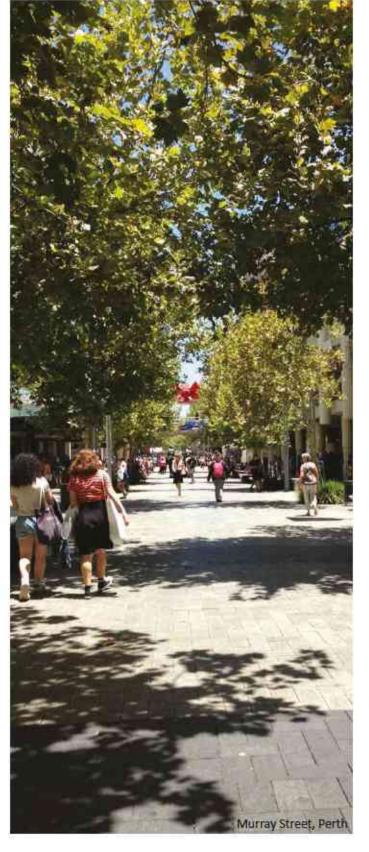
Sustainable Design

The underlying design principle adopted in the development of the concept plan is that the design is culturally appropriate, environmentally considerate, cost effective and functional.













6. Masterplan Concepts

Concept Design Diagrams

Beach Precinct Renewal

Cottesloe Beach is an iconic recreation experience and was crucial in the development of the suburb of Cottesloe. Renewal of the beach foreshore and adjoining precincts will be achieved by:

MATINE PARACE

MATINE PARACE

AMANUE PARACE

AMANUE PARACE

AMANUE PARACE

FOR PROPERTY BY

Legend

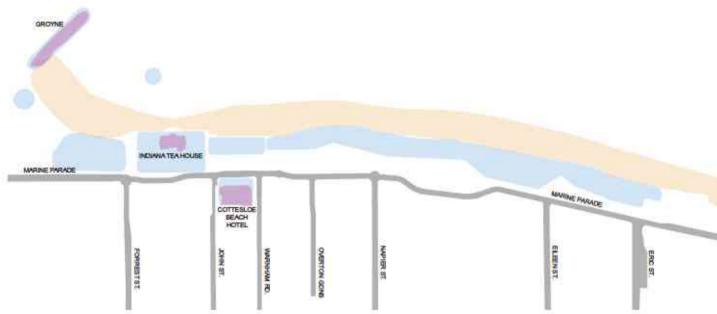
- Creating a sense of arrival into the Cottesloe Foreshore Precinct
- Providing greater integration between the beach, the adjacent parklands, and Marine Parade
- Celebrating and strengthening Cottesloe
 Foreshore's character as a signature experience

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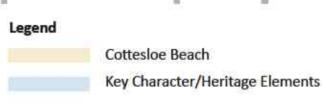
Cottesloe Beach

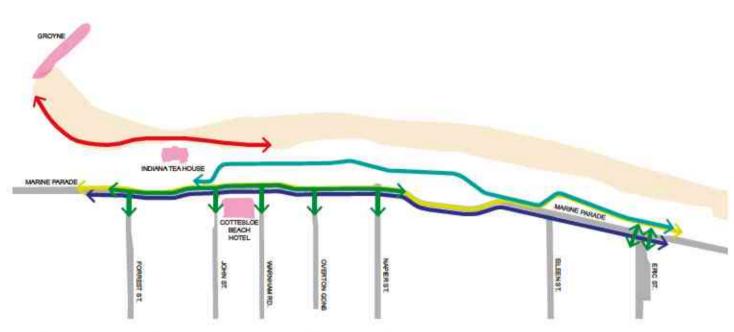
Character and Heritage

New recreational infrastructure will be sensitively retro-fitted to the existing foreshore by:



- Maintaining the character of the beach and foreshore environment and associated streetscape setting including the iconic Norfolk Island pine trees
- Enhancing key natural landscape and urban setting of key heritage and character features and built form
- Interpretation the natural and cultural histories and stories of Cottesloe Foreshore



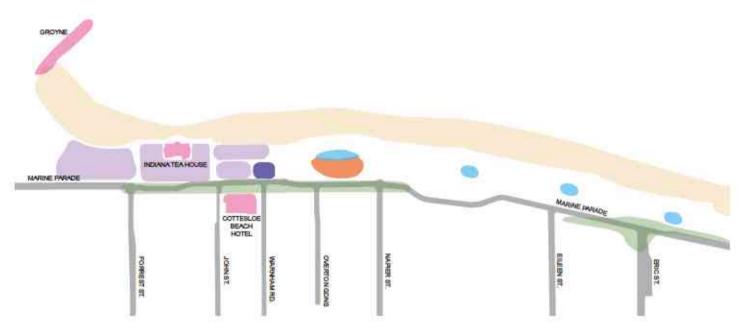


- Developing a coastal promenade along Cottesloe Foreshore, connecting all recreational zones and key connection points for beach access
- Providing shared spaces to key areas of Cottesloe Foreshore Precinct incorporating innovative approaches to the transport design including road alignment and width, parking arrangement and strategic location of planting and urban furniture
- Maintaining a generous Urban Corridor on the building side of Marine Parade, that also accommodates alfresco dining



Destinations

The renewal of Cottesloe Foreshore Precinct provides an opportunity to enhance and highlight a range of destinations, either existing or new. This will be achieved by:



- Enhancing the existing parklands by providing additional picnic amenities, shading and access paths through the area
- Creating a picnic lawn adjoining Marine Parade to complement the north terraces as well as enhancing the beach front view in front of the Cottesloe Hotel
- Providing a suitably located and compact beach front car parking space that can be adapted to host organised events
- Enhancing and relocating the playground, so that is integrated in the landscape setting adjoining open lawn areas for passive recreation and overflow play zones
- Improved streetscape setting enhancing the character of Marine Parade with potential for alfresco areas with the aim to boost and support beach front business opportunities



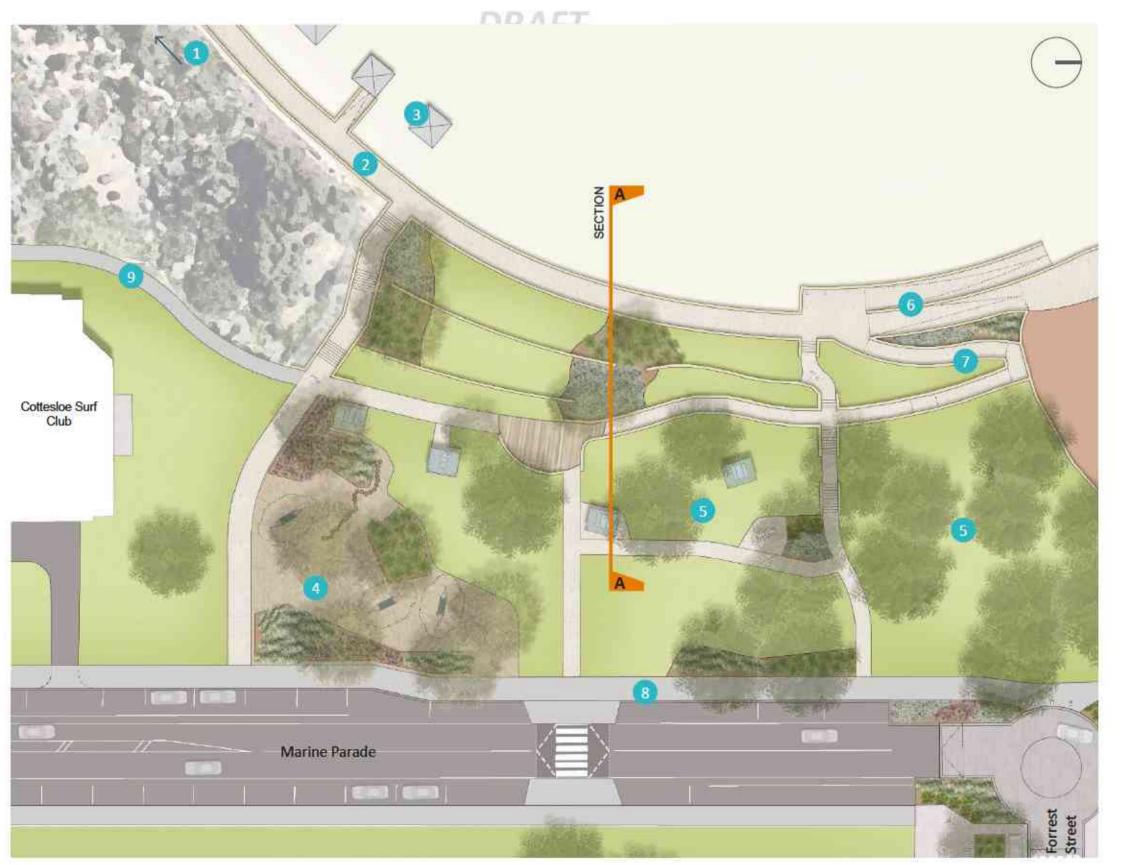
 Provide a series of pockets of elevated decks that overlooks the beach at key vantage points along the foreshore promenade

Concept Design Drawings



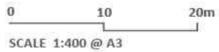


Mudurup and Southern Terraces Zone



Key

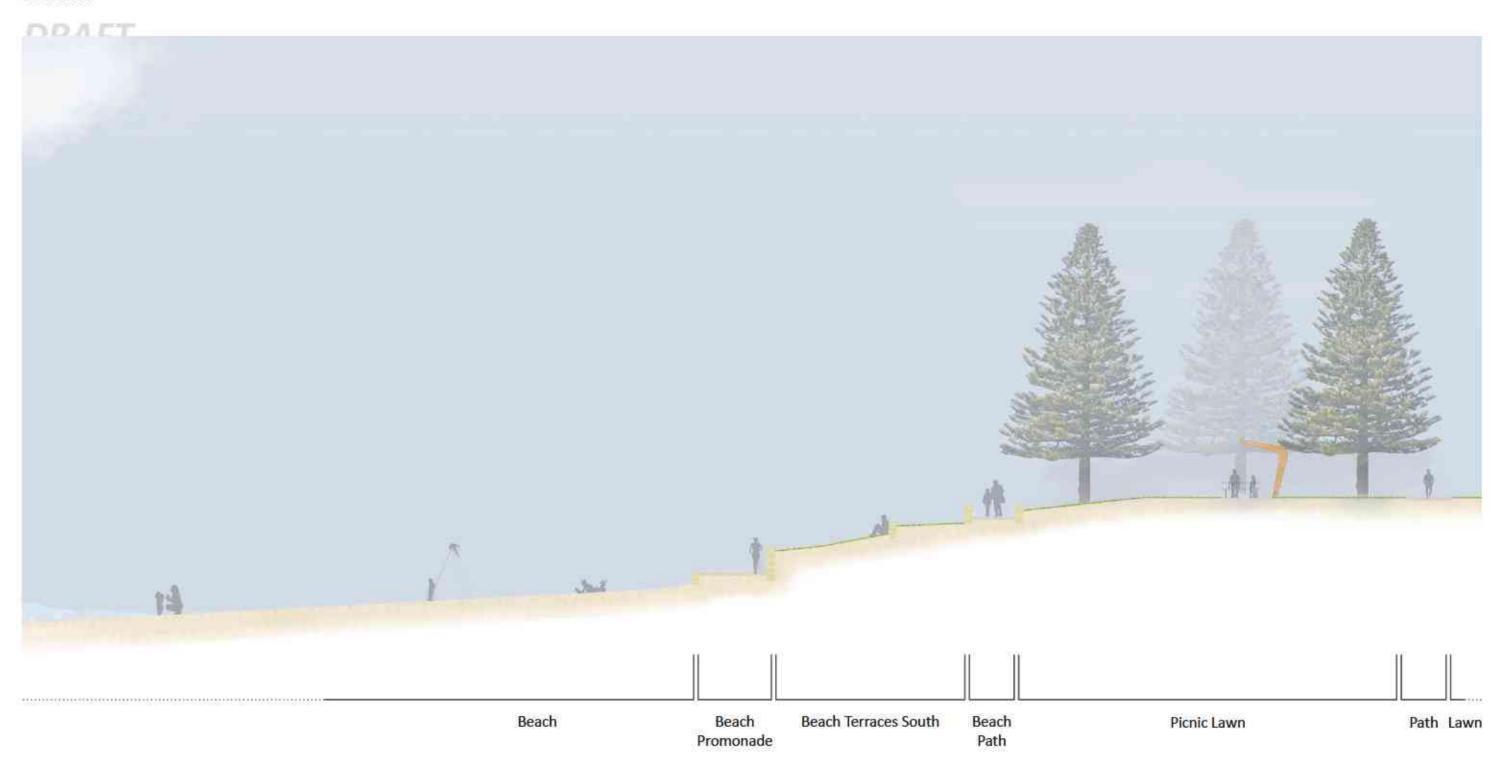
- Potential art interpretation around Mudurup
 Rocks
- 2. Upgrade to exisiting path surface
- New beach shelters (to replace existing). One shelter will be accessed via a path to faciliate universal access
- Mulched area around existing trees with informal play elements and planting.
- 5. Picnic area with shade shelters, seating and BBQ
- 6. New universal beach access ramp
- Realignment of pathway to achieve universal access
- 8. Cycle path
- Realigned footpath to improve visibilty to rear of Surf Club.



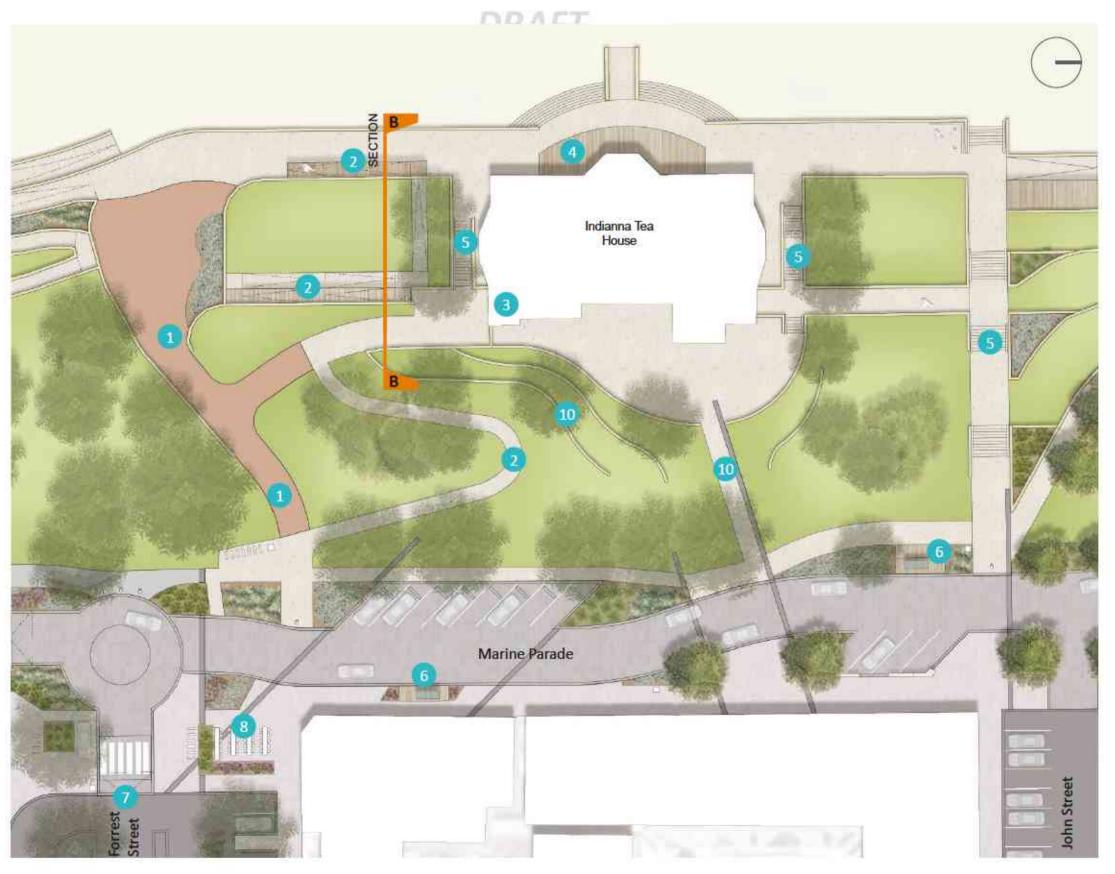
Location Diagram



Section A

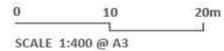


Indiana Precinct and Shared Zone Entrance



Key

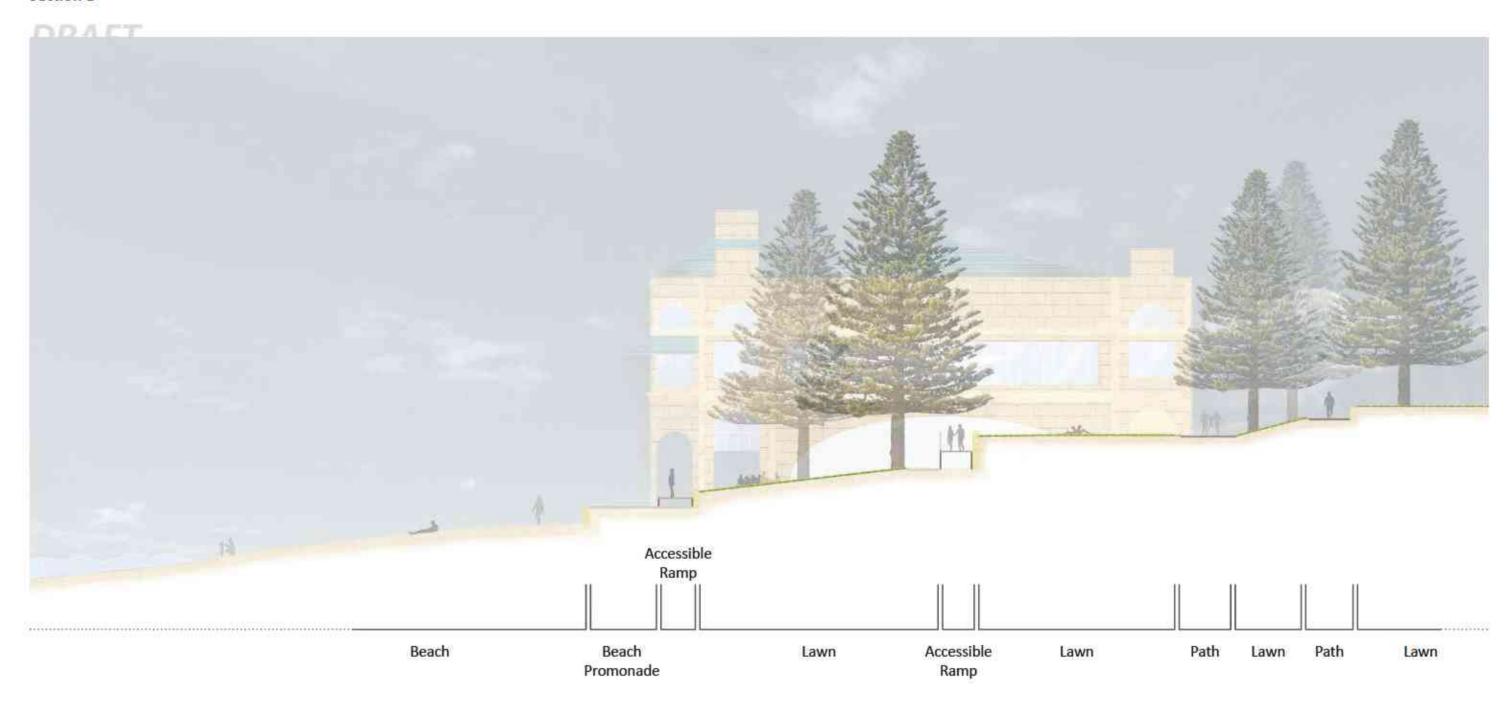
- 1. Beach access for authorised vehicles
- 2. Universal access ramp
- 3. Public toilets
- 4. Flush deck outside the Surf Club storage area
- 5. Upgrade to existing staircase
- 6. Bus stop
- 7. Ramp up to Marine Parade shared zone
- 8. Marine Parade alfresco zone
- 9. Roundabout marks southern entrance to shared
- New terracing and pathways to the front of Indianna Tea House



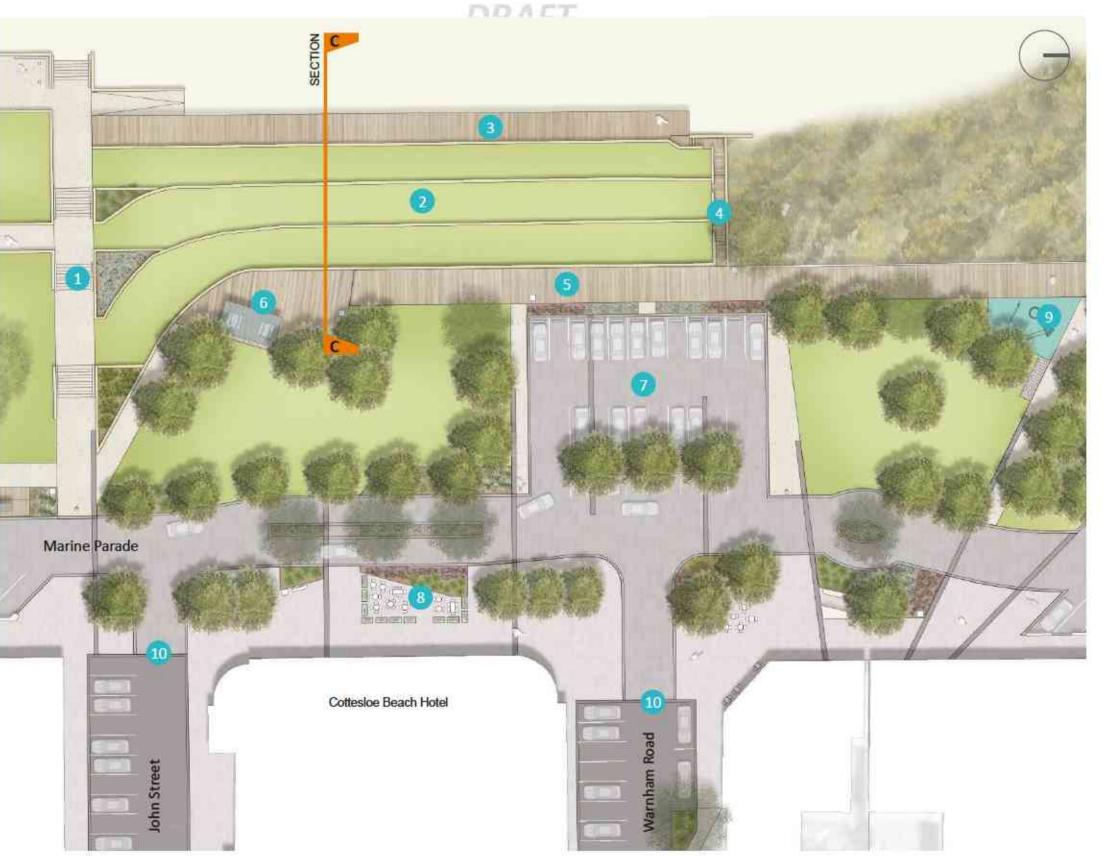
Location Diagram



Section B

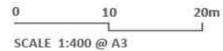


Terraces Precinct and Marine Parade Shared Zone



Key

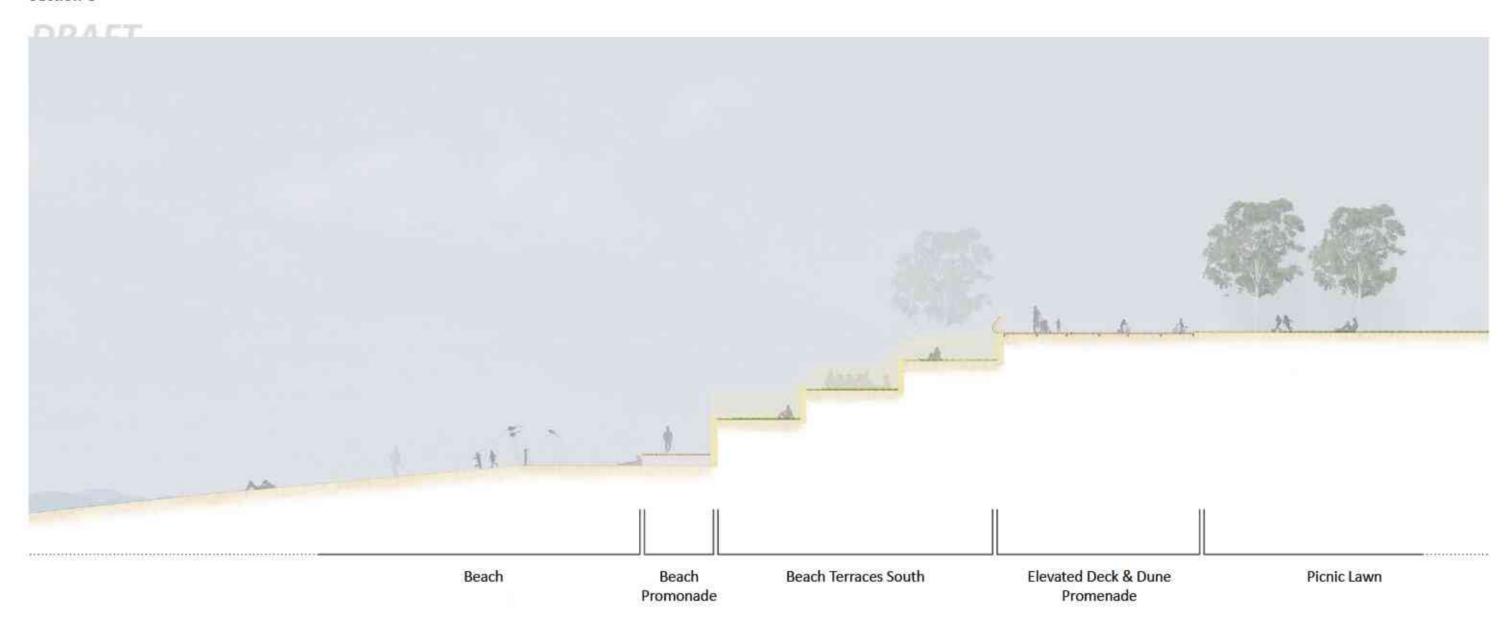
- 1. Upgrade to existing staircase
- 2. Existing limestone terraces
- 3. Lower level deck
- 4. Stair connection, upgraded with decking
- 5. Upper level boardwalk/promenade
- 6. Breakout node with shade and seating
- 7. Carpark with 20 bays
- 8. Alfresco zone
- 9. Exercise station with outdoor fitness equipment
- 10. Ramp up to Marine Parade shared zone



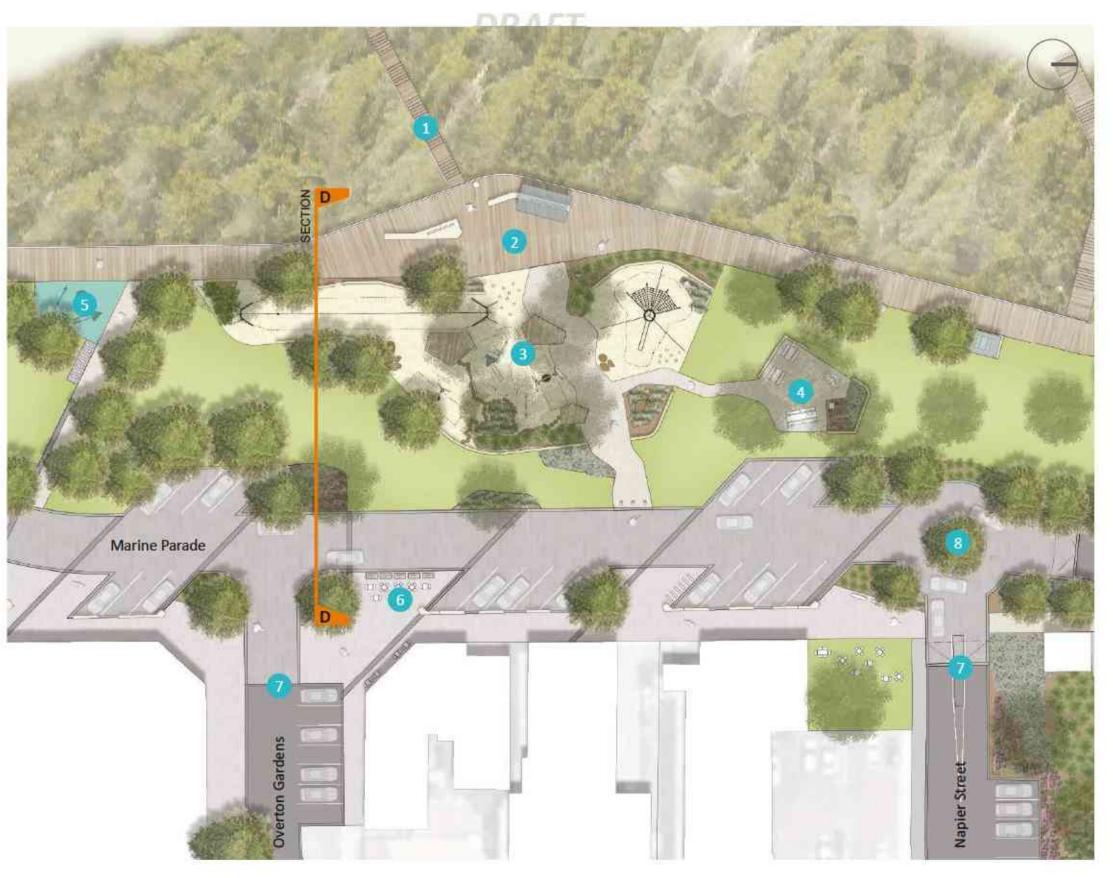
Location Diagram



Section C

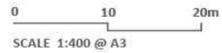


Playground Zone



Key

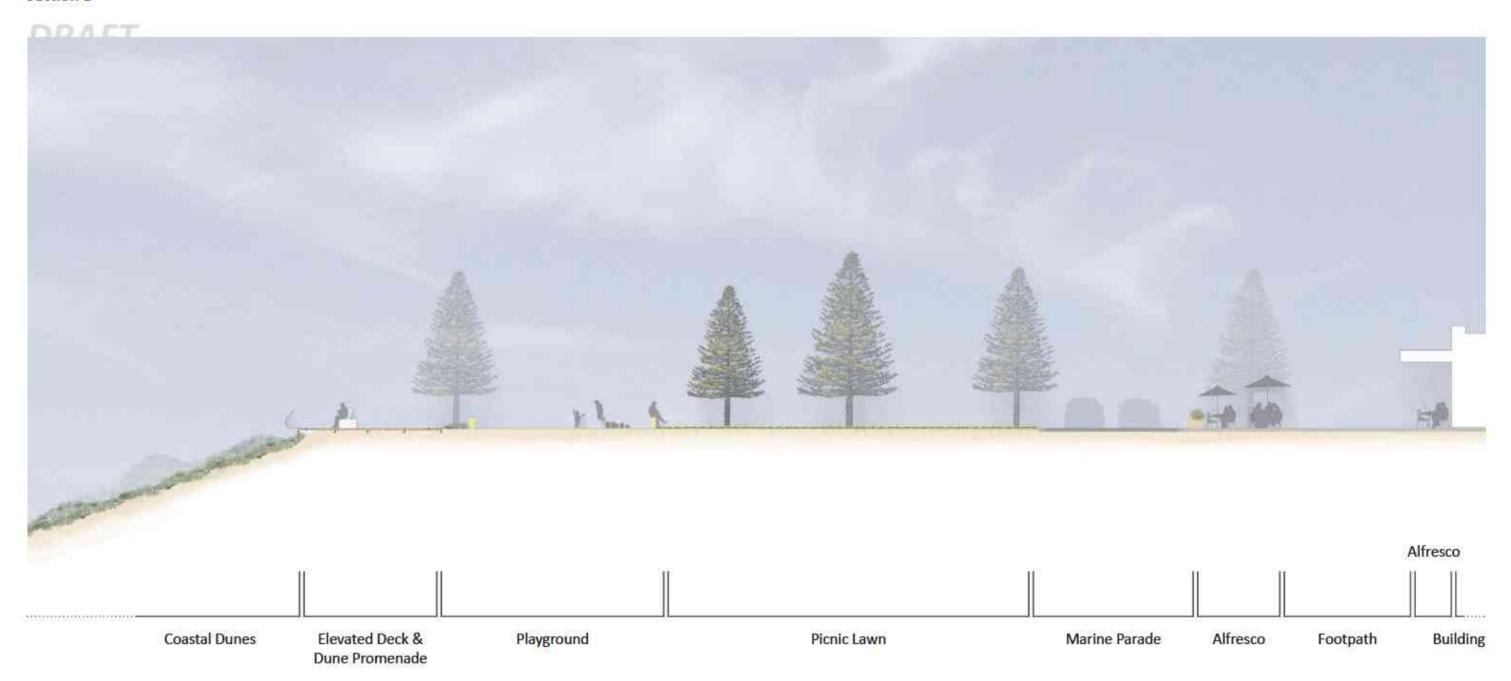
- 1. Beach access staircase
- 2. Breakout area with shade, seating and showers
- 3. Conceptual playground arrangement
- 4. Picnic area with seating, shade and barbecues
- 5. Exercise station with outdoor fitness equipment
- 6. Alfresco zone
- 7. Ramp up to Marine Parade shared zone
- Roundabout marks northern entrance to shared zone



Location Diagram



Section D



Central Parklands



Key

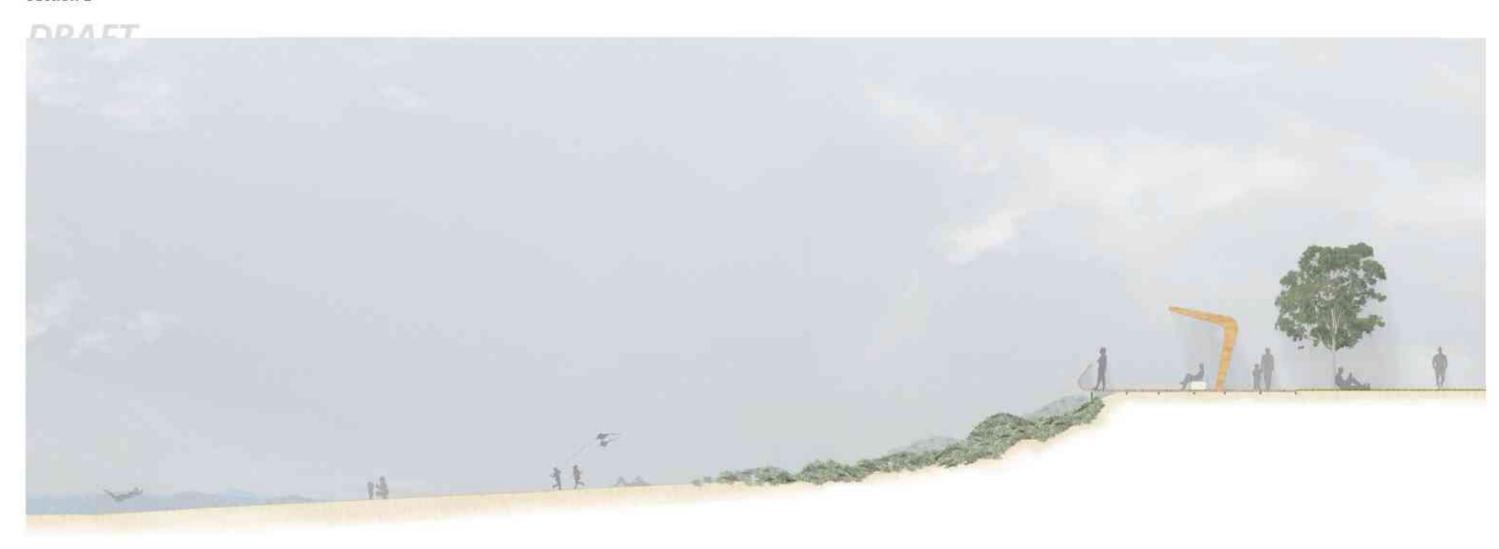
- 1. Roundabout marks entrance to shared zone
- 2. Exercise station with outdoor fitness equipment
- 3. Beach access
- 4. Grassed kick-about space
- 5. Breakout node with shade, seating and showers
- Limestone terraces with shade shelters, picnic settings and barbecues
- 7. Deviation of Marine Parade
- 8. Public amenities
- 9. Parking for 90 carks
- 10. Overflow carpark for 200 cars



Location Diagram



Section E





Promenade

Northern Parklands



Key

- Breakout node with shade, seating and existing sculpture 'Centrefold' by Mark Grey-Smith
- 2. Beach access
- 3. Exercise station with outdoor fitness equipment
- 4. Reconfigured parking
- 5. Bus stop
- 6. Raised crossing zone
- 7. Termination of boardwalk
- 8. Urban square at western end of Eric Street
- Alfresco and public gathering space for future development of Ocean Beach Hotel

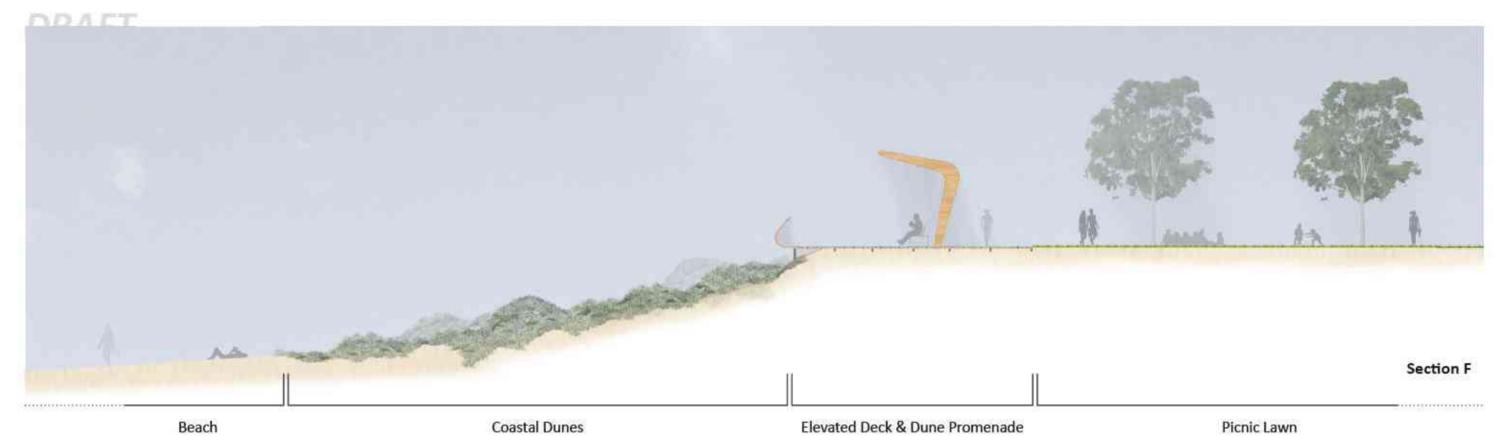


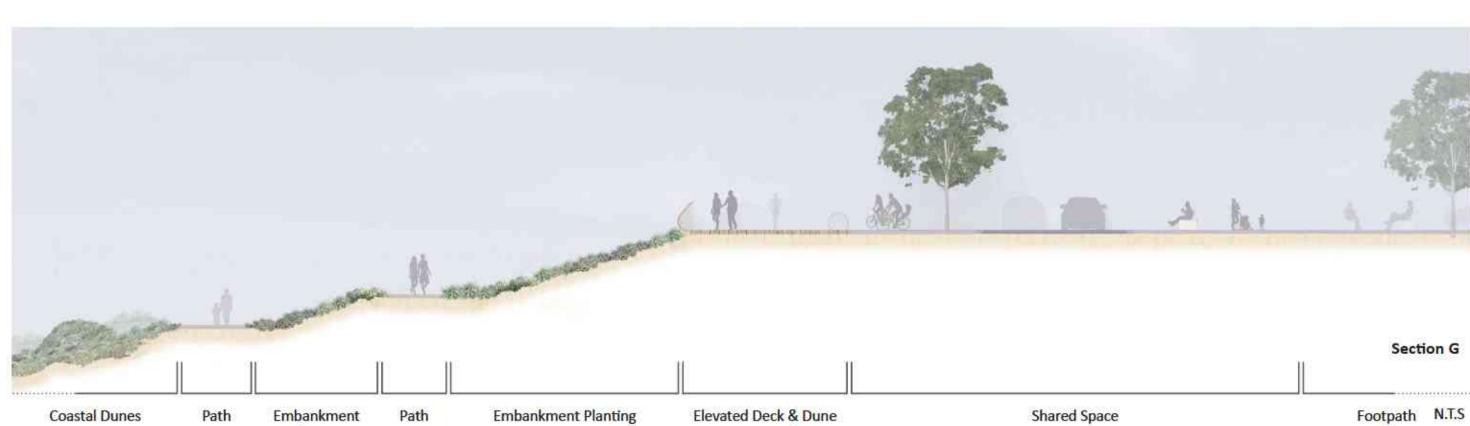
Location Diagram



Sections F & G

Planting





Promenade

Visualisations



View of deck and seating area looking towards the beach from playground

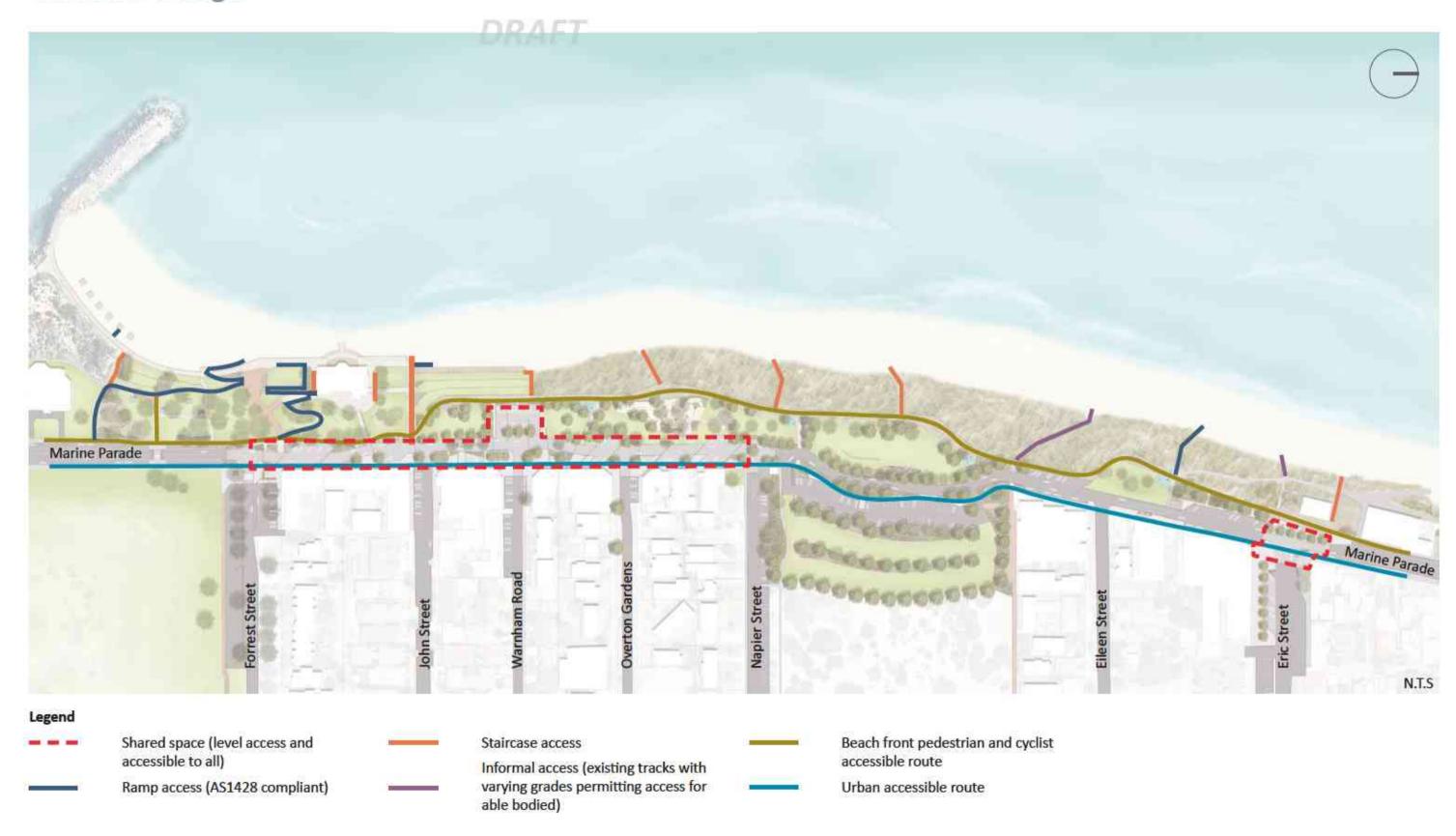






7. Design Considerations

Universal Design







People of all abilities should be free to access and enjoy Cottesloe Foreshore Precinct.

The Masterplan has been developed cognisant of providing universal access across the parklands, along Marine Parade, and importantly, to the beach. This is achieved through path networks, and ramps that have been designed in accordance with AS1428 Design for access and mobility.

Access to the beach

Cottesloe Beach has been the focal point for visitors to the Cottesloe Foreshore Precinct and has become one of the most popular seaside destination to local and international visitors. Despite the steep topographical conditions along the foreshore, access to the beach has been a key consideration for the development of the Cottesloe Foreshore Renewal designs. This includes establishing accessible paths to the beach at key locations and ensuring intuitive navigability throughout the foreshore precinct.

A Shared Zone Environment

A crucial part of the renewal process was to address the barrier presented by Marine Parade to the function and usage of Cottesloe Foreshore Precinct. The Masterplan design investigates the potential to 'unify' key areas of the Cottesloe Foreshore Precinct as a shared space environment facilitating pedestrian accessibility. This is achieved by providing a level access path throughout as well as implementing innovative interventions of traffic calming measures to achieve a safe and equally functional shared zone environment without significantly impacting on the social and economic dynamic of the area.

Traffic and Tansport Design





The Masterplan design has an important interface with transport function along and across the Marine Parade Corridor. Marine Parade is currently used for trips to recreation and social destinations along the foreshore and as a local connection from the south into Cottesloe's residential areas.

Marine Parade currently provides connectivity for private vehicles, pedestrians, cyclists and buses. All of these transport components are important to the function of the area, and must be maintained into the future. However, the current function of Marine Parade constrains the activity along the corridor, as well as the connection between built-form on the eastern side, and the natural, recreational uses along the foreshore. The transport component of the Masterplan has therefore focused on designing a corridor that maximises the utility of Marine Parade for the community by enhancing its attractiveness for destination and leisure trips, while reassigning other forms of trip function to alternative routes.

General Design Concept

The upgrade of Marine Parade is intended to create a highly attractive shared zone for mixed-traffic at prevailing speed of 20-30km/hr, between Forrest Street to the south and Eric Street to the north. This speed is consistent with shared use of the road surface by buses, cars and bikes, and with safe pedestrian crossing at all points along the corridor.

This environment intentionally disadvantages through-traffic by commuters and high-speed cycling groups. These demographics are expected to reroute to alternative north-south links including Broome Street and Curtin Avenue.

Destination trips by cars are still maintained, and supported through on-street and improved off-street parking facilities. The existing Transperth bus route and ongoing use of Marine Parade by coaches are both desirable functions that will be maintained.

The speed environment is to be maintained through vertical and horizontal Local Area Traffic Measures, maintaining a meandering road alignment along the project length, narrow pavement cross-section, compact roundabouts and slow points. In addition, surface textures and pavement differentiation is proposed to delineate vehicular areas from pedestrian and activity zones. The road meander is to be accentuated through the placement of planter boxes, urban furniture, trees and other vertical elements to reduce the visual width of the road, and truncating forward visibility. These factors are known to contribute to slow speeds through a 'Self-Explaining Streets' method.

Specific Design Components

Road Alignment

The road alignment has been chosen to restrict the view corridor along any road segment to less than 100m. This has been achieved by changing the existing straight alignment and creating a substantial 'meander' for approximately 500m of the project area, between Forrest Street and Eileen Street.

The section of Marine Parade north of Eileen Street is projected to act as a transition zone in this plan, operating at a slow speed but without the aggressive restrictive devices included in the highly active zone. There are opportunities to continue the slow-speed treatment through to Eric Street and beyond in later stages of development.

Compact Roundabouts

An alternative roundabout form has been proposed at two locations: Forrest Street and Napier Street. The geometry of these roundabouts has been modelled on the Transport for London's Compact Roundabout Standard and are intended to be trafficable by buses as required to support existing Transperth bus routes.

A compact roundabout is designed to slow traffic considerably, effectively requiring vehicles to stop at the approach and continue through the intersection at 10-20km/hr. The narrow circulating width creates an impediment for buses, particularly where right-turning movement is required. For this reason, the central island is proposed to be fully trafficable at Forrest Street, with the vertical geometry maintained to support the desired movement while still promoting adherence to the road rules.

Road Width

The road envelope is proposed to be maintained at a narrow 6.0m cross-section to promote low speeds. A clearance envelope of 500mm will be maintained on both sides of the road, defined by a differentiated pavement surface will allow buses to pass without risk of conflict. This envelope will be maintained clear of any vertical obstructions, with such elements including planters, street furniture and trees located hard up against the envelope to create vertical friction and further narrow visual width. In some locations it is expected that buses and other large vehicles may need to use the clearance zone to navigate corners or around obstructions.

Kerbing

No kerbs are proposed as part of the road crosssection. This maximises crossing opportunities in clear sections of the road, though pedestrians will be directed towards particular crossing locations by landscaping, planters, car parking or other obstructions.

Road Surface

The road pavement surface texture is extremely important to provide tactile feedback to drivers and cyclists and maintain slow speeds. In particular, surface texture promotes cycling speeds within the desired 20-30km/hr range, reducing potential conflicts between bikes and pedestrians.

This surface must be chosen carefully; aggressive surface texturing such as the granite cobbles is uncomfortable to cycle on as well as for pedestrians crossing with prams or mobility devices. High quality segmental pavements with a some small insets can be used to maintain the desired 'feel' for the roadway.

Tiered Cycling Environment

The Cottesloe Foreshore Precinct is an attractive destination for cyclists, as well as a route for recreational cycling activities. The use of the Cottesloe Foreshore Precinct for appropriate cycling will be encouraged through selection of path alignments and surface treatments, integrating the upgraded foreshore segments into the wider network.

High quality shared path facilities have recently been completed along Forrest Street, at the southern extent of the project area. This creates a strong link between the Cottesloe Foreshore Precinct and the Cottesloe Train Station / Fremantle Railway Principal Shared Path.

An off-street path environment is proposed for the foreshore side of the project, with cycling permitted only at pedestrian speeds. This includes a boardwalk along the beachfront which should be attractive for families and other slow-speed recreational cycling trips. Within the project area, on-street cycling on Marine Parade is expected to be comfortable and safe for cyclists of all experience levels.

The traffic environment outside of the project area is less pleasant for cyclists, with higher speed traffic and 'door zone' issues from parallel parking. The onroad environment is therefore likely to be used by group riders and experienced cyclists. These on-road riders can continue along Marine Parade on-road, at the 30km/hr design speed, or redistribute to Forrest Street or Broome Street.

Care has been taken to ensure less confident cyclists can transition safely from the managed speed section to the retained off-street paths outside of the project area. Transition locations have been chosen at the Forrest Street roundabout (effectively creating a 4th leg for cyclists on the western side), and via a mixing zone adjacent to the North

Cottesloe Surf Club, north of Eric Street.

Parking

On-street parking is encouraged in specific areas to support the adjacent built-form. This parking is proposed to be provided in angled parking bays to increase the overall supply. The slow speed environment allows for safe movement in and out of parking bays. The 'clearance envelope' is intended to create the visual buffer to allow traffic and cyclists to see parking vehicles and adjust accordingly.

Parking geometry has been maintained in accordance with Australian Standards.

Threshold Treatments

The section of Marine Parade between the Forrest Street and Napier Street compact roundabouts is expected to be raised to verge level, creating a raised threshold at all approaches. The roundabouts will be included in the raised area, creating vertical deflection on the approaches. This is considered vital due to the difference between the design speed of these roundabouts when compared to Austroads standard geometry.

A secondary threshold treatment is located at the northern entry, Eric Street, to define the slow-speed area and create a transition zone to the activated section of roadway.

Signage and Linemarking

Signage will be maintained at an absolute minimum, restricted wherever possible to speed limits on the approach to the project area and parking restrictions. The slow speed nature of the road eliminates the need for statutory or warning signage within the activated zone.

Stormwater Management



Proposed Stormwater Management Strategy

The proposed drainage strategy is to retain and infiltrate the 10 year ARI storm event within a series of bio-retention swales and underground storages within the vicinity of Marine Parade. The 100 year is expected to flow overland and discharge to the ocean. A post development hydrological model of the proposed works has been undertaken using XPSWMM¹. The model was built to characterise the behaviour of the post-development environment.

Post Development Modelling

The post development was modelled as three (3) catchments. The makeup of each catchment is displayed in **Table 1-1**.

10yr ARI Storm Event

During the 10 year ARI storm event a retention volume of approximately 3600 m3 is required across the site. This volume is to be stored in the proposed underground storage basins and ultimately infiltrated into the ground. It is noted that prior to any construction, detailed analysis is required.

Table 1-2 provides further details on the underground storage basin capacity.

Modelling Assumptions

Assumptions adopted for post development surface runoff modelling are as follow:

- Underground storage basin depth of 1.8 m was adopted in the modelling.
- Infiltration rate of 5 m/d2 was assumed for the proposed underground storages (200 mm/hour).
- Fraction impervious of 40%, 80% and 10% was applied for Residential, road and Major Open Space respectively.
- Any flooding over the 10 year ARI storm event will be flowing overland and ultimately discharge into the ocean.

¹ XPSWMM is a sophisticated hydrological and hydraulic software package which has the ability to generate hydrographs to model open channels, pressure flow networks, backwater effects and stage storage relationships using a complex routing package.

In the concept stage, infiltration rate of 200 mm/hr was assumed for Cottesloe. It is highly recommended that this infiltration is confirmed and further assessed in the detailed design.

Table 1-1 Catchment Areas Breakup

Catchment ID	Total Area (Ha)	Residential (Ha)	Road and Car Park (Ha)	Public Open Space (Ha)
1	8.72	5.22	1.79	1.71
2	10.68	2.89	3.23	4.56
3	12.87	8.17	2.10	2.60

Table 1-2 10 Year ARI Storage Retention Volumes

Catchment ID	Infiltration Rate ² (mm/hour)	Storage Area (m2)	Storage Depth (m)	Total Retention Volume (m3)
1	200	600	1.8	980
2	200	700	1.8	1260
3	200	840	1.8	1390

Water Quality Treatment

Eric Street

The flow from Eric Street would be captured at the junction of Eric Street and Marine Parade via side entry pits sized to capture the 100 year ARI event and directed into the underground storage. The flow from the underground storage should then infiltrated into the ground (10 year ARI) or directed to the ocean for discharge generated from events greater than the 10 year ARI.

Car-Park (corner of Napier St and Marine Pde)

The flow from the 1 year ARI storm event within the carpark area at the junction of Napier Street and Marine Parade is proposed to be treated onsite within the proposed raingardens. Treatment area required for this site is 200 m2.

Napier Street

The flow from Napier Street would be captured at the junction of Napier Street and Marine Parade via side entry pits sized to capture the 100 year ARI event and directed into the underground storage. The flow from the underground storage would be infiltrated into the ground (10 year ARI) or directed to the ocean for discharge generated from events greater than the 10 year ARI.

John Street

The flow from John Street would be captured at the junction of John Street and Marine Parade via side entry pits sized to capture the 100 year ARI event and directed into the underground storage. The flow from the underground storage would be infiltrated into the ground (10 year ARI) or directed to the ocean for discharge generated from events greater than the 10 year ARI.

Forrest Street

The flow from Forrest Street would be captured at the junction of Forrest Street and Marine Parade via side entry pits sized to capture the 100 year ARI event and directed into the underground storage. The flow from the underground storage would be infiltrated into the ground (10 year ARI) or directed to the ocean for discharge generated from events greater than the 10 year ARI.

Marine Parade

Rain gardens are proposed alongside Marine Parade for water quality treatment purposes. The total area of treatment required to treat the flow from the 1y 1hr ARI storm event is assumed to be 2% of the equivalent impervious road surface runoff area. Total required treatment area along Marine Parade is approximately 80 m2. It is estimated that flows generated from events larger than 1yr 1hr ARI and smaller than 10 year ARI storm events will bubble down to underground storage units and infiltrate. Events larger than the 10 year ARI storm event are expected to be directed to the ocean for discharge.



Structures



A visual assessment was conducted to determine the condition of the retaining walls at all of the grassed terraces adjacent to the Indiana Tea House building. The assessment includes the structural integrity of the walls, condition of handrails to the adjacent carpark and recommendations for repair and maintenance.

Visual Assessment and Recommendations

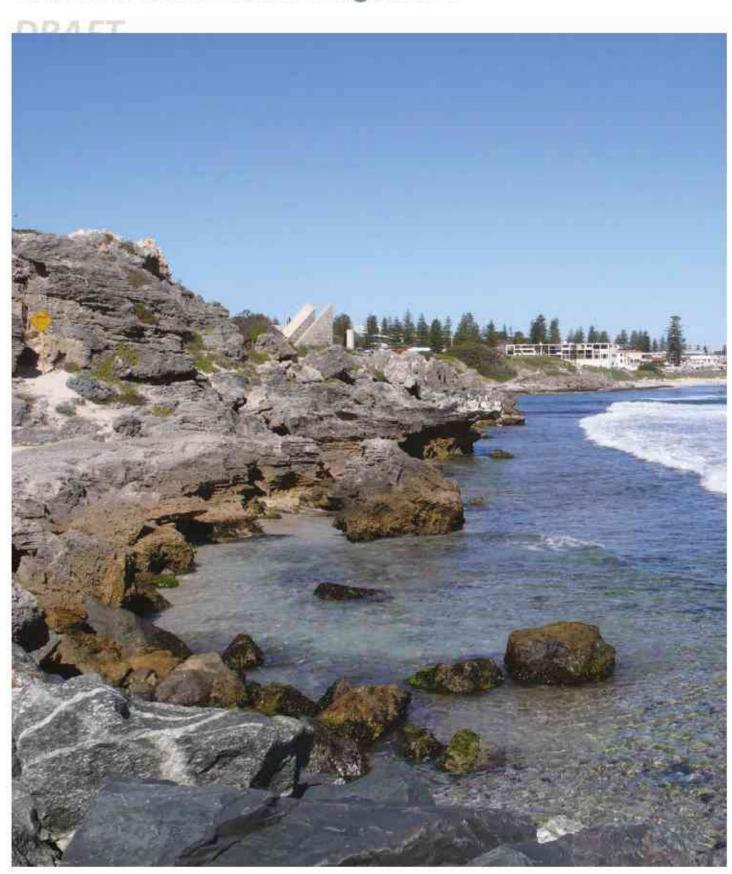
It was observed that all stone retaining walls were generally in good and stable conditions. Shrinkage cracks were observed on the mortar joints between the stone, however in general, the mortar is still firmly intact to the stone. It is recommended that the mortar joints are inspected, and any loose parts are removed and patched with repair mortar.

Vertical crack along the height of the wall were observed at some location. Thought it seems that those cracks were not excessive, and have been addressed on previous repairs, it is recommended that observation to be made on those cracks, and the cracks patched with repair mortar.

The concrete retaining wall at the base of the northern terraces was generally in good condition. Shrinkage cracks were observed along the height of the wall at regular intervals. Exposed reinforcement was observed at some location. This reinforcement is badly corroded and need to be replaced, and covered.

The galvanised steel railings at the carpark area are generally in good condition. Corrosion was observed at the joints between the post and horizontal railing. Some connection points between the post and horizontal railing were missing, and are a hazard. It is recommended that the missing connections are reinstated, and corrosion protection applied to the railing.

A copy of the full assessment report is enclosed as Appendix 3.



Cardno have developed a Coastal Hazard Risk
Management and Adaptation Plan (CHRMAP)
in accordance with Western Australian Planning
Commission (WAPC) guidelines to demonstrate that
current and potential future coastal hazards have
been considered. This report addresses the initial
steps in the CHRMAP process; namely establishing
the context and identifying risks through a coastal
vulnerability assessment.

The context for coastal management has been established through assessment of previous investigations, initial stakeholder consultation and the review of environmental conditions and processes at the site. This has allowed the determination of success criteria, against which identified risks will be evaluated. These criteria are:

- · Environment and sustainability;
- Maintain and protect public safety;
- Protect and enhance the local economy and growth; and
- Protect community and lifestyle.

A site investigation was undertaken to assess the environmental setting of the study area and the layout of existing infrastructure at the site. This site visit, in conjunction with a review of existing coastal investigations in the area, allowed a preliminary assessment of coastal hazards and their associated risks.

Coastal hazards within the study area have been quantified and mapped through a coastal vulnerability assessment. This assessment follows the guidelines set out the State Planning Policy No 2.6 - State Coastal Planning Policy (SPP2.6) (WAPC, 2013). The coastal vulnerability of the study area now and for the future planning horizons 2040 and 2070 has been considered. Overall planning setbacks for erosion were developed by combining the potential for short-term (storm induced) erosion with potential long term erosion; comprising historical shoreline movement trends and that due to predicted sea level rise. Coastal inundation due to water level variations and wave setup has also been considered for current and future sea level rise scenarios.

In the next phase of the project, accompanying the finalisation of the concept design, risks will be evaluated in detail by analysing the likelihood and consequence of impacts due to the determined coastal hazards. This evaluation will draw on the success criteria to assess the acceptability of each risk. Advice will then be provided as to the most appropriate locations for various land-use proposals, and any adaptation options required to mitigate the risks of these hazards. Adaptation options will follow the SPP2.6 'Avoid, Retreat, Accommodate and Protect' hierarchy.

A copy of the full report is enclosed as Appendix 4.

Hardscape Palette

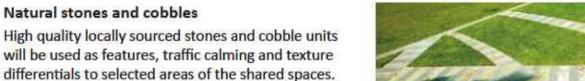
A palette of materials and products has been developed to ensure a consistent approach across the Cottesloe Foreshore Precinct. Recommendations are provided on paving, furniture and structures, signage, wayfinding and lighting.

The palette has been developed with consideration for quality, value and maintaining the 'look and feel' of the suburb of Cottesloe.

Paving

Concrete pavers

Concrete pavers will be used to define the shared space and pedestrian pathways on the building side of Marine Parade.



In-situ Concrete Paving

A high quality exposed aggregate finish will provide a subtle and cost-effective ground treatment using locally sourced aggregates which complements those selected for the concrete pavers to the shared spaces.

Decking

High quality synthetic decking boards will be used to define paths and platforms on the beach side of Marine Parade.

Asphalt

Red asphalt will be used to highlight key access ways and black asphalt to define the surfacing of car parking bays and road ways.









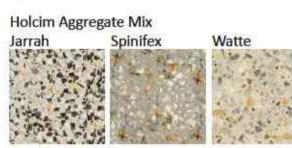














Street Furniture & Structures

A site specific suite of seating, handrail and shade structure elements is proposed for the Masterplan. These elements provide the greatest opportunity to contribute to the new identity and character of Cottesloe Foreshore Precinct.

Design Concepts

The furniture suite reinforces the overarching design concept established in the Masterplan. The form and design rationale of the furniture suite reflects the natural qualities associated with the beach combined with the distinctive features of iconic built form characteristic to Cottesloe Foreshore Precinct.

Urban Furniture palette

The proposed palette of furniture items combines slated hardwood timber, stainless steel and concrete into a simplistic and refined design language.

The selected materials have been chosen to ensure sustainability, longevity and ease of maintenance. Where possible details, fixings and finishes will be standardised across the project.

Proprietary Products











Examples of Bespoke Designs









Feature lighting integrated with furniture Bollard seat

Proposed Bespoke Designs



Handrail design with interpretation opportunities



Seating and shade structure

Planting Palette

Plant species selection will be determined by a combination of site specific requirements, e,g. soil, exposure and landuse) and application of design intent.

The proposed palette of plant species is based on promoting and showcasing vegetation that is native to the Cottesloe coastal region and in combination with exotic species to complement existing planting and trees in reflecting the local and cultural character of the Cottesloe Foreshore Precinct.

The final species selection will be sourced from this proposed palette.

Trees Palettes

Shade Trees for Public Open Spaces Native Palette



Eucalyptus gomphocephala, Tuart

Large tree growing 10-30m high with rough bark. Flowers are white during January to April.



Eucalyptus rudis, Flooded Gum

Large tree growing 5-20m high with rough bark. Flowers are white during July to September.



Casuarina obesa, Swamp Sheoak

Small tree growing 1.5-10m high. Flowers during January to December.



Melaleuca lanceolata, Black Paperbark

Small tree growing 5-10m high. Flowers are whitecream, during January to September.





Metrosideros exselsa, NZ Christmas tree

Medium tree growing 8-12m high. Flowers are red bottlebrush like, during November to March

Street Trees Native Palette



Melaleuca lanceolata, Moonah/Black Paperbark

March.

Eucalyptus platypus, Moort

Small tree growing 4-10m

with smooth bark. Flowers

are white/cream-yellow-

green, during September

to December or January to

Small tree growing 5-8m high. Flowers are whitecream, during January to September.





Metrosideros exselsa, NZ Christmas tree

Medium tree growing 8-12m high. Flowers are red bottlebrush like, during November to March

Screening and Car Park Trees Palette



Eucalyptus gomphocephala, Tuart

Large tree growing 10-30m high with rough bark. Flowers are white during January to April.



Casuarina obesa, Swamp Sheoak

Small tree growing 1.5-10m high. Flowers during January to December.



Melaleuca lanceolata, Black Paperbark

Small tree growing 5-10m high. Flowers are whitecream, during January to September.



Banksia menziesii, Menzies' banksia

Small tree or large shrub growing 2-8m high. Flowers are pink/red/yellow, during February to October.



Agonis flexuosa, Sweet Peppermint/ Willow Myrtle

Small tree or large shrub growing 5-10m high. Flowers are white, during July to December.

Source information and photos are from Cottesloe Coastcare Association and FloraBase

Plants Palettes

Street Shrubs and Groundcovers Palette



Austrostipa elegantissima, Feather spear-grass Perennial grass growing



Hibbertia hypericoides, Yellow Buttercups Small twiggy shrub growing 0.2-1m high. Flowers are yellow during April to December.



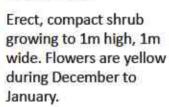
Kennedia prostrata, Scarlet Runner/ Running Postman growing 0.1-0.15m high.



Prostrate or twining shrub Red flowers during April to November.



Leucophyta brownii, Cushion Bush

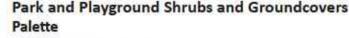




Rhagodia baccata, Berry Saltbush

Spreading shrub growing 0.3-2m high. Flowers are cream-yellow/green during February or April to May or October to December.







Banksia dallanneyi, Couch Honeypot

Small shrub growing to 0.3m high. Flowers are cream-yellow-brownpink-green during May to October.



Carpobrotus virescens, Coastal Pigface

Prostrate shrub growing 0.1-0.3m high, 0.5-3m wide. Flowers are purplepink/white during June to December or January.



Conostylis candicans, Grey Cottonhead

Small shrub growing to 0.4m high. Flowers are yellow-brown during July to november.



Eremophila Glabra, Kalbarri Carpet

Small shrub growing 0.1-0.3m high, 1-1.5m wide. Flowers are greenyellow-orange-red-brown during March to December.



Grevillea crithmifolia (prostrate), Green Carpet

Small dense shrub growing 0.3-0.6m high, up to 3m wide. Flowers are white/ white-pink during August to November.



Grevillea preissii (prostrate), Sea Spray Small shrub growing to 0.5m high, 3m wide. Flowers are red during June to September.



Hemiandra pungens, Snakebush

Small shrub growing 0.5-1m high. Flowers are white/ blue-purple/pink during January to December.



Hibbertia hypericoides, Yellow Buttercups

Small twiggy shrub growing 0.2-1m high. Flowers are yellow during April to December.



Leucophyta brownii, Cushion Bush

Erect, compact shrub growing to 1m high, 1m wide. Flowers are yellow during December to January.



Rhagodia baccata, Berry Saltbush

Spreading shrub growing 0.3-2m high. Flowers are cream-yellow/green during February or April to May or October to December.



0.13-2m high, 1.5m wide.



0.3m high. Flowers are cream-yellow-brownpink-green during May to October.



Conostylis candicans, Grey Cottonhead

Small shrub growing to 0.4m high. Flowers are yellow-brown during July to november.



Eremophila Glabra, Kalbarri Carpet

Small shrub growing 0.1-0.3m high, 1-1.5m wide. Flowers are greenyellow-orange-red-brown during March to December.



November.







DRAFT

Acknowledgement of Traditional Custodianship

The past and present traditional custodians of this land, the Whadjuk people are acknowledged and respected in this interpretation plan.

Their continuing culture and the contribution they make to the life of this city and this region is recognised.

It is a privilege working with Whadjuk people, Whadjuk land and their stories.

Client



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Attachment 1. Aboriginal Heritage Sites Attachment 2. Aboriginal Heritage Sites Attachment 3. Cottesloe Foreshore Redevelopment - Sites of Aboriginal Significance: Research and Consultation

Introduction

The Cottesloe Foreshore Redevelopment is a project advanced by the Town of Cottesloe.

The Masterplan is being developed by Cardno with Apparatus providing heritage interpretation guidance and public art coordination services.

The first stage of the project is the seamless design of an overall landscaping concept for the Cottesloe Foreshore. Stage Two will see the detailed design and construction of the section of the Cottesloe Foreshore between Forrest Street and Napier Street.

This first stage will determine the surface, infrastructure, furniture, vegetation and interpretation themes for the whole of the Cottesloe Foreshore redevelopment.

The Town of Cottesloe will ultimately approve the Master Plan following endorsement by the key project stakeholders.

In particular this document will offer strategic direction to:

- reveal and enhance the cultural heritage values found within the area;
- · promote public understanding and prompt curiosity about the site's past uses; and
- · inform and guide the design and installation of interpretative tools for the redeveloped site.

Cultural heritage interpretation will celebrate Cottesloe by bringing local stories into the public realm. Interpretation elements will be delivered to exacting standards enhancing the natural aesthetic of the beach and improving its public amenity.

Interpretation is an educational activity which aims to reveal meanings and relationships through the use of original objects, by firsthand experience, and by illustrative media, rather than simply to communicate factual information." Freeman Tilden, 1957

Fig 1 Masterplan

http://inherit.stateheritage.wa.gov.au/Public/Inventory/Details/72706993-bfbe-41c0-9a3bc3ac6c852eac

Purpose

The purpose of this Interpretation Plan is to articulate the cultural heritage value of the site, provide themes and locations for interpretation and outline an associated implementation budget.

The purpose of providing interpretation at the Cottesloe Foreshore is to:

- · provide an opportunity for visitors and residents to form connections and a deeper engagement with the place through the purposeful delivery of stories directly relevant to Cottesloe's history;
- reveal the value of Cottesloe's cultural heritage; and
- provide opportunities for reflection of the site's past through consideration of interpretive elements embedded into the landscape design such as didactic plaques, artwork elements and utilisation of street furniture as sites for interpretation.

Heritage interpretation is a means of sharing Australian history and culture with other communities, new citizens, visitors, and people overseas.

It is also a means of passing on the knowledge of Australian history, culture and values to new generations.

Heritage Office, NSW,

Cottesloe Foreshore Redevelopment - Interpretation and Public Art Plan 7

Approach

A place-led approach has underpinned the Master Plan, to align objectives through visioning, planning, development, investment attraction and management. The community and stakeholder engagement outcomes have also been reflected in the Master Plan.

The methodology seeks to provide relevant and targeted interpretation strategies in order to communicate the history and value of the heritage associated with the site and form a complementary part of the Cottesloe Foreshore redevelopment project.

Methodology

The preparation of this methodology involved much consultation and careful thinking about the site and its potential users; this helps to inform the creative communication of the key stories and values of the site. It is structured into four chapters:

PEOPLE

This section includes an audience profile to establish who the visitors are likely to be for redeveloped Cottesloe Foreshore and what they are likely to expect.

This section includes a context analysis of the site in the past, present and future.

THEMES + STORIES

This section provides a thematic analysis for interpretation; sets a vision for the interpretation; and includes the most significant themes and stories associated with the place.

This section presents the projects for appropriate interpretation for the site along with a timeline for delivery and guidance on the next steps to implement the strategy.

Guiding Principles

To ensure the methodologies align with best practice, this Interpretation Plan has been informed by the following documents:

- Interpretation fact sheets, State Heritage Office
- Aboriginal Cultural Heritage Management Plan Template, Swan Catchment Council 2008
- 'We're a Dreaming Country', Guidelines for Interpretation of Aboriginal Heritage, The National Trust of Australia (WA) 2012
- . Sharing our Stories: Guidelines for Interpretation, The National Trust of Australia (WA) & Museums Australia (WA)
- · Interpreting Our Heritage, Freeman Tilden (1957) and printed by the University of North Carolina Press, Chapel Hill.
- The ICOMOS ENAME Charter for the Interpretation and Presentation of Cultural Heritage Sites prepared by ICOMOS International Scientific Committee on Interpretation and Presentation

Based on those documents the following four principles were developed to guide a strategy for interpreting the Cottesloe Foreshore site.

ENJOYMENT - To enhance visitor enjoyment of public spaces and support engagement and understanding of the Cottesloe Foreshore.

SENSE OF PLACE - To assist in defining a sense of place for the Cottesloe Foreshore; provoke thought and contemplation by allowing people to discover the cultural heritage value of the site.

EXCELLENCE - To be high quality and contribute to the culture of place.

INCLUSION - Interpretation should cater for all users of the redeveloped site and should be socially inclusive with its strategy.

People

Understanding the audience is key to developing appropriate interpretation strategies. It is important in deciding what the aims and objectives of the interpretation planning are, what the balance between different types of interpretation should be and where these should be located within the redeveloped site.

Visitors

It is assumed that visitors to the Cottesloe Foreshore will vary in how they engage the mix of natural, recreational, retail, commercial and residential land uses. These visitors are not necessarily seeking a heritage and/or interpretation experience. the interpretive elements will provide an unexpected depth of engagement while enjoying through the beachfront.

Given the nature of the Cottesloe Foreshore, which primarily relates to recreational users, the place is likely to be frequently occupied and visited during day times hours and on the weekends, though there will be likely fewer visitors in the winter months.. As a result there are a number of potential groups that will use the precinct at different times.

Incidental Users

This group will primarily come from those who live and work in Cottesloe or who are involved in the provision of services. This group will be subliminally aware of the interpretative mediums that are located in the precinct as part of their daily activity. This group does not need to be marketed to or targeted in any way other than providing an honest and attractive presentation of the Cottesloe Foreshore and subtle pieces of interpretive media,

allowing them to appreciate the landscape design and be subtly informed of the foreshore's unique value while gauging an outline understanding of the previous use.



Recreation at Cottesloe

Cottesloe Foreshore Redevelopment - Interpretation and Public Art Plan 10

Recreational Visitors

Visitors from the local and wider community will use the spaces in and around the Cottesloe Foreshore for swimming, promenading, eating or relaxing and can spend more time engaging with the history of the place and thinking about its previous use.

It is anticipated that recreational visitors will also be repeat visitors so it is imperative to the success of the site's interpretation that these visitors are given the opportunity to learn about the site's heritage in more depth. It would be beneficial to their experience to incorporate a range of curiosities and elements to continue to explore.



Sunday Session at the Cottesloe Beach Hotel



The Rottnest Channel Swim

Sporting Visitors

The primary purpose of the Cottesloe Foreshore is that of a place of recreation, swimming and water sports. Interpretation at the Cottesloe Foreshore should be reflective of this particularly special aspect of the site.

There are numerous sporting events and activities that take place at Cottesloe Foreshore. These include:

- · The Rottnest Channel Swim, an annual open water swimming event from Cottesloe Beach to Rottnest Island off the coast.
- · Surfing and surf lifesaving at the Cottesloe Surf Life Saving Club and the North Cottesloe club.
- Surf competitions.
- Beach volleyball events for the WA Beach Volleyball Association.
- Vac Swim swimming classes.
- Surf ski-ing.

Cultural Visitors

Each year Cottesloe beach is transformed by the free public exhibition Sculptures by the Sea, featuring works by local artists. It is the sister event to Sculpture by the Sea held at Bondi Beach in Sydney.

It is likely that cultural visitors interested in the heritage of Cottesloe Foreshore will be a niche group. This will be a group who will embrace both subtle and overt interpretation and will arrive with a heightened expectation of what they want to experience.

While this group will most likely be a smaller percentage of the overall audience some specific strategies to engage with them are required. It is necessary to ensure that any information presented that relates to the site is accurately presented and factually correct.



Indiana Tea House, Cottesloe



Sculpture by the Sea, Cottesloe 2016 Photo by Sandy L

Tourism Visitors

The Cottesloe foreshore is internationally recognised for its clean, sandy beaches, Norfolk Island pine trees, shaded lawns and grassed terraces close to the water.

Tourism visitors will be looking for a more educational and engaged experience of the Foreshore to understand and absorb more about Cottesloe's cultural history and significance.

The will be looking for an authentic and unique experience that sets Cottesloe apart from any other place in the world.

Place

The following Information is from the Cottesloe Enquiry by Design Report, 2009

The Cottesloe Foreshore is both a local and regional beach environment within an established and historic seaside suburb. It is internationally recognised for its clean, sandy beaches, Norfolk Island pine trees, shaded lawns and grassed terraces close to the water.

It is also well known for its beachfront strip along Marine Parade which includes the Indiana Teahouse, the Cottesloe Beach Hotel and the Ocean Beach Hotel. The foreshore offers a range of public and recreational activities while remaining a tranquil place with a sense of openness.

The following precincts are listed on the Heritage Council's Places Database:

- · Cottesloe Beach Precinct;
- · Norfolk Island Pine Precinct, Cottesloe
- · Vestige of Original Jetty and Site of Pavilion
- Cottesloe Beach Pylon (Cottesloe Beach Shark Proof Pool, Foreman's Folly)

Moonderup (commonly called Mudurup) is listed on the Department of Aboriginal Affairs Heritage Site Database as a place of ceremonial and mythological significance.

The Cottesloe Enquiry by Design Report produced in 2009 for the DPI and the Town of Cottesloe states that the most positive elements of the foreshore, apart from the tall Norfolk Island Pines and the beaches, were thought to be the continuous pedestrian boulevard and the grassed areas.

When asked to describe what gave Cottesloe its unique character, most participants attending the Enquiry by Design workshop used terms such as low key, village-like, serene, casual, good human scale.



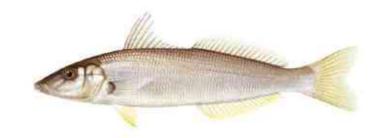
The foreshore offers a range of recreational activities.

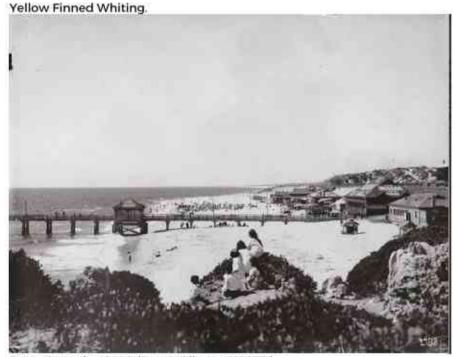
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Site + Situation

The coastline, landform and vegetation of Cottesloe provide a distinctive natural landscape setting, which underpins its identity as a suburb with prime ocean frontage. The topography falls toward the coast from an elevated ridgeline to the east. Marine Parade and the beachfront buildings are set above the beach providing a unique character, offering views from vantage points back toward the ridge and limiting the impact of built form along Marine Parade when viewed from the beach. The coastal landscape is a mix of revegetated dunal areas and grassed terraces and verges.

Cottesloe Beach is not adjacent to a major north-south road system and consequently visitors must access the beach by driving through Cottesloe's streets. This indirect approach serves to reinforce the physical sense that the beach is actually part of the Cottesloe suburb, unlike many other metropolitan beaches which are divorced from their suburbs by major roads or highways. It is this close relationship between beach and town that most likely gives rise to the local feeling that this is a local community beach rather than a regional beach. 1





Jetty, Cottesloe, 1920 (Battye Library 011113D)

Cottesloe Beach is however a regional asset to be enjoyed by all.

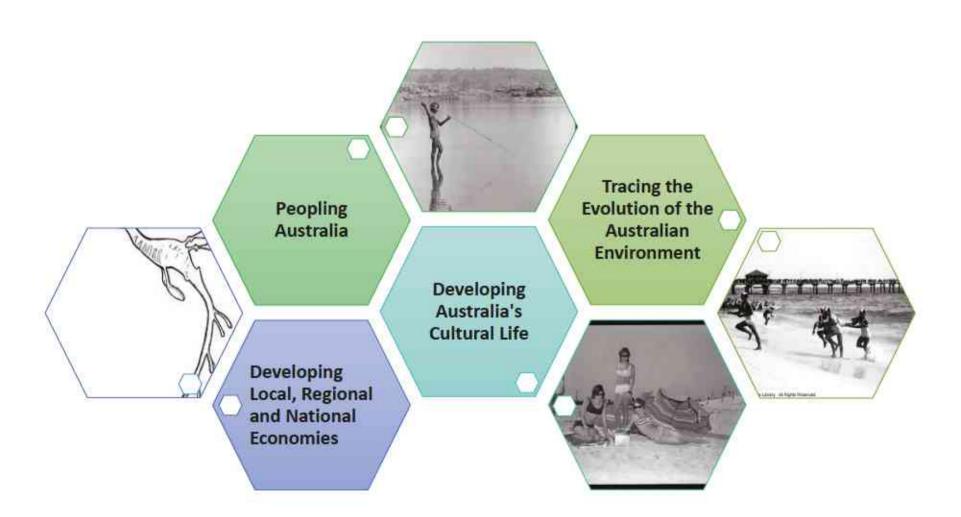
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The rail service to the Town Centre provides access to the beach for a significant number of Perth's residents and visitors who use Forrest Street as a pathway to the beach.

A portion of the Cottesloe Reef has also been declared a Fish

Habitat Protection Area under the Fish Resource Management Act (1994), reinforcing the value of its marine environment and its importance to the community.

Themes + Stories



Key Themes

The key themes have been formed specifically for this project by drawing on the Australian Historic Themes Framework.

T.I		ing the Evolution of the Australian ronment				
	1.1	Tracing climatic and topographical change				
	1.2	Tracing the emergence of Australian plants and animals				
	1.3	Assessing scientifically diverse environments				
	1.4	Appreciating the natural wonders of Australia				
T.2	Peopl	ling Australia				
	2.1	Living as Australia's earliest inhabitants				
	2.2	Adapting to diverse environments				
	2.4	Migrating				
		2.4.1 Migrating to save or preserve a way of life				
T.3	Devel	loping Local, Regional and National Economies				
	3.4	Utilising natural resources				
		3.4.1 Hunting				
		3.4.2 Fishing and whaling				
	712	Feeding people				

3.12.1 Using indigenous foodstuffs

3.23 Catering for tourists **Developing Australia's Cultural Life** Organising recreation Playing and watching organised sports Enjoying the natural environment Going to the beach Going on holiday 8.3 Eating and drinking Forming associations Helping other people 8.5.2 Associating for mutual aid 8.5.3 Pursuing common leisure interests 8.5.4 Worshipping 8.6 8.6.2 Maintaining religious traditions and ceremonies Making Australian folklore Celebrating folk heroes

Myth making and story-telling

3.22 Lodging people

8.11.2

Theme 1 – The Environment

A portion of the Cottesloe Reef is a Fish Habitat Protection Area under the Fish Resource Management Act (1994), reinforcing the value of its marine environment and its importance to the community.

Them	Them	Sub-	Story 1A – Marine Habitats and Species
е	e	Theme	
Group			
Т.1	1.2 1.3 1.4		 A portion of the Cottesloe Reef is a Fish Habitat Protection Area under the Fish Resource Management Act (1994), reinforcing the value of its marine environment and its importance to the community. This story expands on the various marine habits and species found at Cottesloe.
			Story 1B – Birds,Land Animals and Plants
T.1	1.2 1.3 1.4		This story describes the various birds and animal species found at Cottesloe.
			Story 1C – Separation of the Mainland and Islands
T.1	1.1 1.3 1.4		 Coastal dwelling Whadjuk have an oral tradition describing the separation of Rottnest from the mainland, which occurred between 12,000-8,000 BCE, technically a post-glacial Flandrian transgression. It is believed that Rottnest Island was separated from the mainland 7,000 years ago. The sea level rose, cutting the
T.2	2.1 2.2 2.4	2.4.1	Island off from the land mass, and it is now the largest in a chain of islands (which includes Garden and Carnac Islands) on the continental shelf opposite Perth. Before the separation the Islands were inhabited by Aborigines, and their artefacts there have been dated from about 6500 to 50,000 years ago.
			Story 1D – Geology, Mudurup Rocks
T.1	1.1 1.3 1.4		 On the foreshore and in the cliffs at Mudurup Rocks at Cottesloe is a sequence of beach and prograding shoreline deposits. Exposed on the beach is a development of thick beach rock that extends from below water level to the high-tide
T.2	2.1 2.2 2.4	2.4.1	mark. The beach rock contains large broken shells of gastropods and other molluscs and some coral fragments set in a hard, cemented shelly matrix. • This story describes the geology at Mudurup and its connection to Rottnest, Garden and Carnac Islands.

Theme 2 – Aboriginal Significance

The first Australians, the custodians of Mudurup are the Mooro People, a clan within the Whadjuk group and the Noongar language group. This theme explores their lifestyle, the way they lived at Murdurup and their stories.

Theme	Theme	Sub-	Story 2A - The Mooro People
Group		Theme	
T.2	2.1 2.2		 The land-owning group which inhabited the coastal strip between Yanchep and South Fremantle was collectively known as the Mooro.
T.3	3.4 3.12	3.4.1 3.4.2 3.12.1	 The group was lead by Yellagonga who had territorial control over this vast domain. The land included the area now known as Cottesloe, as well as the future site of Perth (Boorloo), where he had his principal headquarters. This story describes the Mooro people and their way of living as an organized hunter / gatherer society.
T.8	8.2 8.4 8.5 8.6	8.5.4 8.6.2	
Theme	Theme	Sub-	Story 2B – Mudurup
Group		Theme	
T.1	1.4		 Cottesloe is known to Noongar people as Mudurup (pronounced 'Moordoorup' or 'Murdarup').
T.2	2.1 2.2		 Meaning 'place of whiting', it derives from the Nyungar mudu meaning whiting + up, meaning 'place of'. Mudurup is said to refer to the place of the yellow-finned whiting (Sillago schomburgkii) commonly found in
Т.3	3.4	3.4.1 3.4.2 3.12.1	Cottesloe and a great eating fish. • This theme explores Mudurup as a place for fishing and the important of Mudurup to the Mooro people This theme explores Mudurup as a place for fishing and the important of Mudurup to the Mooro people

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Theme	Theme	Sub-	Story 2C – Fresh Water: Creation and Collection
Group		Theme	
T.I	1.1 1.3 1.4		 How did indigenous people survive on this dry coastal belt? This story explains ingenious methods of harvesting fresh surface water from the ocean and collection of fresh water from natural springs. The story could also discuss the local aquifer at Collesloe and the deep connection of the Wagyl to the creation of
T.2	2.1 2.2 2.4	2.4.1	waterways and the Nyitting Time (The Dreaming).
T.8	8.6	8.6.2	
Theme Group	Theme	Sub- Theme	Story 2D – The run of the Wardung and the CrowMan
T.1	1.4		Indigenous oral history states that Mudurup was one of the traditional haunts (or in Noongar terms the 'run') of the
T.2	2.1 2.2		Australian Raven or Wardung. This story talks about the special role the Wardung plays as a storm indicator.
T.3	3.4	3.4.1 3.4.2 3.12.1	 This story could further expand on the story of the Crow Man, known as Bibarn or Johnny Cudgel.
T.8	8.6 8.11	8.6.2 8.11.1 8.11.2	



Theme 3 – Post Colonial Heritage

Cottesloe unique post-Colonial heritage character is explored during these themes, its significance recognised and translated into human interest stories.

Theme	Theme	Sub-	Story 3A – People at Play
Group		Theme	
T.3	3.22 3.23		Visiting from the Country. A tourism hotspot.
T.8	8.1 8.2 8.3 8.4	8.1.1 8.1.4	Neck-to-Knee to Nudity. The Mooro people and their way of living.
Theme Group	Theme	Sub- Theme	Story 3B - Peculiar to Locals
T,8	8.11	8.11.1 8.11.2	 The Pylon is one of three pylons built to anchor a shark net following a fatal attack in 1925. Two were destroyed by storms in 1937. Since then it has become an iconic landmark and popular diving platform for beach users. The Oceanarium - In 1969 Cottesloe sported an Oceanarium displaying a 7-foot shark, turtles, jewfish, snapper, groper, tailor, and in a smaller lank crayfish, seahorses and tropical fish. Peter's Pool - a popular swimming spot at Cottesloe Beach because of the protective reef surrounding the gap between the reefs, one of the nicest places to swim along North Cottesloe Beach.
Theme Group	Theme	Sub- Theme	Story 3C – Built Heritage
T.3	3.22 3.23		 The Jetty, 1906 - Despite the growing attraction of Cottesloe's clear waters and pristine sands, it was not until the completion of a wooden English-type pier that Perth's favourite beach reached new heights of popularity. With the official opening of the jetty and the carnival-like atmosphere created on the beaches alongside of it, people flocked
T.8	8.2 8.3 8.4 8.11	8.11.2	 from all corners the State to spend their summer holidays on that pleasant section of the coast. The evolving foreshore The Tea Rooms The Hostel Manly - A sizeable number of guest and boarding houses, catering for summer visitors, sprang up within walking distance to the ocean, the railway and the highway. There is little doubt that it was Cottesloe's best-known holiday guest house.

Theme	Theme	Sub-	Story 3D – Bronzed Aussie + Iron Men and Women
Group		Theme	
T.8	8.1 8.2 8.5	8.1.1 8.1.4 8.5.2 8.5.3 8.5.4	There are numerous sporting events and activities that take place at Cottesloe Foreshore. These include: The Rottnest Channel Swim, an annual open water swimming event from Cottesloe Beach to Rottnest Island off the coast. In 1909 it became the birthplace of surfing and surf lifesaving in Western Australia, with the establishment of the Cottesloe Surf Life Saving Club. The North Cottesloe club followed in 1912.
	8.11	8.11.1	 The Cottesloe Classic Mile, Cottesloe Port to Pylon. Surf competitions for locally based surfing clubs at any beach with the Town. Beach volleyball events for the WA Beach Volleyball Association on any beach. Vac Swim swimming classes. Surf skis, swimming and recreation.



The opening of the Jetty, 1907, photo from Cottesloe History (cottesloehistory.wordpress.com)

Implementation

The delivery of the Cottesloe Foreshore Redevelopmen will be focused around the redevelopment of the site and the heritage/interpretation value will form a key consideration and an inherent part of the decision making process.

A key part of the heritage interpretation implementation is to incorporate the interpretive projects into the design and development process. This Interpretation Plan gives clear

direction to the intended heritage interpretation outcomes for the place. Engaging artists and interpretation designers to assist with further detailed design and content will be necessary to provide designs suitable for construction and accurate costing. The following table is intended as a guide to inform when projects could be implemented and who will be responsible for overseeing the design development and installation.

Proj	ect	When to be implemented	Integrated or Stand Alone	Who will implement
l.	Interpretive Material	Within 18 months	Integrated	Apparatus and Cardno
2.	Noongar Stories	Within 18 months	Integrated	Apparatus and Cardno
3.1	Interpretive artwork - Bronze	Within 18 months	Stand Alone	Apparatus
3.2	Interpretive artwork - Textural	Within 18 months	Integrated	Apparatus and Cardno
4.	Playground interpretive artwork	Within 18 months	Integrated	Apparatus and Cardno
5.	Interpretive Street Furniture	Within 18 months	Stand Alone	Apparatus and Cardno
6.	Refresh Existing Trail signage	Within 18 months	Integrated	Apparatus and Cardno



Esperance Waterfront Interpretive Signage, Creative Spaces



Mandurah Health Centre Artwork Detail, Sandra Hill and Jenny Dawson

Project 1:Interpretive Material

There is an opportunity to thread interpretive material throughout the redesigned and redevelopment landscape along the foreshore. This could include wayfinding and interpretive signage, utilising heritage photographs, blueprints of the pre-existing heritage landmarks, newspaper clippings and custom illustrations of the landmarks, to create context and a sense of place.

It is envisioned that a Western Australian history with a sense of local history would be commissioned to work with the interpretive design team on various stories written for text and spoken word interpretation.

The interpretive design team would work across all projects to ensure a consistency of approach and design.

Project 2: Noongar Stories

Mudurup was an important place to the Whadjuk Noongar people and the Noongar stories told here will play an important role in the perceptions future users will form about the Cottesloe Foreshore.

It is proposed that a Noongar artist and a Noongar writer will be commissioned to work with the interpretive design team to bring stories to life. Much research has already been done and is contained in the Interpretation and Public Art Plan: Sites of Aboriginal Significance: Research and Consultation.

Whadjuk Noongar consultation will be necessary to ensure that all material produced is culturally appropriate.

Project 3:Interpretive Artwork

Integrating physical, sculptural elements into the landscape will provide an opportunity for visitors to interact with and understand the site.

It is recommended that a series of discrete, narrative bronze sculptures are commissioned for integration into the landscape. This will provide elements that are at once whimsical and tactile. These could be items such as a discarded towel, thongs and bathers in bronze. In addition, a series of textural artworks integrated into the footpath and landscape design will provide a natural earthy element, this could be ceramic pieces echoing the bed-forms found in the sand underwater.



The existing playground on the foreshore is earmarked to be redesigned with new equipment focusing on natural play, in conjunction it is suggested that an artist is commissioned to design public art interpretive and educational play elements that are integrated into the play space.

These play elements may be concrete stepping-stones with sandblasted images and text descriptions of the unique marine biology and land-based fauna found in the Cottesloe area.



Esperance Foreshore Redevelopment, Creative Spaces





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Esperance Foreshore Interpretation Project, by Creative Spaces. Photo by Dan Paris



Wardun Beeliar Bidi Signage. Photo by Helen Curtis

Project 5: Interpretive Street **Furniture**

To provide a comfortable place to wait for public transport that contributes to the place making of the foreshore.

A suite of bespoke bus shelters will be designed and fabricated especially for the Cottesloe foreshore. The industrial designer will design the shelters to carry interpretive information as images embedded into toughened glass and spoken word that operates on a push-button system.

The bus-shelters would only be used in the Cottesloe foreshore area highlighting the importance and distinctiveness as Perth's premier beachfront.

Project 6: Refresh Existing Trail Signage

New signage will be fabricated to replace the Wardun Beeliar Bidi Signage currently installed on the foreshore which has degraded.

The new signage will be developed in the style of the existing trail signage with the main signage installed near Mudurup Rocks and the directional markers integrated into the foothpath.

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Costs

Project	Action	Themes + Stories	Indicative Cost
Interpretive Material	Commission interpretive design specialists to coordinate the integrated design and fabrication of interpretive material throughout the projects.	1A. 1B, 1C. 1D + 2A, 2B, 2C, 2D + 3A, 3B, 3C, 3D	\$220,000
	Commission writer to work with interpretive design team on various stories written for text and spoken word interpretation.	3A, 3C	\$7.000
2. Noongar Stories	2.1 Commission Noongar artist team to work with interpretive design team.	2A, 2B, 2C, 2D	\$10,000
	2.2 Whadjuk Noongar consultation.	2A, 2B, 2C, 2D	\$1,400
	2.3 Commission writer to work with Noongar artist team and interpretive design team.	2D	\$3,000
3. Interpretive artwork	 Commission artist for a series of discrete, narrative bronze sculptures integrated into the landscape. 	ТВА	\$75,000
	3.2 Commission artist for a series of textural artworks integrated into the footpath and landscape design.	1A, 1B, 1C, 1D + 2A, 2B, 2C, 2D + 3A, 3B, 3C, 3D	\$75,000
Playground interpretive artwork	4.1 Commission artist for public art as interpretive and educational play equipment integrated into the play space.	1A, 1B, 1C	\$75,000
5. Interpretive Street Furniture	5.1 Commission industrial designer to design of a series of bespoke bus shelters to carry interpretive information.	3A, 3C	\$15,000
	5.2 Commission fabricator to work with industrial designer and interpretive design team.	3A, 3C	\$300,000
Refresh Existing Trail signage	6.1 Fabricate new trail signage in the style of the existing trail signage to integrate into the foothpaths and install near Mudurp Rocks	2	\$15,000
Total		,	\$796,400

Acknowledgements

Apparatus would like to thank all those that have contributed to developing this interpretation plan. This includes specialists who have provided advice as well as members of the Cottesloe community and local interest groups:

Alan Totterdell (Peter's Brother) Barry McGuire, Whadjuk Noongar Elder Cara Clifton, Project Director David Handley, Sculpture by the Sea Doolann Leisha Eatts, Whadjuk Noongar Elder Doug Elkins, Town of Cottesloe Dr. Barbara Dobson, Anthropologist Heritage Council of WA Ian McIntyre, Anthropologist Marie Taylor, Whadjuk Noongar Elder Mike Ewing, Cottesloe Coastcare Noel Nannup, Whadjuk Noongar Elder Penny Fletcher-Hughes, Rottnest Island Authority Phillip Wadds, Sculpture by the Sea Richard Walley, Whadjuk Noongar Elder Robyn Benken, Cottesloe Coastcare Rose Walley Ruth Marchant James, Historian Sindy Dowden, Town of Cottesloe History Librarian Sue Freeth, Cottesloe Coastcare Theresa Walley, Whadjuk Noongar Elder The Town of Cottesloe Elected Members Walter Eats, Honorary Noongar Elder

Special thanks are owed to Sue Freeth who has been incredibly generous with her time and valuable information as well as lan Macintyre and Dr Barbara Dobson whose work with Whadjuk Elders over four decades has largely informed the Aboriginal stories contained within the associated Aboriginal Significance document. Thank you to the Whadjuk Noongar Elders for sharing their kaartdijin.

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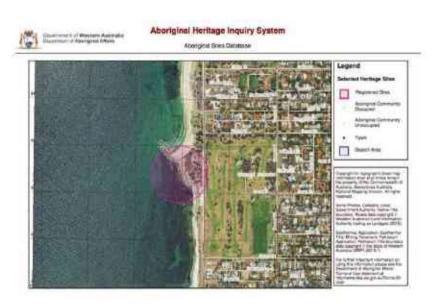
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Redevelopment of Indiana Tea House, Cottesloe Beach, Town of Cottesloe

Attachment 1. Aboriginal Heritage Sites



Aboriginal Site and Heritage Place - Registered Site

#435 Moonderup (commonly called Mudurup) Type: Ceremonial, Mythological No Gender Restrictions Not Protected

Further information in associated Aboriginal Significance document.

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Attachment 2. Heritage Sites



Cottesloe Beach Precinct

LOCATION - Marine Pde Cottesloe LOCATION DETAILS

Western side of Marine Pde extending from Napier to Jarrad Street. Direct referral Reg Com 30/08/02; 30/5/03 deferred.

LOCAL GOVERNMENT Cottesioe REGION Metropolitan **CONSTRUCTION DATE - Constructed from 1898**

DEMOLITION YEAR N/A - Statutory Heritage Listings

TYPE	STATUS	DATE
State Register	Interim Extension Indefinite	03 Nov 2005



Norfolk Island Pine Precinct, Cottesloe

LOCATION Curtin Av. Railway St. Forrest St. Loma St. John St and part

LOCATION DETAILS - Pine trees are those on Curtin Avenue, Railway Street, Forrest Street, Loma Street, John Street and parts of Jarrad Street, Marmion Street, Broome Street, Marine Parade and the Cottesloe Beach foreshore,

LOCAL GOVERNMENT Cottesloe REGION Metropolitan

CONSTRUCTION DATE Constructed from 1904				
RHP - Assessed-Stakeholder	(# V			

09 Aug 2010 Current Consultation

CONDITION Cottesloe Beach Precinct is in a constants state of evolution. but in that it retains its values. Elements within the precinct are in various conditions, but overall the precinct is a well managed landscape and buildings.

Cottesioe Foreshore Redevelopment - Interpretation and Public Art Plan 33



Vestige of Original Jetty and Site of Pavilion

Municipal Inventory

LOCATION Marine Pde Cottesioe **LOCATION DETAILS LOCAL GOVERNMENT** Cottesloe **REGION** Metropolitan CONSTRUCTION DATE Constructed from 1929, Constructed from 1904 LISTING

Adopted

30 Sep 1995

result of an architectural competition, was an icon for the most popular beach in Western Australia at the time. Nightlife for the western suburbs up until the late fifties was centred on the Cottesloe foreshore strip which included the bathing pavilion and its elegant dining and dancing facilities. The jetty had long been a focus for social life with listening to band concerts from jetty rotunda and promenading on it being fashionable past times. The pleasure steamer the Zephyr berthed at the jetty on its way to Rottnest from Fremantle. In the 1930s tourist posters declared "Cottesloe never palls whether you come for a day, a year or a life," Lang Ms PHYSICAL DESCRIPTION

STATEMENT OF SIGNIFICANCE The elegant 1929 bathing pavilion, the

Site of jetty and former bathing pavilion. The remains of a pylon in the water [part of the shark proof bathing area built in 1936], mark the site of the 1904/6 pier with bandstand. The current bathing pavilion at Cottesloe Beach is where the former landmark pavilion was located.

HISTORY

The jetty built first in 1904 and rebuilt in 1906 after damage was a landmark and part of the social life of the area. It was built by Atkin and Law, had a wide promenade which included a rotunda in the middle where a band played on Sundays and some evenings. 45 piles were attacked by Toredo worm in 1913. It was eventually demolished in 1949. Wheeled bathing boxes were available 1906-8. When the owner moved them to North Cottesloe the Council built a wooden bathing pavillion.

INTEGRITY/AUTHENTICITY

Integrity site only Modifications Demolished even the jetty vestige has now been lost in 1995 storms.



Cottesloe Beach Pylon (Cottesloe Beach Shark Proof Pool, Foreman's Folly)

LOCATION

Offshore at Cottesloe Beach in line with John St Cottesloe

LOCATION DETAILS

in the Indian Ocean

OTHER NAME(S)

Cottesloe Beach Shark Proof Pool

Foreman's Folly

LOCAL GOVERNMENT Cottesloe REGION Metropolitan

CONSTRUCTION DATE

Constructed from 1936 TO 1996

LISTING

State Register 15 Aug 2003 Permanent

STATEMENT OF SIGNIFICANCE

The elegant 1929 bathing pavilion, the result of an architectural competition, was an icon for the most popular beach in Western Australia at the time. Nightlife for the western suburbs up until the late fifties was centred on the Cottesloe foreshore strip which included the bathing pavilion and its elegant dining and dancing facilities. The jetty had long been a focus for social life with listening to band concerts from jetty rotunda and promenading on it being fashionable past times. The pleasure steamer the Zephyr berthed at the jetty on its way to Rottnest from Fremantle. In the 1930s tourist posters declared "Cottesloe never palls whether you come for a day, a year or a life." Lang Ms

PHYSICAL DESCRIPTION

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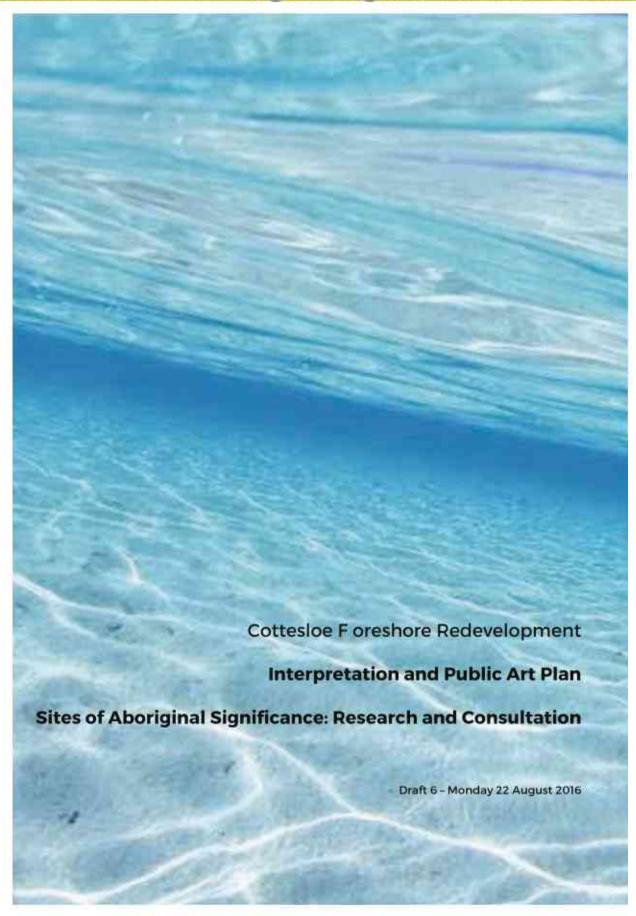
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INTEGRITY/AUTHENTICITY

Integrity site only. Modifications Demolished even the jetty vestige has now been lost in 1995 storms.

Appendix 2 - Sites of Aboriginal Significance: Research and Consultation



Acknowledgement of Traditional Custodianship

The past and present traditional custodians of this land, the Whadjuk people are acknowledged and respected in this interpretation plan.

Their continuing culture and the contribution they make to the life of this city and this region is recognised.

It is a privilege to be working with Whadjuk people, Whadjuk land and the stories created here.



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Disclaimer

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DRAFT

Interpretation of Aboriginal heritage

'Heritage interpretation is about sharing memories and experiences. It respects the connections between people and place whether a place is natural landscape or one modified by use...'

Sharing Our Stories National Trust of Australia (WA)

Aboriginal heritage is indivisible from the country. It is the past and the present connections to that landscape. It is living cultures imbued with cultural heritage through story, song, dance, language, kinship, custom, ceremony and ritual. It is living heritage given life through oral tradition and continued interaction with the landscape.

The task of interpreting Aboriginal heritage is impossible without mapping and celebrating cultural connection to Country. This connection provides the soul to interpreting Aboriginal heritage. An interpretive work that captures this multi-layered, rich and cultural connectedness to Country ensures the strength and power of the Aboriginal voice is heard.

'We're a Dreaming Country' Guidelines for Interpretation of Aboriginal Heritage (National Trust, 2012)

Background

The Cottesloe Foreshore Redevelopment is a project advanced by the Town of Cottesloe.

The Masterplan is being developed by Cardno, with Apparatus providing heritage interpretation and public art coordination services.

This document is part of the overall interpretation and public art plan for the whole of the Cottesloe Foreshore redevelopment.

In particular this document describes the process of consulting with Whadjuk Noongar Elders and those stories that reveal and enhance the cultural heritage values of Aboriginal Significance found within the area.

The stories and information gathered here will be used to promote public understanding and prompt curiosity about the site's past uses and inform and guide the design and installation of interpretative material for the redeveloped site.



Photo: Luke Austin Photography

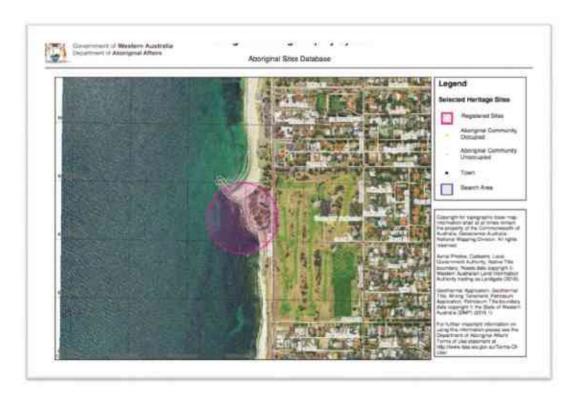
Consultation

Consultation with the Whadjuk Noongar Elders for the Cottesloe Foreshore Redevelopment was undertaken in line with the consultation protocols set out by the South West Aboriginal Land and Sea Council (SWALSC) and the Department of Aboriginal Affairs.

Registered Sites

One registered site - Mudurup Rocks - was found on the Department of Aboriginal Affairs Aboriginal Heritage Inquiry System (AHIS) on the DAA website.

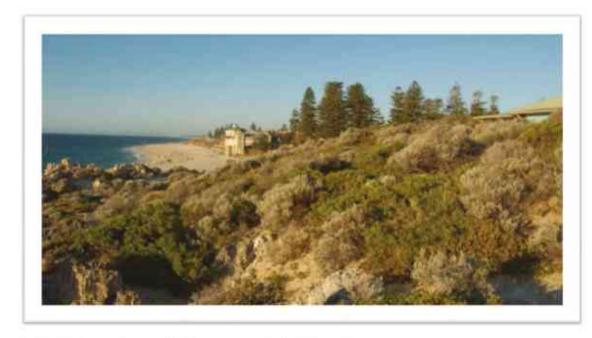
Mudurup Rocks is a mythological, ceremonial and fishing site. It is registered as Site ID 435 at the Department of Aboriginal Affairs, Cultural and Heritage Division, Perth.



Risk

According to the Aboriginal Heritage Due Diligence Guidelines: Aboriginal Heritage Risk Matrix, the risk to the above sites is low. This conclusion was reached based on the Previous Land Use being Built Environment e.g. urban environment, towns, metropolitan region and the Land Activity Category being Significant Disturbance e.g. creation of new roads or tracks, major landscaping/contouring.

The action required of a low risk project is to "Review the landscape and proposed activity (see sections 2.4 - 2.8 - assessing the landscape and the activity). Refer to the AHIS.⊠



http://cottesloecoastcare.org/dir/current_projects/project_mudurup



Aboriginal Consultation for Registered Sites

Consultation Aboriginal for this project is required with the:

- (a) determined native title holders:
- (b) registered native title claimants;
- (c) persons named as informants on Aboriginal site recording forms held in the Register at DAA; and
- (d) any other Aboriginal people who can demonstrate relevant cultural knowledge in a particular area.

The purpose of such consultation could be:

- to provide easily understood information about the proposed land use and to seek responses from the relevant Aboriginal people;
- (c) to assess whether the proposed land activity might damage Aboriginal sites;
 and □
- (d) to develop strategies for heritage management for the proposed land use and for any longer term disturbance that might occur as part of the activity (e.g. construction of power poles and later periodic maintenance).

Recommended Consultees

Traditional custodian of Pindjarup Noongar land, Mr Ken Colbung was named as a DAA site informant and as such a required consultee, however Mr Colbung passed away in 2010.

Two Native Title Claims exist over the area:

- · Registered claim Whadjuk People (WAD242/2001); and
- Not registered Single Noongar Claim (Area 1) (WAD6006/2003) represented by the South Western Aboriginal Land and Sea Council (SWALSC).

SWALSC was contacted regarding who best to consult with regarding this project. The following consultees, all Whadjuk Noongar Elders, were discussed with and approved by Clem Rodney, South Western Aboriginal Land and Sea Council.

- Mr Richard Walley 0419 919 888 abprodpr@iinet.net.au
- Mr Noel Nannup 0400 770 409 noel@indigenouswa.com
- Mr Barry McGuire 0452 264 880 barry@redspear.com.au
- Mrs Doolann Leisha Eatts 0439 925 750 walter eatts@optusnet.com.au
- Mrs Theresa Walley C/- Rose Walley - 9489 7802 -Rosemary.Walley@telethonkids.org.au
- Mrs Marie Taylor 0457 343 663 mariejtaylorl@bigpond.com

Mr Walter Eatts, Honorary Noongar Elder was also consulted with. 0439 925 750 - walter eatts@optusnet.com.au

Meetings were held with the Elders in April 2016 and again in June 2016.

The following information was presented to the Elders for their consideration and all Elders deemed the information as culturally appropriate to use as interpretive material for the Cottesloe Foreshore Redevelopment.



Archaeological Evidence of Aboriginal Habitation

- Some of the Elders consulted by McIntyre and Dobson were aware of ancient Noongar campsites which had been located by archaeologists in the 1960's and 1970's in the Cottesloe/ Mosman Park coastal belt. These indicated a long history of seasonal occupation of this coastal area. Two of the sites registered at the Department of Aboriginal Affairs are Site ID 3335 (Victoria Street Station) and site ID 3336 (MacArthur Street, Mosman Park). Other isolated artefacts have been located in the sand dunes near fringing vegetation in the vicinity of the Cottesloe Vlamingh Memorial and the old Cable Station. These include pre-contact and post-contact materials. Isolated fragments of worked bottle glass prove that these pre-contact sites were occupied into post-colonial times.¹
- Ancient artefacts, such as chert and quartz flaked implements, have since been found at a number of local sites, including those discovered in 1972 by archaeologist Dr Charles Dortch on the eastern side of Curtin Avenue, near the Victoria Street railway crossing in Mosman Park. These invaluable finds suggest that this particular neighbourhood was once frequented by the original inhabitants, who made regular use of the stone taken from coastal quarries some 10 000 to 30 000 years BC. It is believed that the area may have once been part of a well-worn route leading from the river to the former extended coastline. Other archaeological artefacts, carbon dated at about 8,000 BC, have been unearthed at similar registered sites in Curtin Avenue, Cottesloe, and in the vicinity of the former Billy Goat Farm at Mosman Park, layers of fossilised marine shells have also been found set in the limestone banks.²

Site of Aboriginal Significance: Information for Interpretation

The following information is largely derived from papers written by and information compiled by indigenous heritage specialists and long-term Cottesloe residents Ken Macintyre and Dr Barbara Dobson. This information is the result of their anthropological research based on extensive interviews with Aboriginal Elders from the Swan Coastal Plain and examination of historical documents. My thanks to Ken and Barb for the generous provision of their work for this project.

DAA site file information and information from texts listed in the bibliography has also been used.

Whadjuk Noongar Elders, Richard Walley, Noel Nannup, Barry McGuire, Doolann Leisha Eatts, Theresa Walley, Marie Taylor and Walter Eatts have provided information, stories and corrections and these are noted below. My thanks to the Elders for their stories, their time, their warmth and their willingness to help with this project.

Noongar names and terms can be rendered in many different ways. There is no single 'correct' spelling as the Noongar language is traditionally an oral one. Choice of spelling usually depends on an individual or group's preferred orthography and/or regional or dialectical linguistic variations.

The term Noongar which denotes Aboriginal people whose roots traditionally derive from southwestern Australia, can be spelt *Nyoongar*, *Noongar* or *Nyungah* or *Nyungar*, depending on individual or group preferences. The language is fundamentally similar throughout southwestern Australia (as noted by Grey 1840, Moore 1842, Bates 1914 and others) albeit with regional and dialectical variations (and in some cases colloquial terms and expressions which are confined to a particular district).

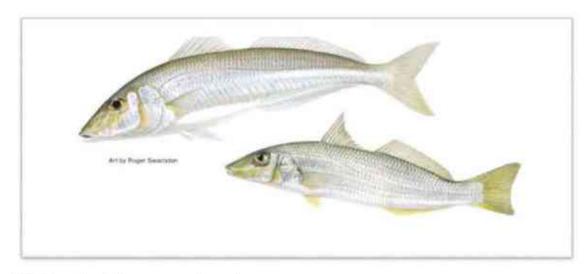
Mudurup Rocks - Background of the site

- According to DAA site file information recorded in 1995 'the site is located immediately W. of the Cottesloe Surf Lifesaving Club and SSE of the Cottesloe Beach Groyne.'
- Macintyre and Dobson consultations with senior Indigenous spokespersons
 with knowledge of the area, record the site as extending north and south of
 the present day groyne, including part of the rocky shoreline and beachfront
 limestone formations which existed there prior to the construction of the
 groyne.
- Consultants were unanimous that the Mudurup Rocks site included all the high ground, including the ground on which the surf club is built. Two Elders, Humphries (1992) and Colbung (1998, 1999, 2000) were convinced that the site extended northwards beyond the sloping ground on which the Indiana Teahouse is now located.

Place name - Mudurup

- Macintyre and Dobson state that the original site name is Mudurup (pronounced 'Moordoorup' or 'Murdarup').
- Meaning 'Place of the Whiting', the name Mudurup derives from the Noongar mudu³ meaning 'yellow-finned whiting' + up - meaning 'place of'.
- According to Macintyre and Dobson, one senior Aboriginal consultant (Bodney) was convinced that Mudurup was the district name prior to white settlement.
- Macintyre and Dobson state that "We could find no historical or ethnographic reference to Mudurup Rocks as Moonderup in the archival literature. Old newspaper reports showed that the name Mudurup Rocks had always applied, ever since the time of settlement of Cottesloe in the 1890's."⁴
- The Department of Aboriginal Affairs changed the name of the site from Mudurup to Moonderup based on the site information provided by Ken Colbung and recorded by archaeologist Pat Vinnicombe from DAA in 1995.
- Macintyre and Dobson state that that "... all the other Aboriginal heritage spokespersons (including Cliff Humphries 1992 and Corrie Bodney 1994, 1995) had stated categorically that the place had always been known to them as

Mudurup, and as far back as they could recall all the 'old people' had called it Mudurup."5



Art by Roger Swainston -www.westernangler.com.au

Mudurup - Place of the Yellow Finned Whiting

- The probable site name, Mudurup is said to refer to the place of the yellow-finned whiting (Sillago schomburgkii) most commonly found in this area and also known as the Western Sand Whiting, which is, according to Hutchins and Thompson (1983: 34) 'Abundant on sandy bottoms in shallow coastal areas.'
- Hyndes and Potter (1997: 435) note that this species 'spends its entire life cycle' in 'sheltered near shore waters in southwestern Australia' where it 'spawns predominantly from December to February.'
- It was during mid to late summer birok (Dec-Jan) and burnoru (Feb-March)
 that indigenous people used to frequent a place called Mudurup, which we
 now know as the Cottesloe coastal strip.⁶⁷
- Macintyre and Dobson suggest that the Whiting's breeding cycle was a
 dependable seasonal marker which drew Noongar people to the coast at this
 time to take advantage of this abundant food source.

⁵ Indigenous Significance of Mudurup Rocks, Cottesloe, Macintyre and Dobson, page 7.

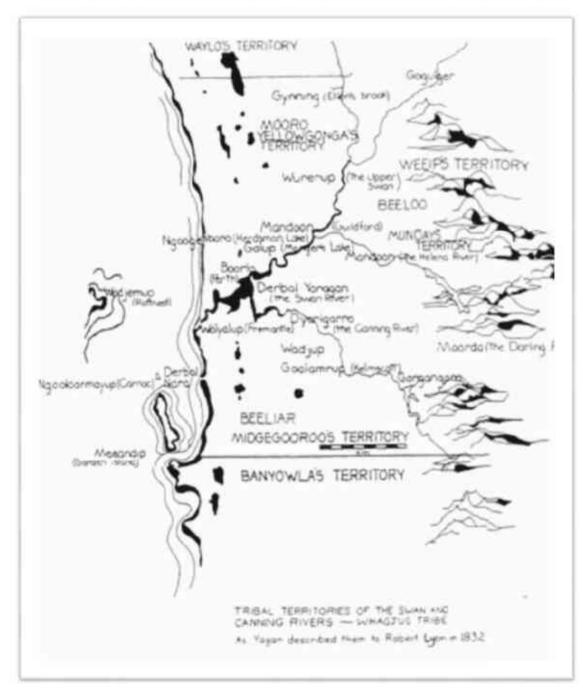
⁶ Aborigines and the Cottesloe Coast, Macintyre, 2004 page 1.

⁷ Note: the Western notion of calendar months is used loosely here to refer to the approximate time of year. Noongar people would have used season markers and indicators such as flowering plants, animal movements and behaviours and astrological conditions (solar and lunar cycles) to ascertain the particular season.

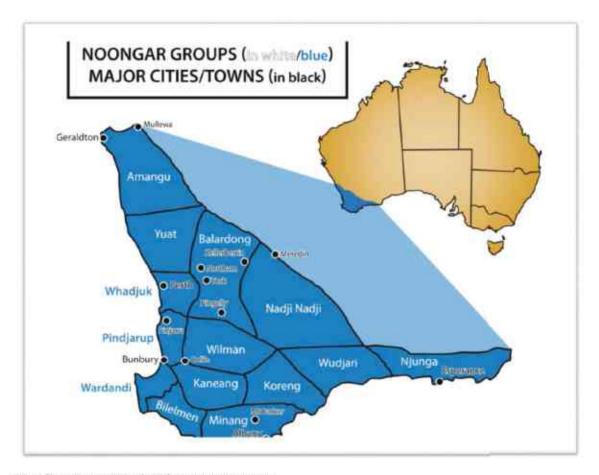
³ (or muda, murdar, murda or muda)

¹ Indigenous Significance of Mudurup Rocks, Cottesloe, Macintyre and Dobson, page 6.

- Yellow-Finned Whiting is a good eating fish and to be celebrated, it is the prized catch of all inshore whiting species.
- After spawning occurs they gather during the summer months in the inshore waters. The whiting feeds in shallow waters and are easily spooked. They then head to deeper waters as the temperatures cool. This means you can catch whiting over summer knowing that they've done their breeding for the year.



Map illustrates the Perth region before settlement (according to Robert Lyons as told to him by Yagan, in Tindale, 1974)



https://en.wikipedia.org/wiki/Nyungar_language

Mooro People

- The in habitants and custodians of the coastal strip between Yanchep and Fremantle were collectively known as the Mooro.⁵
- The group was lead by Yellagonga who had territorial control over this vast domain. The land included the area now known as Cottesloe, as well as the future site of Perth - Boorloo - where he had his principal headquarters.¹⁰
- Yellangonga's group was one of several that were collectively known as the Whadjuk, who were based around the Swan River. The Wadjuk was a part of the greater group of fourteen, which formed the south west socio-linguistic

⁹ Thanks to Noel Nannup for correcting me that Noongar people don't own land, they belong to it, they're custodians of the land.

¹⁰ Cottesloe - A Town of Distinction, Ruth Marchant James, 2007, page 4.



block still known today as Noongar (The People), or sometimes by the name Bibbulmun.¹¹

- The lake system and wetlands, from Yanchep in the North to Galup (Lake Monger) and including Ngoogenboro (Herdsman Lake) throughout the coastal dune system and the Swan coastal plain, provided a strong economic base for Noongar people. The wide variety of ecosystems, aquatic vegetation, and forests supplied fresh water, fish, birds and waterfowl along with kangaroo and other small animals for food and clothing, tools for hunting and materials, and resources for building shelters and for trade with neighbours.¹²
- Their society was well established and structured. There has always been a strong focus on family and extended family. The community consists of Elders both male and female, spiritual leader, family groups and children. The Law and Dreaming is passed on through stories, dance, painting and caribberie corroborees.¹³
- They were a hunter, gatherer, fisher clan who maintained a small, environmentally sustainable population. It was for this reason that Aboriginal people were able to sustain a continuous and harmonius lifestyle for over 50,000 years. 16
- Doolan Leisha Eatts stated "they never took lots, only enough for that meal".
- It is likely that at the time of fish spawning that many clans would visit the site, camps would be set up and large quantities of fish would be consumed and caribberie¹⁶ held. It is likely this would include arranged partnerships or give aways, shell collecting and decorating for use as tools, drinking implements and trade, stories would be told, songs sung and dances danced ke-ning.¹⁷

"http://www.det.wa.edu.au/aboriginaleducation/apac/detcms/aboriginaleducation/apac/regions/beechboro/history-of-the-north-metro.en?cat-id=9192499

- Noel Nannup described that when the Wardung flew between Wadjemup and Mudurup it indicated a change in the westher and the arrival of fish.¹⁸
- Noel Nannup described the fishing as being a communal activity where women used branches of the paperbark tree to herd the fish into one spot where the men could use gidgees to spear the fish.¹⁹
- Noel Nannup continued that after the harvesting of fish during Birok, the clan would head inland to burn the land hunting for marsupials before the rain came.²⁰
- There is no doubt that kangaroo, emu and large game were hunted but it
 would seem that the staple protein of the indigenous people of the Swan
 Coastal Plain was obtained predominantly from fish, aquatic reptiles and
 crustaceans found in the lakes, swamps, rivers and coastal estuaries (Macintyre
 and Dobson 2002).
- Barry McGuire told the story about the elderly men who would sit by the ocean
 and chant with their tapping sticks. Hearing the loud noise made by the
 tapping sticks, the dolphins, keela would come rushing toward the beach. The
 fish would shower onto the beach sand to get out of the way.²¹
- In her book, Cottesloe A Town of Distinction, Ruth Marchant James states that Mudurup Rocks provided an abundance of seafood, but was "shadeless, windswept and lacked the convenience of a freshwater spring." Marchant-James goes on to state that "Separated from the more inviting river banks and freshwater springs by only a narrow tract of bush, the reef below Mudurup Rocks was more likely to have been frequented by hunters intent on collecting the fruits of the ocean as an alternative to catching fish in the river... Seasonal camps comprising bark-covered huts sheltered members of the Mooro people from the more discomforting aspects of the elements."
- Marchant James goes on to say that "Captain Frederick Chidley Irwin,
 Commandant of the 63rd Regiment and one-time acting-governor of the
 colony, observed... 'Huts about 4 ft high and capable of containing but three or
 four persons. Constructed with sticks and covered with the bark of the
 Melaleuka or tea tree. Bark, a soft cottony substance strips off in large flakes.
 Entrance is opposite prevailing wind'.

Cottesloe Foreshore Renewal - August 2016

http://www.det.wa.edu.au/aboriginaleducation/apac/detcms/navigation/regionalwebsites/north-metro/about-the-region/

http://www.det.wa.edu.au/aboriginaleducation/apac/detcms/aboriginaleducation/apac/regions/beechboro/history-of-the-north-metro.en?cat-id=9192499
 Aborigines and the Cottesloe Coast, Macintyre, 2004 page 1.

¹⁵ Consultation with Helen Curtis for the Cottesloe Foreshore Redevelopment, 2016.

¹⁶ Corroboree - Was first used by Europeans to describe Aboriginal ceremonies of song and dance. The Aboriginal word is 'caribberie' and the ceremonies pass on stories of the Dreaming or Nyitting. The Noongar word for dance is ke-ning. Dances and ceremonies vary, depending on which part of Noongar country they are performed in. The use of ochre and designs indicate the type of ceremony and which language group is performing.

¹⁶ Consultation with Helen Curtis for the Cottesloe Foreshore Redevelopment, 2016.

¹⁹ Consultation with Helen Curtis for the Cottesloe Foreshore Redevelopment, 2016.

²⁰ Consultation with Helen Curtis for the Cottesloe Foreshore Redevelopment, 2016.

²¹ Story told by Barry McGuire in consultation with Helen Curtis for the Cottesloe Foreshore Redevelopment, 2016



Camp at Lake Monger, 1923. Image copyright State Library of Western Australia. 54500P.

- Daily life mainly consisted of hunting, fishing and food gathering. It is likely
 that women performed chores such as the preparation and collection of many
 natural foods using the wanna or digging stick, to the fashioning of useful
 items from animal skins and paperbark, such as carry bags for travelling and
 for cradling infants. Men probably hunted marsupials and took acre of their
 spears and hunting equipment. Common fare comprised kangaroos, possums,
 tortoises, land crabs, as well as a range of grubs and roots in season and a
 plentiful supply of fish, which was generally wrapped in bark and cooked in
 hot ashes.
- Mooro people lived a complex, sophisticated and deeply spiritual life with stories, traditions and beliefs passed down through each generation. Noongar people would have had to be resourceful, innovative and be flexible to survive and adapt to the changing environment.
- The earliest records of Aboriginal seasonal patterns of movement on the Swan
 Coastal Plain are provided by Stirling (1827) who states... in Summer they
 frequent the Sea Coast where their skill in spearing fish is truly wonderful. In
 Winter they inhabit the higher grounds, where the Kangaroo, the Opossum,
 the Land Tortoises, several species of Birds and roots compose their
 sustenance... (Stirling 1827: 570 quoted by Hallam 1979: 23).

Mooro People - Spiritual Beliefs

- The spiritual beliefs wiirn mut²² -of the Mooro, like other Noongar tribes throughout south-western Australia, was deeply involved with mythology relating to the Cold Times or Dreaming - Nyitting.
- Mooro spiritual beliefs also involved the maintenance, restoration and revitalisation of bird, animal and insect species through 'increase rituals' at certain places. ²³
- Bodney (1995) speculated that the caves at Mudurup may have had something
 to do with increase ceremonies to ensure a plentiful supply of whiting. He said
 that 'the old people must have negotiated through ceremonies with the spirit
 that controlled the supply of the mudar. This spirit was the gobourn (totem)
 of the old people who performed the sacred rituals. They were the custodians
 of this place.' ²⁴
- Macintyre and Dobson state that while there were differences of opinion among Noongar heritage spokespersons consulted between 1992 and 2001 as to the mythological narrative and symbolism associated with Mudurup Rocks, all agreed that it was a place of deep spiritual, ceremonial and ancestral importance. ²⁵
- Noongar cosmology traditionally recognises an interconnectivity between all
 facets of the natural environment. It is even possible for them to believe that
 humans could transform themselves into other animal and bird forms and
 that these animal and bird forms could also assume the guise of humans. Such
 beliefs form an integral part of traditional Noongar Dreaming mythology. 26
- Theresa Walley stated that the ocean was a spirit place, she was warned as a little girl "don't go there or the spirit will take you away, she continued that sea birds were not to be eaten, they were the spiritual guardians of the ocean.²⁷

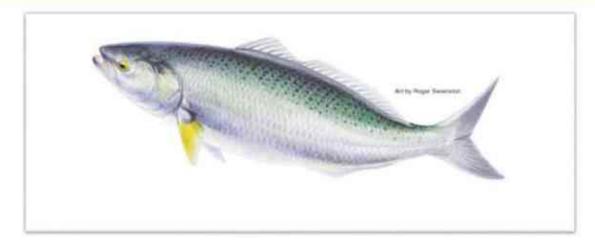
²⁷ Noongar language thanks to Marie Taylor.

²³ Aborigines and the Cottesloe Coast, Macintyre, 2004 page 4.

²⁶ Indigenous Significance of Mudurup Rocks, Cottesloe", Macintyre and Dobson, page 6.

²⁵ Indigenous Significance of Mudurup Rocks, Cottesloe", Macintyre and Dobson, page 8.

²⁶ Indigenous Significance of Mudurup Rocks, Cottesloe", Macintyre and Dobson, page 11.



Art by Roger Swainston -www.westernangler.com.au

Melak 28

- One of the main activities in the summer season was the migration of the Australian salmon, known by local Aborigines as melak.
- It was during this season that fishing became an intensive and sometimes cooperative activity, driving fish inshore to be speared. It was at times, such as the salmon run, that considerable quantities of fish would be consumed and shared with neighbouring groups.
- To maintain a hunter/gatherer lifestyle, it was often a matter of "feast or famine" as weather conditions and the availability of food were not always predictable. Thus it was essential to consume as much protein and fat as possible so that it could be stored in the body and utilised during times of famine.

Gulamwin

- One of the attractions of the Cottesloe coast in summer and this also applies today - is the regularity and cooling effects of the sea breeze in summer, known by the indigenous people as gulamwin (south-westerly breeze).²⁹
- Gulamwin is also known as the Fremantle Doctor.

Sweet/Fresh Water Collection at Beach Street Groyne and the Waugal

- A commonly asked question is how did indigenous people survive on this dry coastal belt. It would appear that they had a number of strategies for obtaining fresh water. Occasionally water was found on the leeward side of sand dunes that had been eroded by wind and water down to the water table. In some cases these soaks had to be dug out and regularly cleaned. Another means of harvesting water was to collect it from the surface of the sea, kappi wodern. Freshwater feeds into the limestone reefs via underground springs from the water table. During low tide and calm weather, freshwater which has a lower density than salt, floats on top of salt water and can easily be seen as a type of oily slick. This oiliness is the result of iron in the freshwater. Water would have been harvested from the surface using a paperbark yoralla (carrying dish). It is highly probably that fresh water seeped out of cracks in the limestone cliffs and outcrops along the coast at Cottesloe and Mosman Park, it should be noted that up until the 1950's Aboriginal people were resident in the Swanbourne area and utilised the coast for fishing activities, as some still do today.30
- Bodney (1993) stated that coastal Aboriginal people traditionally collected fresh water from natural springs located in the sand dunes and limestone formations. However, he did not have any information as to the exact location of the water source in this particular location along the coast. One natural spring was found on the north side of the Beach Street Groyne (which is also known as the Dutch Inn Groyne), almost at the same location as an existing storm water drain. This area seems to be an underground discharge area for fresh water.
- Bodney (1994) further explained that fresh water may have been collected from the surface of the ocean where it was discharged from the aquifer as underground streams in the limestone reefs. He said that it is easily located as it looks like a long, oily slick. This oily impression is caused by iron molecules suspended in the fresh water which, being lighter than the heavier seawater, floats on top. He suggested that fresh water could have been easily scooped from the surface in earlier times using paper bark containers, when other sources of fresh water were depleted.
- Noel Nannup explained that another way of finding sweet water was to look for cyanobacteria, the green algae that grows on the rocks where the sweet

²⁸ Aborigines and the Cottesloe Coast*, Macintyre, 2004 page 2.

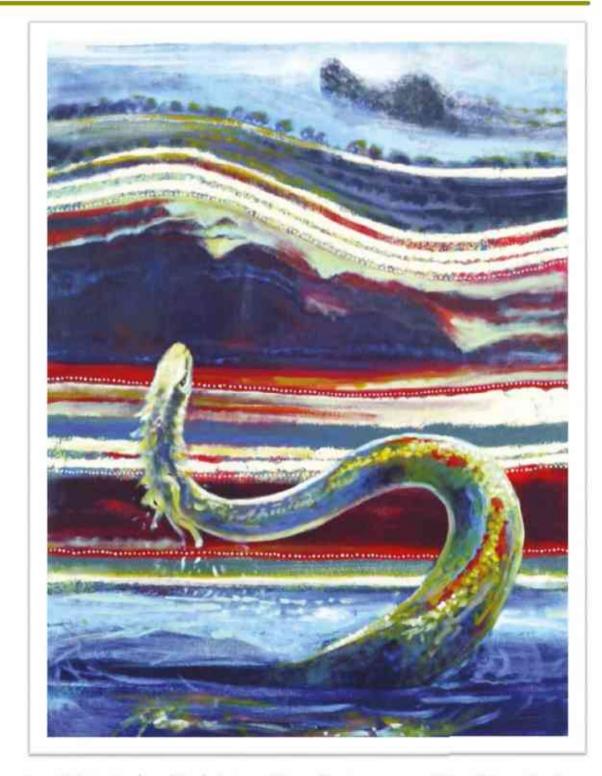
²⁹ Aborigines and the Cottesloe Coast, Macintyre, 2004 page 2.

³⁰ Aborigines and the Cottesloe Coast*, Macintyre, 2004 page 4.

³¹ Indigenous Significance of Mudurup Rocks, Cottesloe", Macintyre and Dobson, page 11.

water runs. 32

- Bodney and Colbung both believed that these streams of fresh water were the spiritual manifestations of the Waugal and that they symbolised the interconnectivity between the terrestrial/sweet water Waugal and the sea Waugal.
- The springs and gnamma holes were made when the sweet water Waugal chased the sea Waugal over the lands and they popped up for air.³³



Shane Pickett, Waagle and Yondock story, 2004, acrylic paint on canvas, 1260 x 950mm, City of Fremantle Art Collection, Courtesy of the Artist's Estate and Mossenson Gallery, Photo Victor France

³² Noel Nannup in consultation with Helen Curtis for the Cottesloe Foreshore Redevelopment, 2016.

³³ Doolan Leisha Eatts in consultation with Helen Curtis for the Cottesloe Foreshore

Pedevelopment 2016

- Every tribe, bard, had their own waterhole and you needed to ask permission before you could use or even approach the waterhole.³⁴
- Permission was granted through the use of the message or talking stick, boornawongkie, where messages and a request for permission to us ethe waterhole was carved onto a boornawongkie. The bard that looked after the waterhole would then approve or deny the request by marking the stick. 35
- The continuous chain of lakes from Moore River to Mandurah were said to have been created in the Nyitting by the Waugal. The creative spirit of the Waugal was believed to have been responsible for the creation of rivers, lakes and wetlands in the Perth and surrounding region. The Waugal was not only a creative totemic being but it was also a protector of the environment. According to Noongar law, springs and gnamma holes could not be drained as it was believed that this would kill the guardian Waugal spirit and cause the water source to dry up permanently. The Waugal was said to be responsible for attracting the rain and keeping water holes and springs replenished. It was said to inhabit deep dark pools and traditionally was seen to be both a destructive and creative force in that it could cause sickness as well as cure sickness.³⁶
- Likewise, underground springs that flowed into the sea were believed to be
 the essence of the Waugal, and in some cases these springs were viewed as
 the children of the Waugal flowing from the river towards the sea. Thus the
 idea of fresh water is so intricately involved with the mythology of the Waugal
 that it is hard to extricate, in some cases, the mythological metaphor from that
 of proto-science.³⁷
- At a deeper level Waugal mythology was indeed the metaphor which emphasized the proto-scientific mysteries of the rivers, water sources and landscape. It also explained through the mythological track of the Waugal how water moved throughout the Swan Coastal Plain as a system of underground streams interlinking wetlands to the rivers and ocean. This knowledge was an essential component of Aboriginal survival.³⁸



Photo: Adam Plucinski

The run of the Wardung³⁹

- Indigenous oral history states that Mudurup (or coastal Cottesloe) was one of the traditional haunts, or in Noongar terms the 'run' of the crow (Australian Raven) or Wardung.
- The Wardung was an indicator bird heralding the arrival of storms or fish.⁴⁰
- Bodney stated that it was said by 'the old people' that when the Wardung who had their camp on Rottnest Island, Wadjemup, visited the coast at Mudurup, they would herald the arrival of the mullet (Mugil cephalus) and salmon (Arripis truttacea). This was a sign of a time of plenty. Even in traditional times when Aboriginal people moved inland in late autumn/early winter to escape the onset of the harsh wintry conditions on the coast, they knew that the Crow man would continue his weather forecasts through his obliging kin, the black cockatoo ngoolark 41- and the ants, minyet.

³⁴ Doolan Leisha Eatts in consultation with Helen Curtis for the Cottesloe Foreshore Redevelopment, 2016.

³⁵ Marie taylor in consultation with Helen Curtis for the Cottesloe Foreshore

³⁹ Indigenous Significance of Mudurup Rocks, Cottesloe, Macintyre & Dobson, pages 1 - 2,

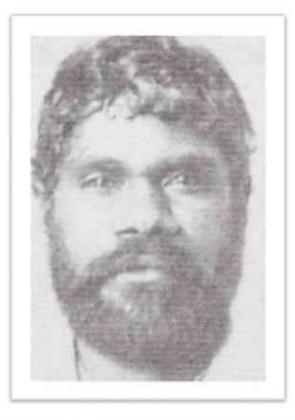
⁴⁰ Noel Nannup in consultation with Helen Curtis for the Cottesloe Foreshore Redevelopment, 2016.

⁴¹ Noongar language corrected by Barry McGuire in consultation with Helen Curtis for the Cottesloe Foreshore Redevelopment, 2016.

 In traditional belief Wardung were the messengers of the rain beings, thunder beings and the wind. Only a powerful sorcerer, such as the Crow man, could divine the subtle unpredictability of these natural elements. When storms approached, the Crow man would announce its coming to his kinsmen, the loud screeching ngoolark (white-tailed black cockatoo) and excite the busy movements of the minyet leaving ant trails, biddit.

The Crow Man⁴²

- There is no doubt that the story of the Crow man has its origin in ancient Noongar tradition. However, the story of Cudgel (whose name may also be rendered as Cudgell, Cadjil, Kudgel, Kudjil, Kadjil or Kutjil) is another story, a more contemporary one involving a real life character by the name of Johnny Cudgel.11
- Marie Taylor was told stories of the crow man who was called by his Noongar name, Bibarn, in the stories. Mrs Taylor continued that when Bibarn escaped from Rottnest he turned inot a crow and sat on the mast of a tall ship. When the ship got halfway to Perth there was a message that Bibarn had escaped. Everyone was looking for him. No body on the boat realized that Bibarn was the crow. And had flown away. 45
- In traditional mythology the Wardung (crow) sometimes assumed the role of a wise man, a cunning trickster or a malicious "bulya man" or sorcerer. Cudgel was all three. Some high- ranking sorcerers were believed to metamorphise into birds, such as crows and owls, and to travel great distances in such guise to seek out their unsuspecting victims. There was no escaping the crow man unless the crow man was a clever bulya man persecuted by an enemy tribe, as in the story of Johnny Cudgel.



Johnny Cudgel prior to his release from Rottnest Island prison in 1915. Indigenous Significance Of Mudurup Rocks, Cottesloe

Cudgel was a perennial gaol bird, a hero to Noongar people, a resistance fighter or rebel warrior who flouted white authority whenever possible, especially when it involved matters of inequity and injustice between black and white people of southwestern Australia. Johnny Cudgel was a regular inmate of the Rottnest Island gaol between 1890 and 1925.

In 1892 at the age of 18 Cudgel received heroic newspaper coverage of his daring escape during a violent storm from the lighthouse on Breaksea Island off the coast of Albany where he had been billeted on work duties. By the early part of the 20th century Cudgel had become a media star, a black bush ranger and a folk hero to the oppressed Noongar people of southwestern Australia. Stories of his uncanny ability to escape from the custody of Her Majesty's gaols abounded within the community to the point where his feats became seen as superhuman, not to mention his perceived ability to transform himself into a crow and mysteriously escape across the sea from the notorious Rottnest Island prison.

⁴² Indigenous Significance of *Mudurup* Rocks, Cottesloe", Macintyre and Dobson, pages 12 - 13.

⁴³ Marie Taylor in consultation with Helen Curtis for the Cottesloe Foreshore Redevelopment, 2016.



Noongar Elders who had formerly camped at the Swanbourne site (where the new Swanbourne Primary School now stands) remembered stories told to them by 'the old people' around the fire at night about Kadjil's miraculous escape from Rottnest Island. There was no doubt in their minds that this story was true and that Johnny Kadjil (or Cudgel) had indeed landed in the semblance of a crow on a beach not far from the (then) Swanbourne camp.12 In another version of the story we find him as the Crow man camped in a cave at Mudurup Rocks performing sacred ceremonies. We could find no documented evidence of Cudgel's escape from Rottnest, However, the Swanbourne fringe camp-dwellers and their descendants were (and still are) convinced by the oral history passed down to them that Kadjil's spirit had escaped and visited his people in the guise of a crow. By the 1920's Cudgel had become a legendary character of Noongar folk mythology. It is not difficult to imagine how such a powerful contemporary folk hero as Cudgel rejuvenated the traditional narrative of what is now known as 'Kadjil, the crow man.'

Biidjiigurdup

Noongar people went down into the caves and lit a fire. The fire took hold and lit up the root system and it became a great underground oven. When the ground dried up it cracked and cold water rushed into the crack the water collided with the intense heat and created an explosion. That explosion changed the land and a water body flowed in creating the many islands off the coast. Hence the name Biidjiigurdup - Place of the fires that formed the Islands

Mamang - Why the Whales beach themselves

When the sea level rose around 10,000 years ago it trapped many of these spirits under the sea. The only way these spirits can return to the land is through the whales. It is said that whenever a whale calf is born one of these spirits attach themselves to the whale calf. The whale will take the spirit on a journey for up to eighty or ninety years around the ocean before returning to the Western Australian coast. The whale will naturally want to beach itself. The scientic explanation is that the sonars from submarines and ships disrupt their travel. Before these technologies were around the whales were beaching themselves. The Noongar people know that they beach themselves to return the spirit being carried by the whale back into the land where it belongs. The Nyoongar men knew when the whales were coming in and would prepare a ceremonial knife called a daap. When the whale washed up on the shore the daap was used to cut the whale open and

when the blood from the whale ran into the land the people would be satis ed that the spirit had been returned. **



https://cottesloehistory.wordpress.com/2012/05/21/mudurup-rocks/

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^{**} Story told by Noel Nannup in consultation with Helen Curtis for the Cottesloe Foreshore



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Appendix 3 - Cottesloe Foreshore Enhancement Engagement Schedule











Sue Freeth	Helen Curtis (Apparatus)	Meeting 24 February 2016
Sandy Dowden, History Librarian	Helen Curtis (Apparatus)	Meeting 24 February 2016
Barbara Dobson, Ken Macintyre, Anthropologists	Helen Curtis (Apparatus)	Meeting 2 February 2016
Peter Totterdell	Helen Curtis (Apparatus)	Phone Contact 14 March 2016
Alan Bryan	Helen Curtis (Apparatus)	Phone Contact 14 March 2016
Ruth Marchant James, Historian	Helen Curtis (Apparatus)	Meeting 10 March 2016
Barry McGuire, Whadjuk Noongar Elder	Helen Curtis (Apparatus)	April 2016
Richard Walley, Whadjuk Noongar Elder	Helen Curtis (Apparatus)	April 2016
Doolan Leisha Eatts, Whadjuk Noongar Elder	Helen Curtis (Apparatus)	April 2016

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Visual Inspection of Retaining Walls Along Cottesloe Foreshore

Prepared for Town of Cottesloe

27 July 2016







Executive Summary

CW961900-ST-R001

The Town of Cottesloe have engaged Cardno to prepare a foreshore redevelopment plan for Cottesloe.

An inspection of the current condition of the terrace retaining walls along the Cottesloe Foreshore, nearby Indiana Tea House, has been carried out. The requirement of this inspection and report is to ascertain the structural condition of the terrace and identify repair works that shall be considered during detailed design.

It was observed that all stone retaining walls (RW1-RW4, RW6-RW8) were generally in good and stable conditions. Shrinkage cracks were observed on the mortar joints between the stone, however in general, the mortar is still firmly intact to the stone. It is recommended that the mortar joints are inspected, and any loose parts are removed and patched with repair mortar.

Vertical crack along the height of the wall were observed at some location. Though it seems that those cracks were not excessive, and have been addressed on previous repairs, it is recommended that they should be kept under observation to identify further movement.

The concrete retaining wall RW5 was generally in good condition. Shrinkage cracks were observed along the height of the wall at regular intervals. Exposed reinforcement was observed at some location. This reinforcement is badly corroded and need to be replaced, and covered.

The galvanised steel railings at the carpark area are generally in good condition. Corrosion was observed at the joints between the post and horizontal railing. Some connection points between the post and horizontal railing were missing, and are a hazard. It is recommended that the missing connections are reinstated, and corrosion protection applied to the railing.



CW933000-ST-R001 Visual Inspection of Retaining Walls Along Cottesloe Foreshore

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Cottesloe Foreshore Renewal - August 2016



1 Introduction

1.1 Introduction

At the request of the Town of Cottesloe an inspection of the current condition of the retaining walls along the Cottesloe Foreshore, nearby Indiana Tea House was carried out by Nico Kusnadi of Cardno.

1.2 Scope of Works

The Town of Cottesloe has engaged Cardno to prepare a foreshore redevelopment plan for Cottesloe. The requirement of this report is to ascertain the structural condition of the terrace and identify repair works that shall be considered during detailed design.

The scope of the report is to:

- · carry out a visual inspection;
- · provide a report on the condition of the terrace retaining walls;
- · provide recommendations for maintenance/repair;

This report has been based on our visual assessment of the retaining walls. No demolition or opening up works were undertaken to expose concealed structure. No construction drawings of the retaining walls have been made available. No calculations have been carried out of the structure.

1.3 Location

The location of the retaining walls inspected is identified in Fig 1-1.



Figure 1-1 Indiana Tea House Cottesloe



CW933000-ST-R001 Visual Inspection of Retaining Walls Along Cottesloe Foreshore

2 Observations

Fig. 2-1 and 2-2 show the walls inspected with the walls identity.



Figure 2-1 North Side Retaining Walls



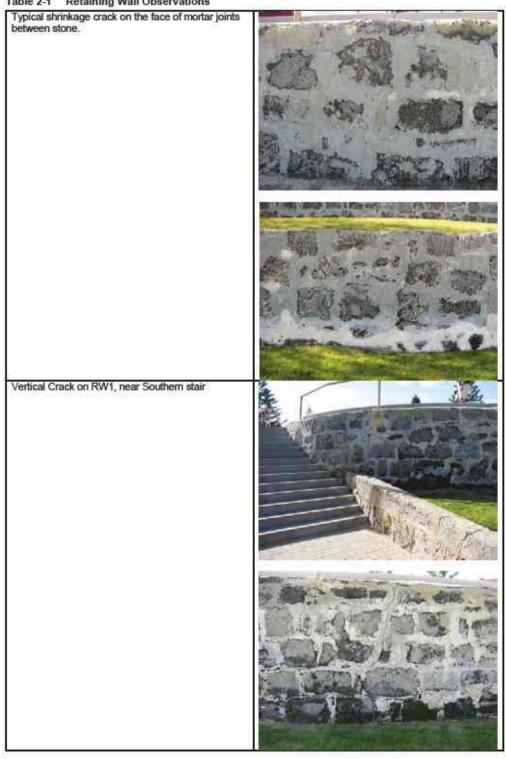
Figure 2-2 South Side Retaining Walls

All retaining walls, except RW5, are stone retaining walls. RW5 is concrete retaining wall.

The photos of observations from our inspection are outlined in Table 2-1 below.

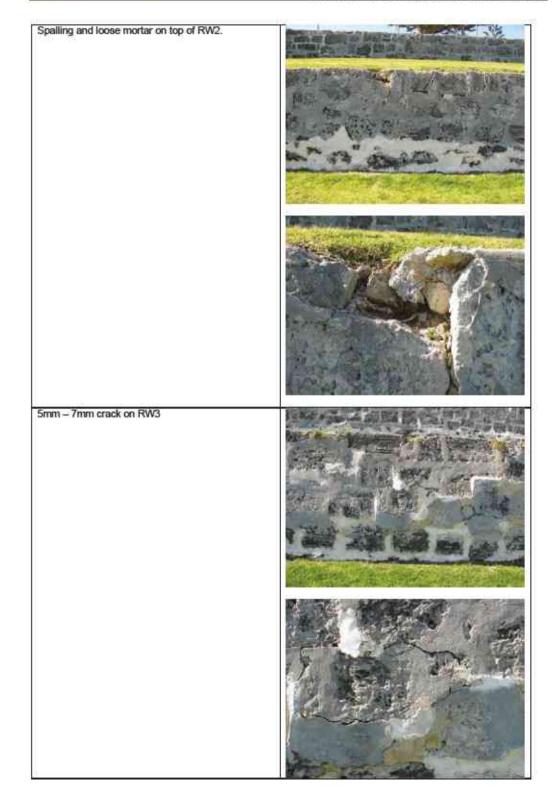
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Table 2-1 Retaining Wall Observations

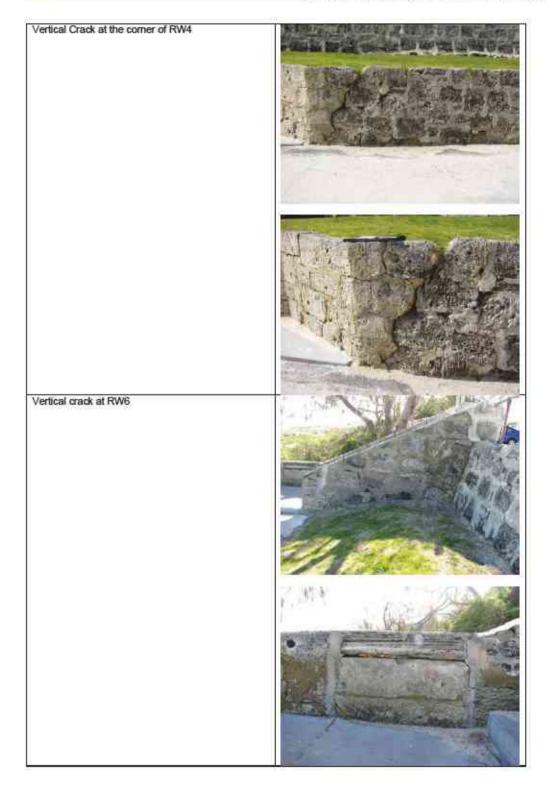




CW933000-ST-R001 Visual Inspection of Retaining Walls Along Cottesloe Foreshore









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Vertical Crack through RW7, near the comer with RW1. We believe that those cracks were caused by soil pressure at the back of retaining wall. It seems that those cracks have been observed previously, and the steel cantilever columns have been installed to prevent further movement of the wall.





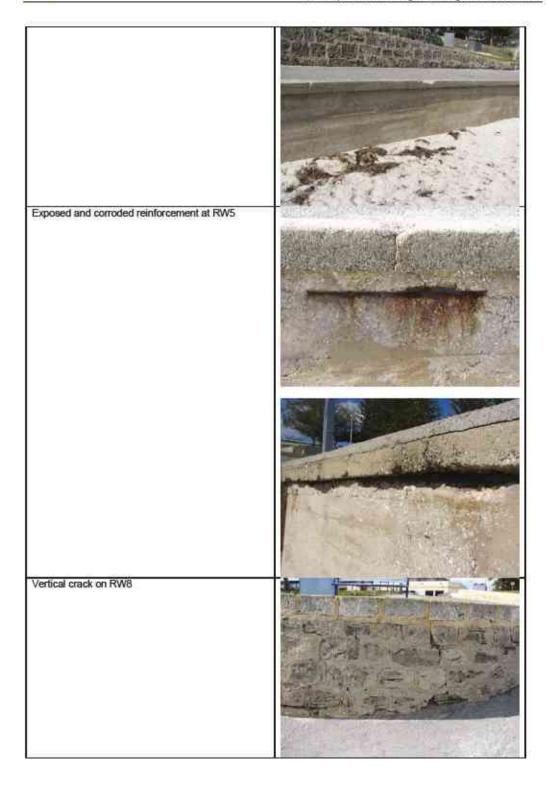


Typical Shrinkage crack on concrete retaining wall RW5



CW961900-ST-R001 Cardno 5 CW961900-ST-R001 Cardno







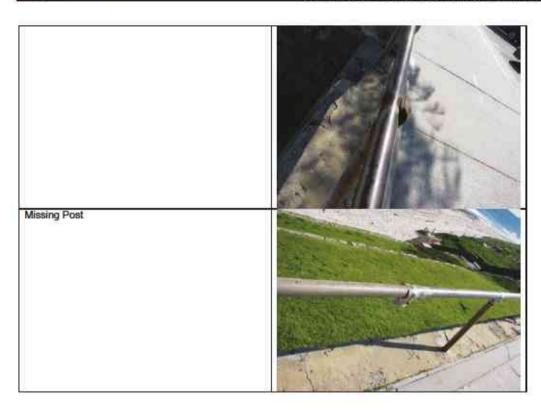
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CW933000-ST-R001 Visual Inspection of Retaining Walls Along Cottesloe Foreshore

3 Conclusion and Recommendations

A visual inspection of the retaining walls and carpark railing have been carried out.

It was observed that all stone retaining walls (RW1-RW4, RW6-RW8) were generally in good and stable conditions. Shrinkage cracks were observed on the mortar joints between the stone, however in general, the mortar is still firmly intact to the stone. It is recommended that the mortar joints are inspected, and any loose parts are removed and patched with repair mortar.

Vertical crack along the height of the wall were observed at some location. Though it seems that those cracks were not excessive, and have been addressed on previous repairs, it is recommended that they should be kept under observation to identify further movement.

The concrete retaining wall RW5 was generally in good condition. Shrinkage cracks were observed along the height of the wall at regular intervals. Exposed reinforcement was observed at some location. This reinforcement is badly corroded and need to be replaced, and covered.

The galvanised steel railings at the carpark area are generally in good condition. Corrosion was observed at the joints between the post and horizontal railing. Some connection points between the post and horizontal railing were missing, and are a hazard. It is recommended that the missing connections are reinstated, and corrosion protection applied to the railing.

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Coastal Hazard Risk Identification

CW93300

Prepared for Town of Cottesloe

22 August 2016







Cottesloe Foreshore Redevelopment Coastal Hazard Risk Identification

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Executive Summary

The Town of Cottesloe has a vision to develop the public spaces along the Cottesloe Foreshore, while conserving the area's environmental, recreational and historical values, which have made Cottesloe Beach an iconic Australian destination. To pursue this vision The Town has created a broad level concept plan for the foreshore, which it intends to advance through the concept and detailed design phases.

Cardno has been engaged to undertake concept design for the foreshore zone from Forrest Street to Eric Street and subsequent detailed design for the zone from Forrest Street to Napier Street. Cardno will manage all aspects of the design process, including community consultation, liaising with relevant government departments to ensure approvals are in place and undertaking contract administration for Stage 1 of the works. The project will involve the coordination of input from various disciplines, including landscape architecture, coastal engineering, civil engineering, traffic engineering / transport planning, public art consultants, electrical engineering and irrigation.

Documentation following the Coastal Hazard Risk Management and Adaptation Plan (CHRMAP) guidelines (WAPC, 2014) will be developed alongside the design process, to demonstrate to the Western Australian Planning Commission that current and potential future coastal hazards have been considered. This report addresses the initial steps in the CHRMAP process; namely establishing the context and identifying risks through a coastal vulnerability assessment.

The context for coastal management has been established through assessment of previous investigations, initial stakeholder consultation and the review of environmental conditions and processes at the site. This has allowed the determination of success criteria, against which identified risks will be evaluated. These criteria are:

- > Environment and sustainability;
- > Maintain and protect public safety,
- > Protect and enhance the local economy and growth; and
- > Protect community and lifestyle.

A site investigation was undertaken to assess the environmental setting of the study area and the layout of existing infrastructure at the site. This site visit, in conjunction with a review of existing coastal investigations in the area, allowed a preliminary assessment of coastal hazards and their associated risks.

Coastal hazards within the study area have been quantified and mapped through a coastal vulnerability assessment. This assessment follows the guidelines set out the State Planning Policy No 2.6 - State Coastal Planning Policy (SPP2.6) (WAPC, 2013). The coastal vulnerability of the study area now and for the future planning horizons 2040 and 2070 has been considered. Overall planning setbacks for erosion were developed by combining the potential for short-term (storm induced) erosion with potential long term erosion; comprising historical shoreline movement trends and that due to predicted sea level rise. Coastal inundation due to water level variations and wave setup has also been considered for current and future sea level rise scenarios.

In the next phase of the project, accompanying the finalisation of the concept design, risks will be evaluated in detail by analysing the likelihood and consequence of impacts due to the determined coastal hazards. This evaluation will draw on the success criteria to assess the acceptability of each risk. Advice will then be provided as to the most appropriate locations for various land-use proposals, and any adaptation options required to mitigate the risks of these hazards. Adaptation options will follow the SPP2.6 'Avoid, Retreat, Accommodate and Protect' hierarchy.



Cottesioe Foreshore Redevelopment Coastal Hazard Risk Identification

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22 August 2016 Cardno



Cottesloe Foreshore Redevelopment Coastal Hazard Risk Identification

1 Introduction

Cottesloe Beach is an ingrained Western Australian icon, it is recognised as the most popular beach in Perth, and a "must-visit" destination for visitors to Western Australia. It is home to the landmark Indiana Restaurant, the trendy Cottesloe Beach Hotel, and plays host to the annual Sculpture by the Sea exhibition.

As a result of recent changes to Town Planning rules, there is new interest in private redevelopment of buildings around Cottesloe Beach, with an initial redevelopment already approved. Additionally, the Town is in negotiations with the leaseholder of the Indiana Restaurant to consider opportunities to redevelop the landmark building.

Responding to this private redevelopment potential, and to ensure the iconic status of Cottesloe Beach is retained, the Town of Cottesloe (herein referred to as 'the Town') intends to redevelop the public spaces of the Cottesloe Foreshore. In combination with the private redevelopment, the Town desires to ensure the retention of the iconic status of Cottesloe Beach. Central to this objective, the Town desires to create a safe and vibrant public space that is sympathetic to its heritage values whilst confirming its important and special place in the social history and fabric of Perth and its surrounds.

In order to progress the redevelopment of the Cottesloe Foreshore, the Town has created a broad level concept plan depicting the community vision. The Town now intends to advance this plan and ultimately to commence the redevelopment of the public spaces of the Cottesloe Foreshore. The Town also seeks to resolve pedestrian and cyclist road safety problems, as part of the redevelopment.

1.1 Scope of Work

Cardno were engaged to assist the Town with the Cottesloe Foreshore Redevelopment Project described above ('the Redevelopment'). The extent of the study area is displayed in Figure 1-1. The scope of the project includes:

- > Concept Design for Forrest Street to Eric Street; and
- > Detailed Design and Contract Administration for Forrest Street to Napier Street.

Cardno's role in the Redevelopment involves managing all aspects of the design process, including:

- > The preparation of a well refined concept plan for the complete foreshore area;
- > Community and stakeholder engagement, to allow relevant parties to inform the design, and gain community support and buy-in to the design;
- > Liaising with relevant departments such as the State Heritage Council and the Western Australian Planning Commission (WAPC) to gain the necessary approvals so that the project can be implemented;
- Progressing the first stage of works (between Napier and Forrest Streets) through to detailed design, to facilitate tendering and construction;
- > Contract administration of the Stage 1 works; and
- Overarching the above will be coordinating the inputs from all relevant disciplines, including landscape architecture, coastal engineering, civil engineering, traffic engineering / transport planning, public art consultants, electrical engineering and irrigation.

Measures to protect, conserve and enhance the Cottesloe Foreshore's coastal values will be inherent in all aspects of the design. This is particularly important given the substantial recreational infrastructure proposed to be included directly on the coast, such as beach-side promenades, an extension to the existing terraces and changes to the car parks. These measures are important not only to ensure the long term sustainability of the foreshore development, but are also required to gain any required approval from the WAPC.

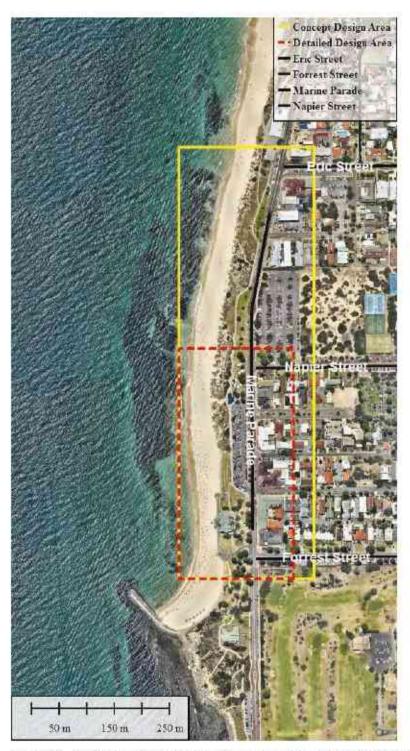


Figure 1-1 Study area - yellow box: concept design area, red box: detailed design area



Cottesioe Foreshore Redevelopment Coastal Hazard Risk Identification

The coastal component of the overall project will follow the recommended CHRMAP methodology outlined in the CHRMAP Guidelines (WAPC, 2014). As such, Cardno will develop CHRMAP documentation that will demonstrate both to the WAPC, and the Town of Cottesloe that the proposed design includes suitable allowance for coastal processes, including present day erosion, historical shoreline movement, sea level rise and storm surge inundation. The steps involved in the risk management and adaptation process are presented in Figure 1-2. This report addresses the first two steps of this process by establishing the context of the CHRMAP and identifying areas at risk from coastal hazards within the study area.

The identified risks will be assessed in a risk assessment framework as part of the next phase of work, in conjunction with detailed design. Ongoing stakeholder consultation will ensure that appropriate success criteria are maintained, against which risks will be assessed. Outlined at the conclusion of this report are the next steps required in the process towards completing the CHRMAP for the Redevelopment.

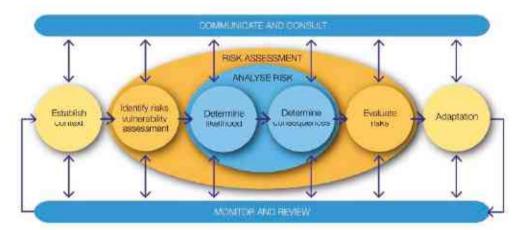


Figure 1-2 Risk management and adaptation process flowchart (WAPC, 2014)

1.2 Qualifications

Any potential impacts due to climate change, other than sea level rise, have not been considered in detail in this study, as they were not part of the scope. Any changes to the dominant storm direction due to climate change will have an impact on longshore sediment transport processes at the site.

Any potential effects due to salt water intrusion, changes in the water table, and other groundwater related effects have not been considered as part of this CHRMAP.

Inundation and flash flood impacts arising from stormwater are assumed to be appropriately managed and have no significant impact on the redevelopment.

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2 Establishing the Context

2.1 Legislative Context

Cardno and the Town of Cottesloe have committed to including measures to protect, conserve and enhance the Cottesloe Foreshore's coastal values in the Developed Concept Plan, particularly given the substantial recreational infrastructure proposed to be included directly on the coast, such as beach-side promenades, an extension to the existing terraces and adjustment to the car parks. These measures are important not only to ensure the long term sustainability of the foreshore development, but are also required to gain approval from the WAPC.

The Western Australian Planning Commission's most recent amendment to the State Coastal Planning Policy 2.6 recommends that management authorities develop a Coastal Hazard Risk Management Adaptation Plan (CHRMAP). This forms the basis of a risk mitigation approach to planning that identifies the hazards associated with existing and future development in the coastal zone. A critical stage of this process is establishing the context of the adaptation plan, through investigation and community consultation, by identifying the key built and natural assets, their value to the community and the success criteria for the adaptation plan.

This study will utilise the State Planning Policy No 2.6 - State Coastal Planning Policy (WAPC, 2013, herein referred to as 'SPP2.6'), WAPC's CHRMAP guidelines, and other relevant documentation to develop comprehensive CHRMAP documentation for the study area. This CHRMAP will guide the ongoing redevelopment of the Cottesloe Foreshore.

2.2 Proposed Redevelopment

This is described in Section 1. The proposed conceptual redevelopment layout, in its present form, is presented in Appendix X.

2.3 Existing Studies

A number of studies and plans have been undertaken for the Cottesloe area to date. These include:

- > Damara & CZM (2008)
- > GBGMaps (2010 & 2011)
- > MP Rogers (2005)
- > BMT Oceanica (2015)
- > Cardno (2016)

The results and analysis of these studies are incorporated into the relevant sections within this report.



Cottesloe Foreshore Redevelopment Coastal Hazard Risk Identification

2.4 Stakeholder Consultation

Stakeholder consultation is an important component of identifying assets of importance that are at risk of coastal hazards. Consultation is being undertaken as part of the greater Foreshore Redevelopment study. Cardno worked with the Town of Cottesloe to engage the key stakeholders involved in this study, all of which are listed in Table 2-1 below. These are the main stakeholders whose values and development requirements shall form the success criteria developed specifically for this study. These criteria shall be assessed against each coastal hazard to ensure the development remains successful throughout the proposed design life.

Table 2-1 Government groups, stakeholders and community engaged in the study

Group	Department/Organisation
Government	WAPC
	State Heritage Council
	Department of Aboriginal Affairs
	Main Roads WA
Community & Stakeholders	Cottesloe Business Association
	Cottesloe Surf Life Saving Club (SLSC)
	North Cottesloe SLSC
	Cottesloe Coastcare Association
	Sculpture by the Sea
	Local Indigenous Groups
	Linley Lutton/Urbanix
	General Community (by way of forums)

2.4.1 Workshop 1 - Visioning

The first workshop was held with the Town of Cottesloe on the 9th February 2016. The aim of this workshop was to provide the design team with a clear understanding of the qualities, themes and vision that Council aspire to for the foreshore. From here, Cardno could begin the concept design in line with the Town of Cottesloe's requirements.

At the workshop, Cardno provided a brief photographic tour of other coastal developments throughout Western Australia and nationally to provide a point of reference for proposals at Cottesloe, and presented some initial options and ideas about how to best treat the key zones in the study area. It was agreed that the development should be low key, with high quality finishes; incorporate a lot of vegetation and 'nature', keep its general feeling and sense of place, have universal access and include environmentally sustainable principles.

Additional suggestions were provided, and feedback acquired, about how to best integrate Public Art within the landscape, with the primary focus recognising the Indigenous and European heritage of the site.

2.4.2 Stakeholder Meetings

Meetings with stakeholders commenced in February and March of 2016. The general consensus was in support of the redevelopment with positive and constructive suggestions from the various groups noted. There was cohesion between stakeholder expectations and the proposed design/vision for the areas, such as keeping/increasing vegetation in the study site and enhancing its natural value; minimising infrastructure (existing and proposed) that is visually obtrusive (car parks, signage); increasing accessibility to the site in a sustainable way (increased awareness of public transport options and bicycle use) and so on.

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2.4.3 Additional Consultation

A number of stakeholder consultation events for the project are yet to be held as follows:

- > Workshop 2 Site Arrangement
- > Workshop 3 Present Draft Concept Plan
- > Community Forum 1
- > Community Forum 2

These are scheduled to occur later in the redevelopment design process.

2.5 Success Criteria

Success criteria are defined to evaluate the significance of identified risks. They determine if the objectives of the development will be achievable on an ongoing basis. In other words, they are the minimum benchmark performance indicators. The criteria below are previously defined success criteria as discussed in Damara & CZM (2008). They also reflect the views of the stakeholders as expressed in the consultation to date, and the objectives and values of the development. Whilst the criteria here are broad, they can be applied to specific consequences:

- > Environment and sustainability;
- > Maintain and protect public safety,
- > Protect and enhance the local economy and growth; and
- > Protect community and lifestyle.

Each risk identified in the risk assessment process shall be evaluated against these criteria. For those risks that are identified to be unacceptable through the consequence-likelihood matrix and vulnerability analysis, adaptation options must be investigated. It is important to note that consequence alone does not constitute failure of the success criteria. For example, minor loss of adaptive capacity to beach access may fail some of the above criteria, but if deemed to be unlikely, may be acceptable overall.

Ultimately, the CHRMAP aims to identify unacceptable risks and provide monitoring or adaptation solutions, whereby the development may continue to provide its services using a sustainable economic budget.



Cottesloe Foreshore Redevelopment Coastal Hazard Risk Identification

3 Environmental Setting

3.1 Site Visit

Cottesloe Beach is located 12 km west of Perth's city centre in Western Australia. Cottesloe's main beach is classified as a reef-protected, reflective sandy beach, while North Cottesloe is a reflective (sandy) beach (BMT Oceanica 2015). The area is made up primarily of calcium carbonate sediment from offshore biogenic sources and eroded Tamala Limestone cliffs from adjacent coastline (CZM & Damara 2008). A site visit was conducted on the 9th November 2015. Key observations from the visit are summarised in the text and images below.

The beach face is wide (at time of aerial and photographic surveys) (Figure 3-1a), with aeolian ripples in the back beach (Figure 3-1b). A steep scarp in the swash zone was present in the beach immediately north of the groyne, at the time of site visit (Figure 3-1c). This feature was noted by BMT Oceanica (2015) in their December 2014 survey. There was no sediment atop the intertidal platform immediately south of the groyne (Figure 3-1d).

Due to the presence of infrastructure, dunes within the study area begin from John St and extend north. They range from 3 to 13 m AHD and are up to 40 m wide in some places (from beach face up to footpath running adjacent to Marine Parade). They are moderately covered by low lying coastal vegetation (Figure 3-2a), with grass beginning as the dune gradient flattens out. Some areas of the dunes are under rehabilitation, and blow outs are also present in areas (Figure 3-2b and c). Limestone cliffs/outcrop in the south of the study area associated with Mudurup Rocks (Figure 3-2). Dense grass and the majority of the public amenity and infrastructure lies atop or immediately behind the primary dune system (Figure 3-3a).

The sea walls/amphitheatre extends to the beach face at main beach in the southern extent of the study area (Figure 3-3b). This extends north to John St. The sea walls will limit erosion of the shoreline landward, but may have the potential for a scarp to form immediately seaward following storm activity. There are numerous beach access paths constructed of various materials (paved or wooden), and varying in condition (some have been overgrown with grass or sediment has built up on top) (Figure 3-3c). Fencing surrounds the dunes to restrict access; these vary in their condition. Some erosion/undercutting has occurred at the base of some the staircases providing access to the beach (Figure 3-3d).

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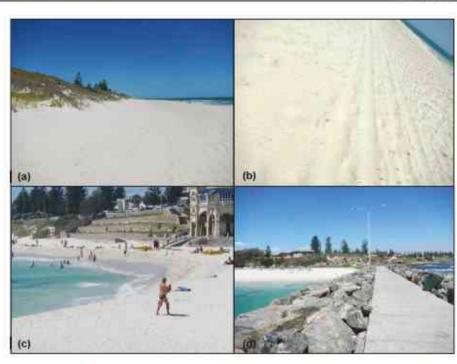


Figure 3-1 Cottesloe beach (a) wide sandy beach face, facing south (b) aeolian ripples (c) steep swash zone (d) no sediment south of groyne



Figure 3-2 Cottesloe beach dune system (a) vegetation covering dunes (b) dune rehabilitation areas (d) dune blow outs (d) limestone outcrop in southern study area



Cottesloe Foreshore Redevelopment Coastal Hazard Risk Identification



Figure 3-3 Infrastructure at Cottesloe Beach (a) majority of infrastructure/public amenity atop primary dune system (b) sea wall/amphitheatre extended to beach face (c) beach access paths both paved (background) and wooden (foreground) (d) undercutting of sediment under staircase to beach

3.2 Oceanographic Conditions

3.2.1 Wind

Cottesloe is located within the greater Perth coastline and experiences typical oceanographic conditions of the area. It is influenced by two dominant seasonal weather patterns. The summer period is characterised by south to south-westerly sea breezes that generally increase through the afternoon and can be very strong at times. The winter period is characterised by intermittent storms attributed to mid latitude low pressure systems, shifting the dominant wind direction to north-westerly; these winds can exceed 20 ms⁻¹.

3.2.2 Water Levels

Cottesloe, like the rest of the Perth coast, experiences low tidal range from mixed but mainly diurnal tides. The tidal range varies from 0.3 m during neap tides to 0.7 m during springs. This small tidal movement allows wind to be the major driver of currents, particularly within the nearshore zone. Longshore currents correspond to seasonal wind and wave conditions, predominantly propagating northward during summer and to the south during winter. The interaction of these currents with shoreline features can form local eddy and rip currents, particularly when swell is present driving substantial water movement perpendicular to the shore.

The present-day astronomical tidal planes at Fremantle have been included in Table 3-1. The full tidal range between LAT and HAT is quite small at 1.2 m.

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Table 3-1 Fremantie Tide Level (Australian Hydrographic Service, 2012)

AHD (m)	Tide	Chart Datum (m)	
0.6	Highest Astronomical Tide (HAT)	1.4	
0.3	Mean Higher High Water (MHHW)	1.1	
0.2	Mean Lower High Water (LMHW)	1.0	
0	Australian Height Datum	0.8	
-0.3	Mean Higher Low Water (MHLW)	0.5	
-0.4	Mean Lower Low Water (MLLW)	0.4	
-0.6	Lowest Astronomical Tide (LAT)	0.2	

3.2.3 Wave Climate

The wave climate in the study area is seasonal. The wave energy is on average higher during the winter months of May to October. Analysis of the offshore waverider buoy at Rottnest from 1994-2006 indicated the annual wave energy peak occurred between June and September (Damara & CZM 2008).

The two seasonal weather modes dominate the local wave climate with locally generated seas from the south, south-west interrupting generally calm conditions during summer. Storms during winter lead to higher energy wave conditions and a greater presence of offshore derived swell, which generally propagates from the south-west. Tropical cyclones that develop during the summer months off WA's north-west coast rarely track down to the study area's latitude, but have been recorded in the area and can cause significant damage to coastal infrastructure.

Cottesloe is afforded protection from offshore wave conditions by Rottnest Island to the west and fringing limestone reef structures scattered adjacent to the coastline. Cottesloe groyne can provide local sheltering from inshore waves, depending on the wave-direction.

3.3 Coastal Processes

3.3.1 <u>Sediment Transport</u>

Under the Department of Transport's (DoT's) sediment cell hierarchy (Stul et al 2012), the study site lies within Primary Sediment Cell F - South Mole Fremantle to Pinaroo Point. Within this primary cell the study area is covered by sediment cell 26, tertiary cell 26a - Mudurup Rocks to north Swanbourne pipe. This means the mechanisms of coastal change are expected to be similar throughout the study area over the short to medium term (i.e. inter-annual to decadal timescales).

Longshore sediment transport within the study area has been shown to be mainly northward from September to April, associated with prevailing currents over the summer period. A southward movement of sediment is usually observed during the winter months of June and July. The result is a net northward movement of material annually (CZM & Damara 2008). Nearshore structures can obstruct this sediment movement. The most notable example of this is the Cottesloe groyne which exhibits accretion of sediment at its northern side in winter and alternatively erosion at the same site during summer.

Cross-shore sediment movement is also seasonal with sporadic periods of swell pushing sediment onto the shore, steepening the beach profile. Mid-year the beach is reformed by the energy of winter storms eroding the beach face and redepositing sediment to form sandbars just offshore. These formations become stable towards the end of winter and act as a buffer, preventing wave breaking at the shore and the substantial shifting of sediment that can cause.



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3.3.2 Shoreline Movement

Typically the shoreline shifts as a result of seasonal weather patterns and associated sediment transport regimes. In summer the Cottesloe main beach is relatively receded. This is due to strong northward currents associated with the south-westerly sea breeze, combined with water level fluctuations moving sediment northward alongshore. The Cottesloe groyne traps the material to the south of the groyne or diverts its transport offshore away from the main beach face; thus sediment is not deposited north of the groyne.

In winter, the shoreline advances as material accretes on the main beach. Winter wave conditions with significant offshore swell move sediment shoreward, feeding material to the nearshore zone and depositing it on the beach face at times. Storm events can drive erosion and accretion and lead to reshaping of beach form. The shift in longshore currents southward during this period means the Cottesloe groyne can now act as a sediment trap to its northern side, aiding retention of material.

North Cottesloe beach at the north of the study area, while exposed to the same hydrological conditions is less affected by the Cottesloe groyne. The beach is relatively open and exposed and its sedimentation is also influenced by a stunted headland at its northern end. Thus more subtle shoreline movements occur.

3.3.3 Existing Controls

Existing controls can refer to any structure, natural or artificial, that interacts or may interact in the future with the oceanographic conditions and coastal processes described above. The existing controls at Cottesloe include the main groyne at Mudurup Rocks adjacent to the Surf Life Saving Club; the reef just offshore of the shoreline both adjacent to the study area and further south; Garden, Camac and Rottnest Islands. Concrete sea walls that have been constructed between Warnham Road and Cottesloe Surf Life Club. These will affect the extent of landward erosion in the future.

The Town commissioned GPGMAPS to undertake geophysical investigations in 2010 and 2011 to address the key knowledge gap in understanding the study area's local geology. Based on testing of a longshore segment between Curtin Avenue and North Street, the depth between ground level and bedrock ranged between approximately 5 metres and greater than 10 metres. The compaction of beach sediment was found to be variable with depth along the tested segment, with generally poor compaction in the first 5 metres below the surface. Testing along a transect perpendicular to the shoreline revealed high variability in the depth from surface to bedrock; ranging from 2 metres to greater than 10 metres. These results indicated the bedrock on its own will not provide a suitable defence against erosion as it is too far below the surface.

Another existing control is the Town of Cottesloe's long-term beach monitoring program that commenced in 2014. The aim of the program is to gain knowledge of the patterns in beach changes along the Town's coastline, and potentially identify longer-term trends in erosions and/or accretion. The program involves shoreline surveys undertaken approximately every 6 months, spread along the span of the Town's shoreline. Complementary to this, monitoring by remote camera units provide images every hour of two key sections of the Town's coastline; Cottesloe Main Beach and North Cottesloe Beach

The monitoring program at present is relatively comprehensive given the Town's available resources. It is recommended the program is continued, in at least its current format, to gather a total dataset of 5-10 years before confident conclusions around trends in shoreline movement can be drawn.

Following completion of year 5 of monitoring, the data should be analysed for medium term trends, as well as for input into coastal management. For example, if medium term erosion trends were observed at a specific location, investigations could assist with management measures at that site. Data collection should still be ongoing, during and following this analysis. This dataset should be used in conjunction with the outcomes of this CHRMAP for optimal planning of the study area coastline.

3.4 Climate Change Parameters

It is widely recognised in the scientific community that climate change is occurring, and as a result possible effects must be considered when planning for the future. For this study the projected effects will most likely be an increase in mean sea level, as well as changes to storm frequency, direction and intensity, changes to precipitation patterns and increased temperatures. For the purpose of this CHRMAP only potential effects due to sea level rise are considered. It was noted in Section 1.2 that there is the potential for changes in the dominant storm direction to impact the site by affecting the longshore sediment transport regime. This has

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not been considered in this study. This should be included in the monitoring and review process of this CHRMAP.

This study will consider the present timeframe, as well as the years 2040 and 2070. The period to 2070 has been included in the analysis to highlight the potential impacts and vulnerabilities beyond the 30 year design life. The purpose of performing risk assessments at different timeframes is to highlight the non-linear impacts of climate change over the design life of the assessment. It is recommended that the adaptation plan be reviewed in light of observed shoreline changes near to the end of the design life.

3.4.1 Sea-Level Rise

The International Panel for Climate Change's (IPCC) report AR4* (2007) has provided projections for sea level rise based on historical sea level rise and future emission scenarios. Based on the IPCC's projections, the DoT have recommended a vertical sea level rise of 0.9 m to be adopted when considering the impact of coastal processes over the next 100 years (2010 to 2110) (DoT 2010). Hunter's (2009) decadal representation of the recommended sea level rise scenario is presented in Figure 3-4, extended to 2110. These recommendations were formally adopted by the WAPC and form the basis of this project's sea level rise cases, presented in Table 3-2.

The more recently updated IPCC AR5 Report (2013) provided updated predictions of sea level rise due to a range of global emissions scenarios and the DoT (2010) recommendation remains consistent with these updated estimates.

For this study, only the sea level rise values up to 2070 have been used.

"The IPCC has released report AR5 (2014) however local projections for sea level rise relevant to this plan have not been significantly aftered

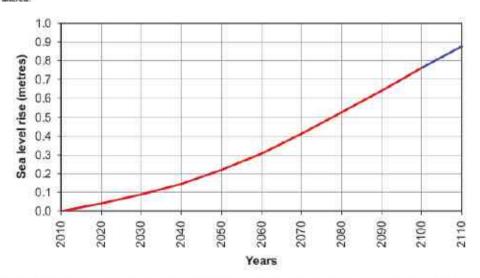


Figure 3.4 DoT's recommended allowance for sea level rise in coastal planning for WA (DoT 2010)

Table 3-2 Climate change simulations modelled sea level rise

Simulation	2040	2079	2110
Sea Level Rise	0.15 m	0.4 m	D.9 m



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4 Coastal Hazard Risk Identification

4.1 Coastal Foreshore Reserve

Schedule One of SPP 2.6 provides guidance for calculating the coastal foreshore reserve to allow for coastal processes including present day erosion, historical shoreline movement, sea-level rise and storm surge inundation. The coastal foreshore reserve should be determined on a case by case basis and include allowance for additional functions provided by the coastal foreshore associated with environmental, social and indigenous values.

The component of the coastal foreshore reserve to allow for coastal processes should be sufficient to mitigate the risks of coastal hazards by allowing for landform stability, natural variability and climate change. The coastal foreshore reserve is a critical input into the coastal hazard risk management and adaptation planning framework outlined in SPP 2.6. The assessment considers allowances for coastal erosion and storm surge inundation in parallel.

4.2 Erosion

The natural coastline is in general very responsive to the climate and any changes that occur. At any time, a development such as this is at risk of exposure to several forms of erosion. Allowances for these risks are categorised in the SPP2.6 as:

- > (S1 Erosion) Allowance for the current risk of erosion;
- > (S2 Erosion) Allowance for historic shoreline movement trends; and
- > (S3 Erosion) Allowance for erosion caused by future sea level rise.

These three factors, plus an uncertainty allowance of 0.2 m per year, combine to form the predicted total erosion during the design life of the development. Included in SPP 2.6 is the current policy relating to the Sea Level Rise (SLR) projection for the 100-years planning period up to 2110. These revisions are:

- > +0.15m for a 30-years (2040) planning period
- > +0.4m for 60 years (2070) planning period

The predicted erosion values shall be calculated for the present day, and these timeframes, as presented in Table 3-2.

The coastal foreshore reserve is applied from a horizontal shoreline datum (HSD), a fixed line that is defined on the basis of the type of coastline being assessed. The HSD defines the active limit of the shoreline under storm activity, and should be determined against the physical and biological features of the coast. In most cases it should be defined as the seaward shoreline contour representing the peak steady water-level under storm activity.

4.2.1 Design Storm

Schedule One of SPP2.6 describes different geographical areas for the definition of the storm event for use as the defined storm event in the assessment of inundation and erosion. The Cottesloe region lies in an area that requires the application of a mid-latitude depression or extra-tropical low storm event. Policy guidance for coastal erosion is that an event corresponding to the 100-years ARI ocean forces and coastal processes should be selected.

For this purpose, DoT has generated a synthetic storm based on analysis of actual events for use in the application of SPP2.6. However, this storm was generated for offshore conditions, specifically at the Rottnest Wave Buoy location (location shown in Figure 4-1 by the white dot). It is not appropriate to apply this storm as forcing to coastal erosion models, due to the inability to resolve wave shoaling and frictional losses. As such, Cardno created a wave model using SWAN (Simulating WAves Nearshore).



The SWAN model bathymetry is presented in Figure 4-1. This was generated using a combination of Two Rocks to Cape Naturaliste LiDAR data collected in 2009, and Navigational Charts AUS754 and AUS112 where the LiDAR was missing.

The synthetic storm was applied across the western model boundary, and part of the northern and southern boundaries, to bring the storm inshore. Cardno used SWAN model parameters consistent with Cardno (2015), for which good calibration was achieved. Data was extracted at 5 locations 2.5 km offshore for use in the coastal erosion model. The bathymetry and output locations are shown in more detail in Figure 4-2, a zoomed in presentation of the model bathymetry.

The output information at these 5 locations was analysed, and the maximum selected for input into the coastal erosion model to allow conservative results. The resultant design storm to be applied in the coastal erosion models is presented in Figure 4-3.

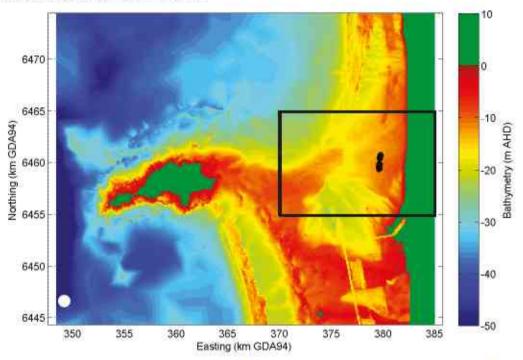


Figure 4-1 SWAN model bathymetry (m AHD). Rottnest Wave Buoy location shown by white dot; SBEACH output points indicated by black dots. Zoomed area presented below



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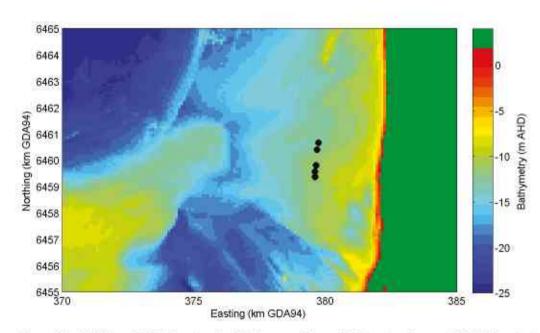


Figure 4-2 SWAN model bathymetry (m AHD) zoomed in on black rectangle area; SBEACH output points indicated by black dots

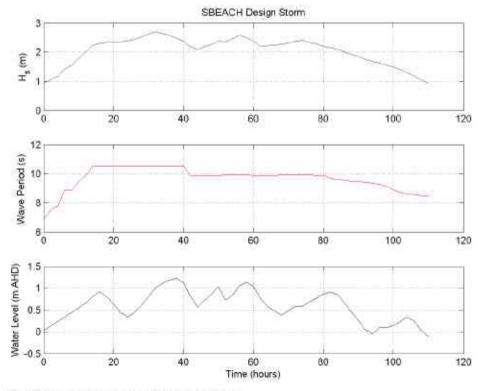


Figure 4-3 Design storm applied in SBEACH

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4.2.2 S1 Acute Erosion

Short-term acute (storm-induced) erosion across the study site was investigated using the SBEACH numerical model as recommended in SPP2.6 for calculation of coastal processes allowance component S1. SBEACH was developed to calculate beach and dune erosion under storm wave action as described in Wise et al (1995).

Locations to be assessed were selected to be in line with the Town's beach monitoring program (Cardno 2016). These correspond to survey profiles 11, 13, 15 16 and 17, as displayed in Figure 4-4 (preceded by 'S' for survey location). The data from the September 2015 surveys was utilised for values above the 0 m AHD contour. From the 0 m AHD contour to 2.5 km offshore, the SWAN bathymetry was utilised. The SBEACH profile resolution is displayed in Table 4-1. Profiles were extended perpendicular to the coastline for 2.5 km to approximately -10 m AHD.

Table 4-1 SBEACH model resolution

Distance offshore from dune crest (m)) SBEACH grid resolution (m)	
0 – 150	0.5	
150 – 200	1	
200 – 250	5	
250 – 400	10	
400 – 600	25	
600 – 1000	50	
1000 - 2500	500	

The sediment size applied in the SBEACH model was 370 µm. This was based on a study undertaken by MP Rogers (MP Rogers, 2005) across the northern metropolitan coastline which involved collecting sediment samples for use in coastal modelling.

The presence of coastal structures and paths were applied in the model as follows:

- > S11: Coastal footpath
- > S13: Coastal footpath and limestone retaining wall
- > S15: Car park retaining wall
- > S16: Vertical seawall at base of amphitheatre
- > S17; Vertical seawall seaward of the Cottesloe Surf Life Saving Club

The model was set up such that these structures would prevent erosion, subject to wave heights and relative water levels.

As discussed, the design storm output from the SWAN modelling was applied in SBEACH, three times in succession in line with SPP2.6. The model results are presented for each profile (S11 to S17) in Figure 4-5 to Figure 4-9. The plots show the intermediate profiles for simulations 1 and 2, as well as the initial and final profile.



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Figure 4-4 SBEACH profile locations

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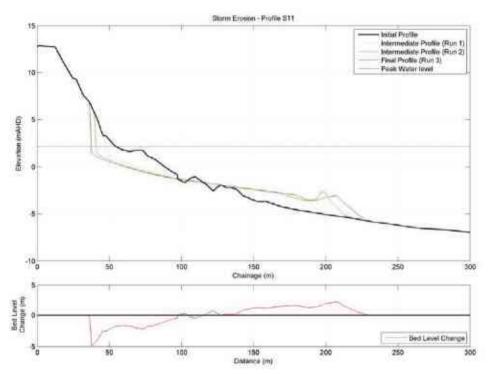


Figure 4-5 SBEACH results for Profile S11

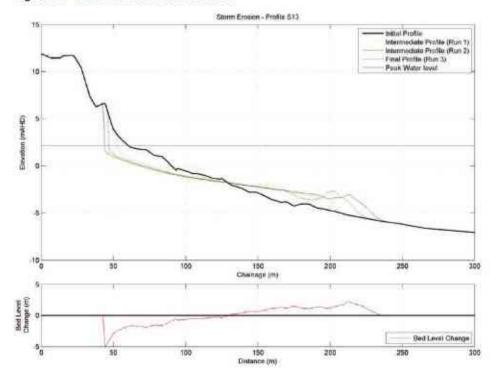


Figure 4-6 SBEACH results for Profile \$13

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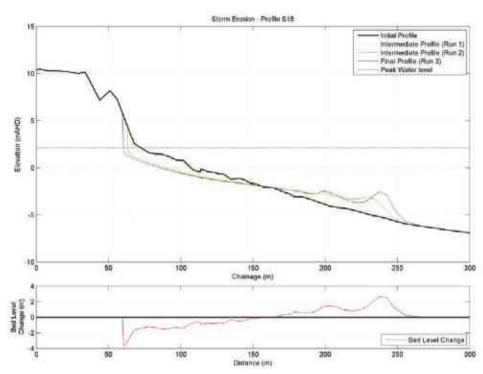


Figure 4-7 SBEACH results for Profile \$15

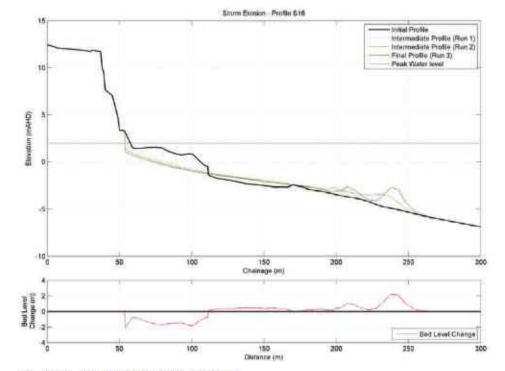


Figure 4-8 SBEACH results for Profile S16



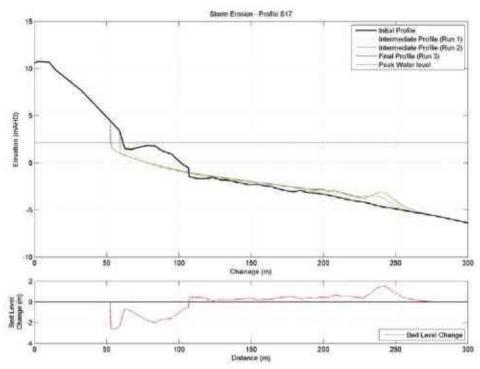


Figure 4-9 SBEACH results for Profile \$17

A single S1 horizontal erosion distance is calculated for each profile based on the maximum horizontal erosion for that profile. This is taken as the maximum erosion calculated across all beach profiles within each section, to the nearest whole metre. Table 4-2 summarises the storm erosion values derived for each profile.

The SBEACH results also indicate the peak water level, which is used to derive the Horizontal Setback Datum (HSD) (blue horizontal line in Figure 4-5 to Figure 4-9). This corresponds to 2.1 m AHD. This value represents the one in 100 year water level plus an allowance for wave setup.

Table 4-2 Acute storm erosion allowance

Section	S1	
S11	18	
513	17	
S15	13	
S16	4	
S17	9	
	-	



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4.2.3 \$2 Historic (Chronic) Erosion

Damara & CZM (2008) assessed historical coastal change. Within the project study area, they found that there was no history of exposed beach rock.

S2 was calculated by MP Rogers (2005) using aerial photographs from 1942 to 2004. To bring this analysis up to date, Cardno examined the 2004 image, and two additional images, 2012 and 2015, to establish further historical shoreline changes. The February 2012 and February 2015 aerial photographs were obtained from the Town of Cottesloe, and the 2004 image from the Department of Transport.

The most seaward vegetation line was traced for all three images. These lines are presented in Figure 4-10. In the detailed design area the main observation is the blowouts observed in the dune system since 2004. There has been accretion in the concept design area. All vegetation in the foredune is patchy; a dune revegetation program would assist with the stability of the dune going forward.

MP Rogers (2005) indicated the shoreline receded 15 m between 1942 and 2004. The vegetation line movement at each profile was measured between 2004 and 2015. The resultant total rate of change over the 74 year period was approximately 0.27 m per year at S11 and S13, and 0.23 m at S15. There was no change at S16 and S17 due to the presence of the seawall. In accordance with SPP2.6, this rate of recession is applied to the 2040 and 2070 scenario. The setback allowance is displayed in Table 4-3 for each profile location.

Table 4-3 Historic setback allowance S2 (m)

Profile	Existing	2040	2070
S11	0	8	16
S13	0	8	16
S15	0	7	14
S16	0	D	0
S17	0	0	0

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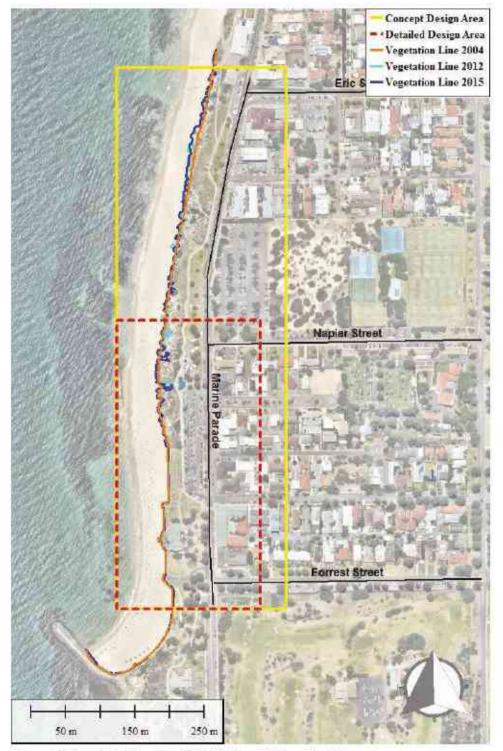


Figure 4-10 Vegetation lines from 2004, 2012 and 2015 aerial photographs

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Cottesloe Foreshore Redevelopment Coastal Hazard Risk Identification

4.2.4 \$3 Erosion due to Sea Level Rise

SPP2.6 stipulates an allowance of 90 m of shoreline recession should be made, based on a vertical sea level rise (SLR) of 0.90 m over the 100 years planning horizon to 2110. The planning horizons to be assessed for this study, as discussed in Section 3.4.1, are present day, 2040 and 2070. The values for each planning timeframe are presented in Table 4.4.

Table 4-4 Erosion due to SLR, S3 (m).

Profile	Existing	2040	2070
S11	0	27	54
S13	0	27	54
S15	0	27	54
S18	0	27	54
S17	0	27	54

4.3 Coastal Hazard Lines

The coastal foreshore reserve allowance for coastal processes for 2040 and 2070 are presented by profile location in Table 4-5 and Table 4-6. The present day coastal foreshore reserve allowance is the S1 column in Table 4-6. The stipulated uncertainty allowance of 0.2 m/year is included in the fifth column.

These coastal foreshore reserve allowances were applied to the HSD line and are plotted for the full study area in Figure 4-11. Also displayed in this figure are the study area sections demarcations.

Table 4-5 Coastal foreshore reserve allowance for coastal processes for 2040

Section	S1	\$2	S3	Uncertainty Allowance	Total 2040 (m)
S11	18	8	27	6	59
S13	17	8	27	6	58
S15	13	7	27	6	53
S16	4	0	27	6	37
S16 S17	9	D	27	6	42

Table 4-6 Coastal foreshore reserve allowance for coastal processes for 2070

Section	S1	\$2	S3	Uncertainty Allowance	Total 2070 (m)
S11	18	16	54	12	100
S13 S15	17	16	54	12	99
S15	13	14	54	12	93
S16	4	0	54	12	70
S17	9	0	54	12	75



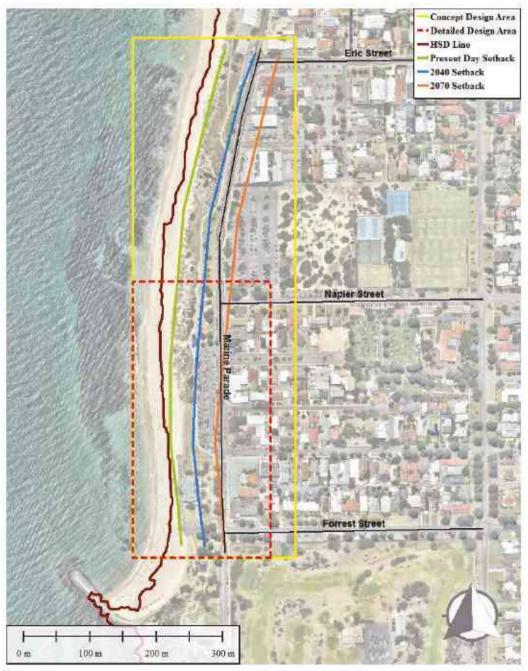


Figure 4-11 Coastal foreshore reserve allowances across the Cottesloe study area for all planning



Cottesioe Foreshore Redevelopment Coastal Hazard Risk Identification

4.4 S4 Inundation

According to SPP2.6, the allowance for storm surge inundation (S4) should be calculated based on a level with a 0.2% chance of exceedance annually, equivalent to a 500 year ARI event. The most reliable, long-term water level dataset in the area has been collected at Fremantle Fishing Boat Harbour. Cardno obtained 50 years of water level data (1966-2015) at Fremantle from the DoT. An extreme value analysis was carried out on the dataset to estimate a 500 year ARI water level at Cottesloe (see Table 4-7).

The water level record at Fremantle Boat Harbour comprises data collected within a protected marina and, as such, is unlikely to capture processes that can affect water level for an exposed shoreline, specifically setup caused by wind and wave processes. Investigations of setup suggest it is a considerable water level phenomenon in the nearshore zone and that the majority of wave setup generally occurs on the beach face (Dean & Walton, 2008). This supports the notion that the Fremantle dataset will not have properly captured water level increases due to setup in the area.

To include the effects of wave setup, Cardno undertook SBEACH modelling with the 500 year ARI water level and the peak wave heights taken from the SWAN wave model output locations (corresponding to a 100 year ARI event at Rottnest). The combination of a 500 year ARI water level with a 100 year ARI wave event would be considered to be a very conservative approach. Overall inundation levels, including the effects of sea-level rise, for present and future scenarios are shown in Table 4-7.

Table 4-7 Inundation level, \$4

Component	Existing	2846	2070
500yr ARI water level mAHD)	1.43	1.43	1.43
llowance for earshore etup (m)	1.37	1.37	1.37
Allowance for Sea Level Rise (m)	3 8	0.15	0.4
fotal (mAHD)	2.8	2.95	3.2

The horizontal extent of the inundation for each level was approximated and mapped for the study area (Figure 4-12). These extents were estimated by interpolating between the perpendicular shoreline profiles undertaken by the Town in September 2015, also utilised in the SBEACH modelling. Survey data from the Town's April 2015 surveys was also incorporated where the September surveys were insufficient (i.e. landward of the beach face).

Due to the steep dune profile and substantial topographical relief landward of the foredune within the study area, the extent of inundation under future scenarios does not vary significantly to that for the present day scenario. It should be noted that erosion of the fordune, as assessed in Sections 4.1-4.3, is likely to allow inundation under future storm surge scenarios.



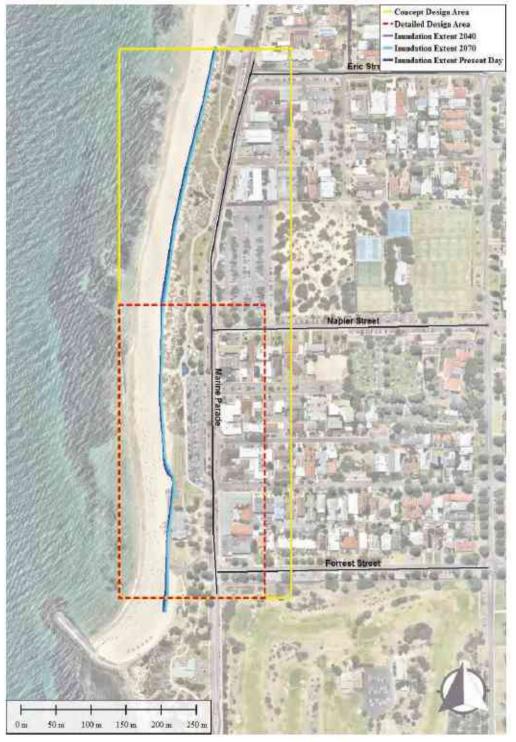


Figure 4-12 Inundation extents across the Cottesloe study area for all planning horizons



Cottesioe Foreshore Redevelopment Coastal Hazard Risk Identification

5 Conclusions & Further Study

This report addresses the initial steps in developing the CHRMAP that will accompany design of the Cottesloe Foreshore Redevelopment. The context has been established through assessment of previous investigations, initial stakeholder consultation and review of environmental conditions and processes at the site. Establishing the context has allowed the determination of success criteria, against which identified risks will be evaluated. These criteria reflect the key values associated with the study area and are as follows:

- > Environment and sustainability;
- > Maintain and protect public safety,
- > Protect and enhance the local economy and growth; and
- > Protect community and lifestyle.

Coastal hazards have been identified within the study area through a coastal vulnerability assessment, guided by SPP2.6. This assessment has provided estimates of erosion and coastal inundation, now and into the future for the 2040 and 2070 planning horizons.

5.1 Input into Concept Foreshore Redevelopment

The context establishment and coastal hazard risk identification undertaken within this report have allowed definition of the coastal foreshore reserve and associated coastal hazards for the Foreshore Redevelopment design life. It is noted that the coastal hazards likely to be encountered are coastal erosion (storm-induced and long-term), coastal inundation, and erosion due to wind and human interaction with the site(s).

In the next phase of the project risks will be evaluated in detail by analysing the likelihood and consequence of impacts due to coastal hazards. We will also provide advice as to the most appropriate locations for various land-use proposals, and any adaptation options required to mitigate the risks of these hazards. Adaptation options will follow the SPP2.6 'Avoid, Retreat, Accommodate and Protect' hierarchy.

A rough cost for adaptation options will be provided for input into the concept level cost estimate. The results of Phase 1 will be provided in a brief summary report.

Any gaps in knowledge or information will be highlighted in the summary report to allow time for collection or generation of this information during Phase 2 of the project.

5.2 Phase 2: Detailed Design

Following receipt of the stakeholder comments from Phase 1, Cardno will complete the CHRMAP process whilst concurrently upgrading the Concept Design to Detailed Design. Any necessary revision to the context establishment and coastal hazard risk identification will be carried out prior to moving to the next step in the CHRMAP process.

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Appendix 6 - Preliminary Cost Estimate

EM	STAGE 1 - FORREST TO DESCRIPTION	THE REAL PROPERTY AND PERSONS ASSESSMENT	QUANTITY	RATE	AMOUN
.00	Preliminaries	UNI	GUARTITI	MATE	Amoun
01	Site establishment, insurances, set out, etc.	item		15%	\$1,461,86
00	Demolition	HEIN		13.6	\$1,401,6s
01	Remove existing kerb	m	3.237	\$2	\$6,4
02	Remove existing road pavement	m²	14.046	\$5	\$70,2
03	Remove existing footpath	m²	9.895	\$5	\$49,4
04	Remove all existing furniture, fences, signage etc	PS	1	\$50,000	\$50,0
05	Store topsoil and respread	m²	16.548	\$30,000	\$33,0
00	Earthworks	in	10,040	44	450,0
.01	Bulk earthworks	PS	-1	\$100,000	\$100.0
02	Detailed earthworks	m²	27,711	\$100,000	\$277.1
00	Pavements	m	21,711	4112	
01	Segmental paving + 200mm crushed rock base course	m²	4,559	\$250	\$1,139,7
.02	[2] 하구입하는 2005 [275] [1] 전투(100] 250[20] [1] [1] [1] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2	m²	3,672	\$230	
03	Segmental paving + 100mm crushed rock base course	m²	5,205	\$85	\$807,8 \$338,3
.04	Asphalt seal (black) + 100mm crushed rock base course Asphalt seal (red) + 100mm crushed rock base course	m²	418	\$70	\$29,2
				(200	
05	Concrete paving - exposed aggregate finish	m²	4,752	\$110	\$522,7
.06	Concrete paving - broomed finish	m²	1,638	\$80	\$131,0
.07	Semi-mountable kerb	m	1,170	\$32	\$37,4
.08	Flush kerb	m	1,233	\$29	\$35,7
.09	Parking bay linemarking	PS	1.	\$5,000	\$5,0
.00	Drainage				
.01	Strip drain - trafficable	m	380	\$800	\$304,0
02	Pit & pipe network	PS	1	\$75,000	\$75,0
.00	Decking		-97174	(4.746.00)	TOTAL STATE
.01	Boardwalk / deck	m	2,102	\$800	\$1,681,6
.00	Walls & steps				
.01	Limestone retaining wall - 400mm high	m	1,137	\$250	\$284,2
02	Point and repair existing retaining walls	PS	1	\$50,000	\$50,0
.03	Concrete steps	m	511	\$350	\$178,8
.00	Furniture				
.01	Handrails	m²	247	\$900	\$222,3
02	Bollards	item	40	\$780	\$30,4
.03	Barbecues	m²	3	\$14,000	\$42,0
.04	Bench seats - proprietary	m²	9	\$3,500	\$31,5
.05	Bench seats - custom	m²	3	\$10,000	\$30,0
80.	Picnic tables	m²	12	\$5,000	\$80,0
.07	Litter bins	m²	12	\$2,500	\$30,0
.08	Bicycle racks	m²	30	\$800	\$24.0
.09	Shade Structures to boardwalk & parklands	item	15	\$25,000	\$375,0
.10	Shade Structures to beach	item	ð	\$18,000	\$108,0
11	Drink fountains (inc plumbing)	m²	5	\$8,000	\$40,0
.12	Beach showers (inc plumbing)	m²	a	\$8,000	\$48,0
00	Lighting & Electrical	111		90,000	910,0
.01	Pole top street lights	item	10	\$10,000	\$100,0
02	Pole top POS lights	item	40	\$15,000	\$600,0
.03	Feature uplighting	item	50	\$2,000	\$100.0
04	Electrical connections	PS	1	\$300,000	\$300,0
0.00		EM	7.0%(1)	90012,000	4000,
0.01	Playground & Fitness Stations Sand softfall	m²	950	\$30	#20.5
				10,000	\$28,5
2000	Rubber softfall	m²	65 520	\$210	\$13,6
	Mulch softfall	m*		\$24	\$12,4
1000	Shade sails	item	1	\$80,000	\$60,0
	Playground equipment	m²	1	\$500,000	\$500,0
سيحضنطمه	Fitness equipment	m²	8	\$2,000	\$16,0
	Softworks		25	1662	7,233
335351	100 Litre trees	ea	75	\$350	\$26,2
1000	Roll-on turf	m²	13,385	\$10	\$133,6
	Topsoil to all turfed areas	m²	13,385	\$3	\$40,0
1.04	Mass planting (4 x 130mm pots per sqm)	m*	3,183	\$34	\$108,2
	Topsoil to all planted areas	m*	3,183	\$5	\$15,8
1.06	Organic mulch to all planted areas	m²	3,183	\$9	\$28,6
2.00	Irrigation				
2.01	Irrigation to planted areas	m²	13,365	\$15	\$200,4
2 02	사용 구경 이번 살아보다 하다면 하다 가요요요요요. 그런 그는	m²	13,365	\$10	\$133,6
	Water source	PS	1	\$80,000	\$80,0
3.00	Other				e di se di fi
3.01		PS	11	\$500,000	\$500,0
	New public amenities building	PS	0	\$400,000	
	Contingencies	1200	-	Total Control	
1.01	The state of the s	PS		25%	\$2,801,9
	C STORY STREET				dering 1 to

ITCU	STAGE 2 - NAPIER TO		200 (S)	DATE	AMOUNT
1.00	DESCRIPTION Preliminaries	UNIT	QUANTITY	RATE	AMOUN
1.01	Site establishment, insurances, set out, etc.	item		15.00%	\$1,461,893
2.00	Demolition	(JESH)		A ROSSELLO	(A) (A) (A) (A) (A)
2.01	Remove existing kerb	m	3,633	\$2	\$7,266
2.02	Remove existing road pavement	m*	18,146	\$5	\$90,730
2.03	Remove existing footpath	m*	4,026	\$5	\$20,130
2.04	Remove all existing furniture, fences, signage etc	PS	1	\$50,000	\$50,000
2.05	Store topsoil and respread	m*	15,110	\$2	\$30,220
3.00	Earthworks	- 22	- 2	5000 AM	2742552
3.01	Bulk earthworks	PS	24 070	\$100,000	\$100,000
3.02	Detailed earthworks	m*	31,079	\$10	\$310,790
4.00	Pavements Segmental paving + 200mm crushed rock base course	m*	752	\$250	\$188,000
4.02	Segmental paving + 100mm crushed rock base course	m*	1,314	\$220	\$289,08
4.03	Asphalt seal (black) + 100mm crushed rock base course	m*	8,881	\$85	\$577,26
4.04	Asphalt seal (red) + 100mm crushed rock base course	m²	999	\$70	\$69,93
4.05	Concrete paving - exposed aggregate finish	m*	1,335	\$110	\$148,85
4.08	Concrete paving - broomed finish	m ²	1,200	\$80	\$96,000
4:07	Semi-mountable kerb	m	1,794	\$32	\$57,408
4.08	Flush kerb	m	510	\$29	\$14,790
4.09	Parking bay linemarking	PS	1	\$5,000	\$5,00
5.00	Drainage				
5.01	Strip drain - trafficable	m	50	\$800	\$40,00
5.02	Pit & pipe network	PS	1	\$75,000	\$75,000
6.00	Decking		Victoria	100000000	TOTAL CHILD CO.
6.01	Boardwalk / deck	m	2,604	\$800	\$2,083,20
7.00	Walls & steps			7222	25222
7.01	Limestone retaining wall - 400mm high	m	160	\$250	\$40,00
7,02	Point and repair existing retaining walls	PS	0	\$50,000	Si
7.03	Concrete steps Furniture	m	300	\$350	\$105,00
8.01	Handrails	m*	407	\$900	\$366,30
8.02	Bollards	item	32	\$760	\$24,32
8.03	Barbecues	IB ²	2	\$14,000	\$28,00
8.04	Bench seats - proprietary	m*	10	\$3,500	\$35,00
8.05	Bench seats - custom	m²	2	\$10,000	\$20,000
8.06	Pionic tables	m²	6	\$5,000	\$30,00
8.07	Litter bins	m²	6	\$2,500	\$15,000
8.08	Bicycle racks	m ²	20	\$800	\$18,00
8,09	Shade Structures to boardwalk & parklands	item.	6	\$25,000	\$150,00
8.10	Shade Structures to beach	item	0	\$18,000	S
8.11	Drink fountains (inc plumbing)	m*	2	\$8,000	\$16,000
8.12	Beach showers (inc plumbing)	m*	5	\$8,000	\$40,00
9.00	Lighting & Electrical			LITTLE WAY	
9.01	Pole top street lights	69	4	\$10,000	\$40,00
9.02	Pole top POS lights	ea	20	\$15,000	\$300,000
9.03	Feature uplighting	ea	30	\$2,000	\$60,00
9.04	Electrical connections	PS	- 1	\$200,000	\$200,00
10.01	Playground & Fitness Stations Sand softfall	m*	0	ean	51
	Rubber softfall	m*	188	\$30 \$210	\$39,48
	Mulch softfall	m'	0	\$210	\$38,40
	Shade sails	item	0	\$60,000	Si
	Playground equipment	m²	0	\$500,000	5
	Fitness equipment	m²	6	\$2,000	\$12,00
the state of the last	Softworks			3,0,0,0,00	
11.00	100 Litre trees	69	80	\$350	\$28,00
11.02	Roll-on turf	m*	10,765	\$10	\$107,65
1.03	Topsoil to all turfed areas	m*	10,765	\$3	\$32,29
1.04	Mass planting (4 x 130mm pots per sqm)	m*	4,345	\$34	\$147,73
	Topsoil to all planted areas	mª	4,345	\$5	\$21,72
11.06	Annal Telephone and the contract of the contra	m*	4,345	\$9	\$39,10
	Irrigation	- 90	7/200	454.0	7.2672654
12.01		m*	4,345	\$15	\$65,17
	Irrigation to turf areas	m*	10,765	\$10	\$107,65
diameter for	Water source	PS	0	\$80,000	\$
terminate par	Other	200		2000 000	2000 00
13.01	·	PS PS	1	\$300,000	\$300,00
13.02		F3		\$400,000	\$400,00
	Contingencies Contingencies	PS		25%	\$2,801,96
	Set in igclibits	1.3		E0 (8)	44,001,00

This preliminary cost estimate is indicative and should be reassessed once detailed design has been completed. We accept no liability or responsibility for interpretations made or use of the information for any other purpose. It should also be noted that the estimate may be affected by a number of factors outside the control of Cardno (WA) Pty Ltd and we cannot warrant the accuracy of the information provided and recommend a further review of the information contained herein be undertaken by the client prior to use.

No allowance has been made for fees and charges relating to project management, detailed design and certification fees.

No allowance has been made for service relocations or major drainage infrastructure





