

Design Report

Point Samson Foreshore

LW15001



Prepared for
City of Karratha

31/03/2015

Version 5

Contact Information

Cardno WA Pty Ltd
Trading as Cardno
ABN 77 009 119 000

11 Harvest Terrace, West Perth WA 6005

Telephone: 08 9273 3888
Facsimile: 08 9486 8664
International: +61 8 9273 3888

wa@cardno.com
www.cardno.com

Document Information

Prepared for	City of Karratha
Project Name	Point Samson Foreshore
File Reference	LW15001-LA-R001-R- Design_RPT-V5CC- MC
Job Reference	LW15001
Date	31/03/2015

Document Control

Version	Date	Description of Revision	Prepared By	Prepared (Signature)	Reviewed By	Reviewed (Signature)
1	23/02/2015	Coastal, Civil & Environmental Review	CC		JG, RD & MC	
4	19/03/2015	Coastal Review	CC		JG	
4	23/03/2015	Environmental Review	CC		MC	

Version	Reason for Issue	Approved for Release By	Approved (Signature)	Approved Release Date
2	Client Review	CC		04/03/2015
3	Client Review	CC		06/03/2015
4	Addition of Sand Trap Fencing Information	CC		09/03/2015
5	Update based on City comments	CC		31/03/2015

© Cardno 2013. Copyright in the whole and every part of this document belongs to Cardno and may not be used, sold, transferred, copied or reproduced in whole or in part in any manner or form or in or on any media to any person other than by agreement with Cardno.

This document is produced by Cardno solely for the benefit and use by the client in accordance with the terms of the engagement. Cardno does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by any third party on the content of this document.

Table of Contents

1	Introduction	1
2	Site Description & Existing Conditions	2
2.1	Location/Extent of Works Area	2
2.2	Coastal Hazard Zones	3
2.3	Landform	3
2.4	Vegetation	3
2.5	Access & Circulation	4
2.6	Parking	4
2.7	Recreational Facilities	4
2.8	Stormwater and Drainage	5
2.9	Acid Sulfate Soils (ASS)	5
2.10	Asbestos	6
3	Proposed Works	7
3.1	Civil Works	7
3.1.1	Miller Close Car Park	7
3.1.2	Community Hall Car Park	7
3.1.3	Mears Drive Upgrades	8
3.1.4	Vitenbergs Drive Car Park	8
3.1.5	Sea Eagle Way Car Park	8
3.2	Landscape Works	9
3.2.1	Tree Replacement	9
3.2.2	Sand Trap Fencing	9
3.2.3	Dune Rehabilitation	11
3.2.4	Mass Planting to Miller Close	11
3.3	New Recreational Infrastructure	11
3.3.1	Decking/Lookout Structures	11
3.3.2	Boat Shed	12
3.3.3	Skate Park	12
3.3.4	New Jetty Structure	12
4	Staging	13
5	References	14

Figures

Figure 1	Extent of Works	2
Figure 2	Coastal Processes 2010 Coastal Processes 2110	3
Figure 3	Acid Sulfate Soils Map (Cardno 2014)	5
Figure 4	Point Samson coastal wind rose	10
Figure 5	Point Samson wind records above the threshold wind speed for Aeolian transport	10

Appendices

- A – Existing Site Conditions
- B – Concept Design
- C – Tamarisk Fact Sheet
- D – Staging Plans

1 Introduction

In 2013, Cardno was engaged by the City of Karratha to prepare a District Structure Plan for Point Samson, a small settlement on the north-west coast. The purpose of the Structure Plan is to:

- > Define future growth areas and precincts;
- > Define objectives for future development including preferred land uses, patterns of movement, and development character; and
- > Outline the parameters within which more detailed planning and future development can take place.

The Structure Plan has identified a requirement for physical enhancement works at key locations along the Point Samson Foreshore which will enhance the level of amenity for the Point Samson community and visitors alike. The City has engaged Cardno to provide additional consultancy services to undertake further investigation on foreshore management, including design and cost estimates.

The proposed physical works relate to:

- > Parking rationalisation;
- > Rectification of the drainage network;
- > New footpaths to complete the pedestrian network;
- > Dune rehabilitation; and
- > New recreational infrastructure.

The objective of this Foreshore Works and Implementation Plan is to identify specific work packages and develop these in further detail to allow subsequent capital works project implementation and future detailed design via a Design and Construct (D&C) package to be tendered by the City.

The preliminary foreshore implementation plans as prepared by Cardno, in association with the draft Structure Plan, were developed following a detailed site investigation in November 2014, and have been informed by background information, including the Foreshore Management Plan (Essential Environmental, 2014), Point Samson Foreshore Assessment (Point Samson Community Association 2013), Foreshore Enhancement Plan (Astron, 2013) and the Draft Structure Plan (Cardno, 2014).

This report provides describes the existing site conditions to help determine the strengths, weaknesses, opportunities and constraints associated with the project. It then provides an explanation of the design rationale, followed by an indication of recommended implementation of the works via a staged process.

2 Site Description & Existing Conditions

Cardno conducted a detailed site investigation in November 2014, followed by a review of relevant background information, to assess the existing strengths, weaknesses, opportunities and constraints which relate to the physical Foreshore Works and Implementation Plan. The findings of the site investigation and background review are as follows.

2.1 Location/Extent of Works Area

The Point Samson Township is located approximately 4 kilometres south-east of Cape Lambert, and is approximately 7.5 kilometres north-east of Wickham. From Karratha, the site is located approximately 38 kilometres to the north-east. It is bordered by the ocean to the east and mangrove swamps to the south-west.

The area proposed for the foreshore enhancement works largely covers the eastern edge of the Township, incorporating the coastal dunes, public open space, and car parks/local access roads associated with Mears Drive, Miller Close and Vitenbergs Drive. The extent of works area is illustrated in Figure 1.

The extent of works area is overlooked primarily by residential buildings from Mears Drive, and with some commercial and tourism based buildings from Miller Close and Bartley Court, inclusive of a general store, tavern and caravan park.



Figure 1 Extent of Works

2.2 Coastal Hazard Zones

For any potential future development within a coastal location, it is imperative that sufficient coastal foreshore reserve be allocated to mitigate the impacts of coastal hazards and processes, notably erosion, inundation and sea level rise (Cardno 2014). The 2110 coastal erosion hazard zone and the ; the southern 15 m is located within the 2110 inundation hazard zone

As part of the Structure Plan development, Cardno have modelled the 2010 and 2110 coastal erosion hazard zones to calculate the Storm Surge Risk. These coastal processes are illustrated in Figure 2 and further details are available in the 2014 Structure Plan.

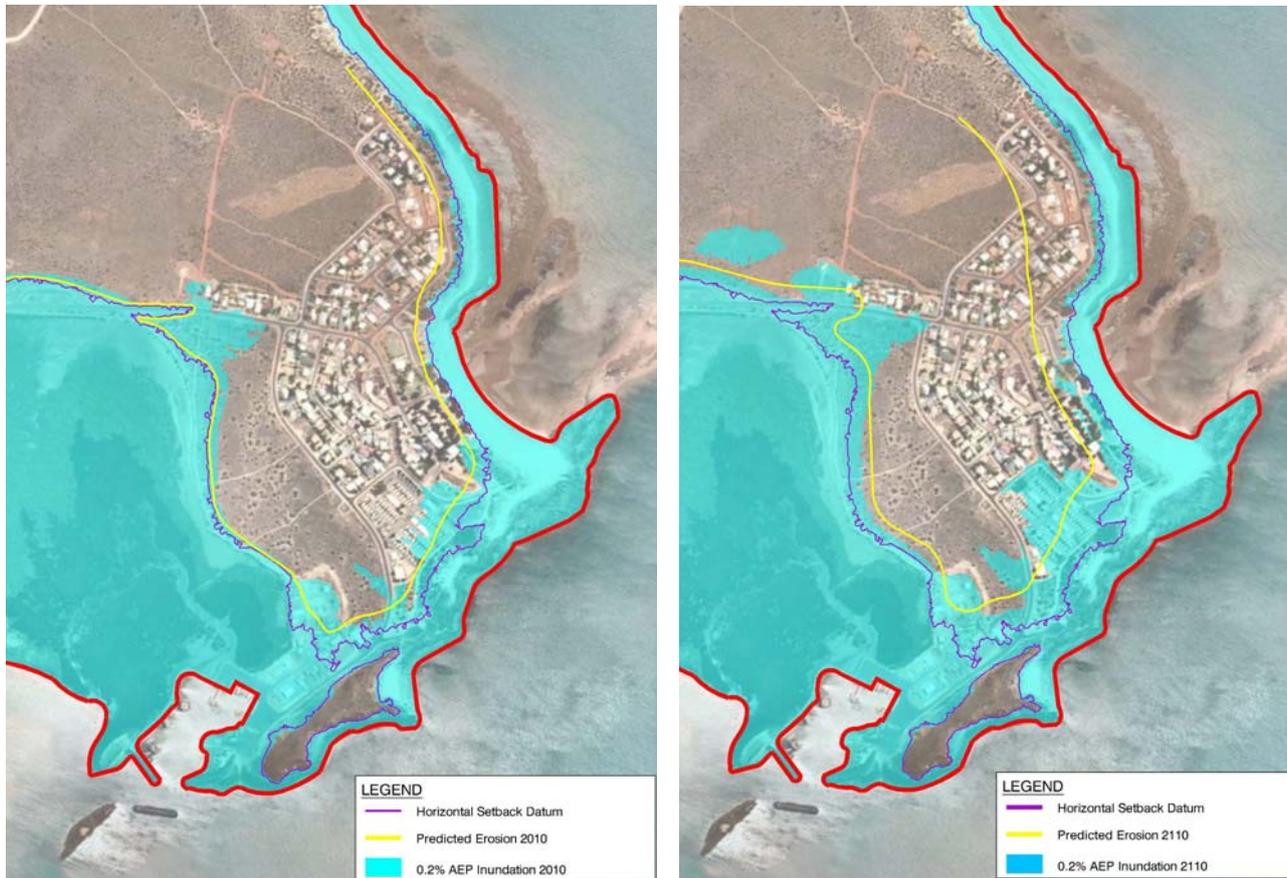


Figure 2 Coastal Processes 2010

Coastal Processes 2110

2.3 Landform

The site is characterised by east facing, mixed sandy and rocky coastline, bordered by coastal dunes. The ground undulates from a maximum of 17.5 m AHD in the northern corner of Mears Drive, down to a minimum of 0 m AHD on the beach.

The northern half of the site provides the greatest variation in landform, with a gradient of 8% along Mears Drive and a substantial fall of up to 20% from Mears Drive to the coast. A gentler gradient is present in the southern portion of the site; at 2% along the Miller Drive car park, and 10-20% from Miller Drive to the beach.

2.4 Vegetation

The dune face to the northern half of the foreshore, seaward of Mears Drive, is relatively undisturbed and well vegetated, despite some cleared vegetation around the beach access tracks, and small unvegetated areas at the beach / dune interface caused by coastal erosion. Vegetation in this area includes a mix of coastal shrubs such as *Acacia coriacea*, *Santalum lanceolatum* and grasses such as *Spinifex longifolius* and *Whiteochloa airoides* (Astron, 2013).

The foreshore dunes located east of the community hall and Miller Close are heavily denuded. These dunes are dominated by Tamarisk (*Tamarix aphylla*) trees which are listed under the Australian Weed Strategy

(NRMCC 2007) as a Weed of National Significance. This area also contains some scattered *Spinifex longifolius* (Astron, 2013).

Dunes to the southern-most section of the site (south of Miller Close) are largely intact, despite some minor erosion, and include *Acacia coriacea*, *Vitex trifolia*, *Whiteochloa airoides* and *Spinifex longifolius* (Astron, 2013).

Introduced weeds including *Cenchrus ciliaris* (buffel grass) and *Aerva javanica* (kapok) are present throughout much of the foreshore dunes in the extent of the works area (Astron, 2013). Other introduced species including Tamarisks (*Tamarix aphylla*), hibiscus and a variety of palms are located throughout the foreshore park and to the verge adjacent to Miller Close car park.

2.5 Access & Circulation

The road network in the foreshore area is comprised of long street blocks and cul-de-sacs, with access to the foreshore area from Point Samson-Roebourne Road, Mears Drive and Miller Close.

Pedestrian access is provided to the full extent of the foreshore area in the form of 1.5 - 2.0 m wide concrete footpaths, typically located on the coastal side of the road. Some of this path network is disconnected as a result of sand-drift or damage to the paths due to storm-water run-off.

Beach access is via informal sand pathways through the existing dune vegetation. A lack of fencing and signage to the pathways facilitates indiscriminate access through the dunes. Unrestricted pedestrian access can be a major cause of vegetation damage and subsequent coastal erosion due to the lack of stabilising vegetation within the dune.

The concrete and sand pathways are illustrated in Appendix A (Existing Site Conditions).

2.6 Parking

Extensive parking is available to the southern portion of the site. A car park of approximately 58 bays is located adjacent to the community hall and doubles as a school and commuter bus pick-up/drop-off area. This car park abuts the dune vegetation and is located adjacent to, but inland of, the predicted existing inundation and coastal erosion hazard zones. It is within the 2110 coastal erosion hazard zone; the southern 15 m is located within the 2110 inundation hazard zone.

A further 62 bays are provided along Miller Close which serve as parking for Town Beach and the adjacent tavern. This car park sits on the landward edge of the present day coastal erosion hazard zone. It is within the 2110 hazard zone for erosion and inundation. The southern turning circle is also within the present day inundation zone.

A large car park of approximately 130 car bays is located to the southern end of Vitenbergs Drive, opposite the Cove Caravan Park. This car park is within all hazard zones: present and 2110 coastal erosion and inundation.

Minimal parking is available to the northern half of the site, with the exception of some informal gravel parking at the northern corner of Mears Drive.

No formal long vehicle or caravan parking is available; however such vehicles typically park across three to four car bays in all three major car parks.

The existing car parks are illustrated in Appendix A (Existing Site Conditions).

2.7 Recreational Facilities

The town's primary park is located directly on the foreshore and within the extent of works area. It includes a community hall, shelters, shade trees, picnic facilities, a heavily shaded playground, and grassed areas which are just large enough for informal ball games. Views to the beach are afforded from the northern half of the park, although the dense vegetation on the dunes limits views to the beach from the southern half.

A toilet/change-room is strategically sited between the Miller Close car park and Town Beach, immediately south of the park.

Outside the extent of works area, other recreational facilities include a community park which houses a number of artwork/sculptures and consists mainly of gravel surfaces and concrete pathways. Additionally, a skate ramp is located adjacent the Point Samson-Roebourne Road into town and is accessed via an unsealed road. Visual inspections indicate it may not have been constructed in accordance with current safety standards.

These recreational facilities are illustrated in Appendix A (Existing Site Conditions).

2.8 Stormwater and Drainage

There are presently issues associated with the stormwater and drainage situations in both Mears Drive and Miller Close. Ongoing ponding at the northern portion of the Miller Close car park appears to be caused by the invert level being too high which prevents stormwater from entering the basin to the north. It is proposed to regrade the car park to create an inverted crown in this portion which will drain to the south east.

As a result of erosion from stormwater run-off in the Mears Drive car park, existing access to the beach has been undermined and collapsed. At this location, Cardno has estimated the run-off from the catchment for a range of storm events (1 to 100 year average recurrence intervals).

2.9 Acid Sulfate Soils (ASS)

The majority of the foreshore area is classified as 'moderate to low risk of ASS disturbance risk occurring within 3 m of natural soil surface' (Cardno 2014).

A small isolated section to the east of the foreshore, roughly 30 m from the coast, is classified as 'high to moderate ASS disturbance risk occurring within 3 m from surface'. Any development proposed in this area would require *in situ* ASS testing to be undertaken prior to construction and a management plan devised if necessary (Cardno 2014).

ASS risk areas for the site can be viewed in Figure 3.

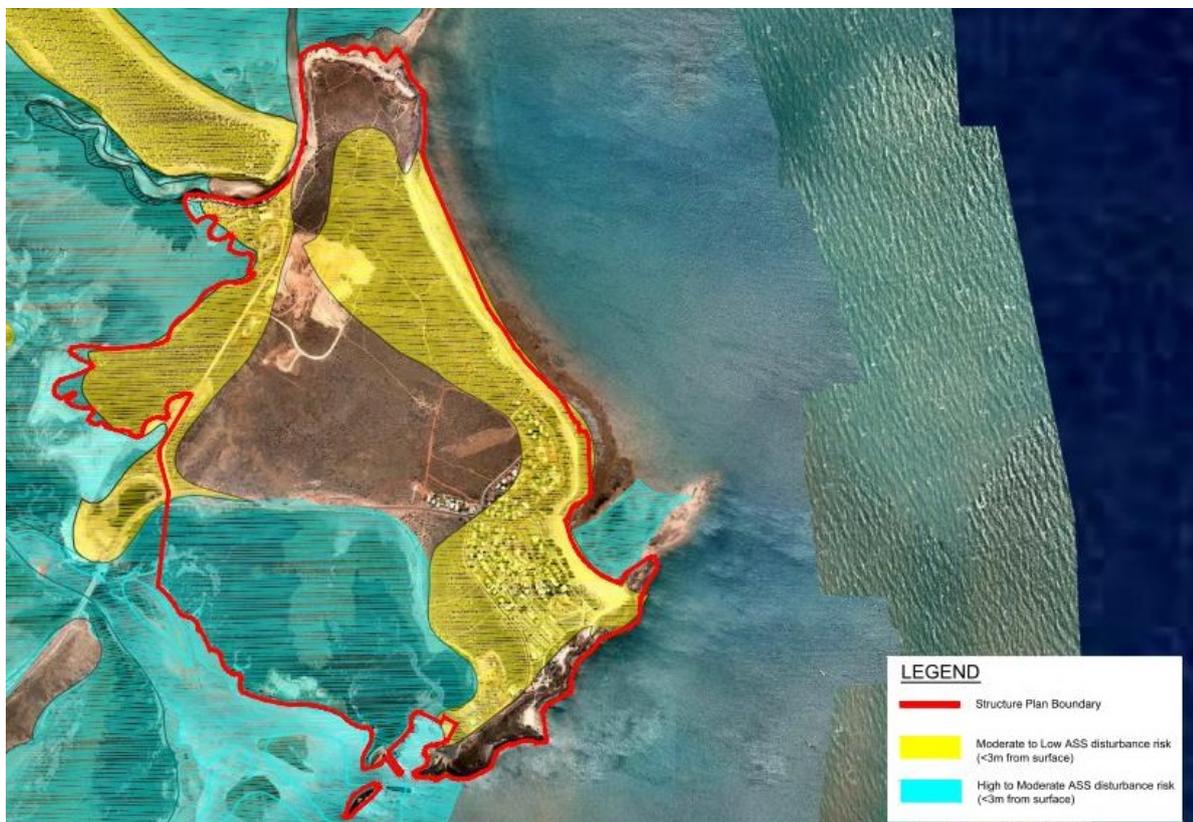


Figure 3 Acid Sulfate Soils Map (Cardno 2014)

2.10 Asbestos

Between 1947 and 1966 Point Samson operated as an export base for blue asbestos from the Wittenoom asbestos mine (Astron 2013). The Point Samson Environmental Scoping Study (Astron 2013) suggests it is unlikely that any property is altogether clear of Asbestos, despite some previous remediation works such as replacement of soil with clean fill, removal of isolated visible contamination and removal of equipment associated with asbestos export works.

The heaviest known area of contamination within the extent of works area is that around the former railway line and asbestos shed – located in the south-eastern corner of the site. Asbestos contamination is also present in the large car park which terminates at the southern end of Vitenbergs Drive, whereby the asphalt seal caps the asbestos contamination (Astron 2013).

Any construction or development in this area shall be subject to additional investigations and remediation via a staged process.

1. A Preliminary Site Investigation will determine the likelihood and extent of the contamination through a desk-top review of previous reports, historical photographs and any other available information;
2. A Detailed Site Investigation will involve intrusive works to take samples and confirm the level of contamination on site;
3. The results of the Detailed Site Investigation will determine the level of risk associated with the site and inform the requirements of the remediation works. The remediation will also be dependent on the final land-use and exposure rates.

3 Proposed Works

Cardno has prepared a concept design (refer Appendix B) for the foreshore area which integrates a number of landscape and civil upgrades for the foreshore area and has formed the basis of the Foreshore Works and Implementation Plan. This concept design has been refined via an iterative process in coordination with the City of Karratha.

Following approval of the Concept, Cardno has prepared a set of documents to guide the future implementation of the foreshore upgrades via a Design and Construct (D&C) process to be tendered by the City. Detailed design will be undertaken by the successful D&C Contractor arising from that procurement process.

Civil engineering and landscape architectural documentation is at a high level, sufficient to identify the core functional requirements for car parks and roads, drainage concepts, dune rehabilitation, decking structures and expected capital cost.

3.1 Civil Works

The proposed civil works includes rationalisation and relocation of car-parking, minor upgrades to the path network, and remediation of the drainage infrastructure. Works have been detailed in four different zones as follows:

3.1.1 Miller Close Car Park

It is proposed that 32 bays will be relocated from the north-east to the south-western side of Miller Close, so as to remove the car park from of the present day coastal erosion hazard zone. In allowing for the reduced car park footprint and to ensure the car park is constructed to Australian / New Zealand Standard Parking facilities, Part1: Off street car parking (AS/NZS 2890.1:2004) a total of 6 car bays have been removed.

Relocation of the car-bays will involve removal of the existing kerbing, asphalt and road base from the existing car park. Topsoil will also be placed in this area to re-establish dune vegetation (refer Dune Rehabilitation section of this report).

Installation of new parking bays to the south-western side of Miller Close may necessitate the removal of some of the hibiscus and Tamarisk trees growing in the verge. New planting is proposed to replace the vegetation that is removed from this area (refer Mass Planting to Miller Close section of this report).

Another key aspect of the civil works to the Miller Close car park includes drainage improvements to prevent stormwater ponding in the northern end of the car park. The new car park will be regraded to create an inverted crown at the northern portion of the car park, which will ensure stormwater run-off is conveyed to the east. To the east of the proposed lookout deck the car park will have a one way cross-fall to convey the flow along the kerb towards a new outlet under the footpath at the turning circle. This will then be conveyed via an open channel to the existing channel. Other works as part of this stage include the installation of a footpath along the foreshore side of Miller Close to maintain full pedestrian access.

3.1.2 Community Hall Car Park

It is proposed to remove 59 parking bays from the car park adjacent the community hall, so as to reduce the risk of erosion and inundation, and assist with the installation of new drainage infrastructure.

19 car parking bays are proposed in the new car-park to facilitate access to the hall and the Town Beach. A turn-around area with a radius of 12.5 m is proposed to also maintain this area as a commuter/school-bus pick-up and drop-off area.

As with the Miller Close car park, removal of the car-bays will involve removal of the existing kerbing, asphalt and road base from the existing car park and installation of topsoil in this area to facilitate future revegetation of the dunes.

There is an existing beach access path from the Community Hall car park which has been undermined and collapsed as a result of erosion from stormwater run-off – the drainage design for this area was focused around providing a solution for this. At this location, Cardno has estimated the run-off from the catchment for a range of storm events (1 to 100 year average recurrence intervals). Initially a drop structure was proposed, but due to concerns over the maintenance of such an asset, this option was not pursued. Instead, an infiltration basin is proposed where the existing car park is to be removed. The basin will retain the 1:20 year average recurrence interval 24 hour duration storm event whilst keeping to a maximum top water level of 0.8 m, and basin side slopes at a maximum gradient of 1:6 m. For larger storm events, a high level spillway would convey stormwater to the beach, and would be concealed by landscaped features such as rocks and / or planting.

This spillway has been designed to terminate at the beach / vegetation interface to allow continuous beach access for the public. During storm events this may scour a channel across the beach. Water, possibly of poor water quality, may pool within this channel and at the base of the dune following the storm. The public should be made aware of any associated hazards, perhaps with signage following an extreme event. To minimise this scouring / pooling, the spillway should be designed such that the stormwater can flow off the longitudinal edges of the spillway as it cuts through the dune. This will reduce the volume of water reaching the beach. The site should be inspected following significant events to determine if dune stabilisation or beach reshaping works are required.

Other works as part of this stage include the installation of a footpath along both sides of the car park to maintain full pedestrian access to both the foreshore and the park.

3.1.3 Mears Drive Upgrades

The gravel car park to the northern corner of Mears Drive is proposed to be formalised and regraded to provide parking for four cars and to ensure adequate drainage of the area. The existing footpath and kerb along Mears Drive is in good condition and will be retained, and extended slightly around the eastern side of the car park to connect with a future decking structure. The full extent of this car park will be retained in public land.

It is understood the City seek to implement measures to prevent vehicles parking on the verge along Mears Drive, and the option of installing a barrier kerb along Mears Drive was explored. This suggestion was discarded because the existing kerb and adjacent footpath are in good condition, it would be costly to remove it and install a new kerb.

A low cost alternative will be implemented for discouraging vehicles from parking on the verge, through the inclusion of line-marking along the edge of the kerb. This is not a guaranteed measure, as drivers may ignore the line-marking, although combined with proposed fencing along the verge as part of the rehabilitation works, it will discourage people to mount the kerb and park on the verge. Additionally, educational signage will be installed at key locations along the verge to prevent vehicles accessing this area.

3.1.4 Vitenbergs Drive Car Park

The Vitenbergs Drive car park design involves substantial rationalisation of the existing car park area, so that there are a total of 30 parking bay and three long vehicle bays. It is understood the remaining asphalt area may be subject to future development.

The stormwater consideration for this area ensures an unobstructed flow path to existing outlets is available; kerb openings and lined open channels have been proposed to enable this.

Due to the likelihood of asbestos presence, further investigations and remediation will be necessary prior to any development or construction works in this area.

3.1.5 Sea Eagle Way Car Park

The Vitenbergs Drive car park design involves substantial rationalisation of the existing car park area, so that there are a total of 30 parking bay and three long vehicle bays. It is understood the remaining asphalt area may be subject to future development.

The stormwater consideration for this area ensures an unobstructed flow path to existing outlets is available; kerb openings and lined open channels have been proposed to enable this.

Due to the likelihood of asbestos presence, further investigations and remediation will be necessary prior to any development or construction works in this area.

3.2 Landscape Works

3.2.1 Tree Replacement

A staged replacement of the Tamarisk (*Tamarix aphylla*) is recommended throughout the dune areas as they are preventing the development of understorey dune vegetation which is exacerbating coastal erosion (Astron, 2013). Additionally the trees are blocking views to the beach from a key part of the foreshore despite providing minimal (if any) usable shade. Management of these trees is necessary for successful rehabilitation of the dunes, and to prevent further spread of the trees throughout the foreshore.

Tamarisks are an invasive species and are listed as a Weed of National Significance; they spread from seed and also from broken tree parts, such as fallen branches. Further information pertaining to the *Tamarix aphylla* is included in the Department of Environment's Weed Management Guide under Appendix C.

It is proposed the Tamarisk trees shall be managed via a staged process over two years. Fifty percent of the Tamarisk trees shall be replaced with native, understorey dune vegetation in the first year of foreshore works, with the remaining trees to be replaced in the second year; this will assist with stabilisation of the dunes and will help maintain coastal views.

Any staged removal of the Tamarisk trees and rehabilitation with native species will only occur when the community is generally in favour of removing specific trees or when required for community safety.

In addition to the replacement of the Tamarisk trees, the existing palm trees in the dunes adjacent Miller Close will be relocated to the adjacent park, as their current location will not link aesthetically with the proposed dune revegetation (as detailed below).

3.2.2 Sand Trap Fencing

Sand trap fencing is proposed to be installed at the base of the foreshore dunes to reduce wind velocity, aid in dune growth and shelter developing vegetation.

To utilise sand fencing to effectively assist with dune development and beach protection there must be adequate conditions at the study site. The main factors determining potential effectiveness are sediment particle size distribution (PSD) or grain size, wind speed, wind direction, and beach profile. These factors and their influence on the design are outlined below.

The amount of wind-blown sediment transport at a given wind speed depends on the sediment grain size. No information was able to be obtained regarding the PSD of the beach sand for the study site. The D_{50} for the study site was assumed to be 0.25 mm (fine to medium sand).

Using the equations for initiation of motion of sediment in Hsu & Weggel (2002), the threshold wind speed at a height of 2 m above the beach is 4.9 ms^{-1} . To estimate the period of time this wind speed is exceeded at the study site, the wind speed near Point Samson was adjusted by applying a height factor as per CERC (1984a). From this it was calculated that approximately 38% of the time sand can be transported by wind; a significant period of time.

Wind direction in Point Samson is strongly seasonal, alternating from the west in summer to the east in winter. Figure 3-1 presents the wind rose for Point Samson, highlighting the strong easterlies and consistent westerlies existing at different times of year. Figure 3-2 shows the wind rose for wind records above the Aeolian sediment transport threshold for the study area. From this it is clear that the dominant transport directions will be alongshore in both directions depending on the season, with some minor transport offshore and very little transport onshore. It should be noted that the wind record used for analysis is located approximately 17 km offshore. This may change the wind direction in that the land sea breeze system (if present at Point Samson) may not be reflected in the data.

The beach profile is well suited to sand fencing with low relief and room to install more than one 'layer' of fence line if desired. Sand fencing is therefore a viable option to aid sand retention at the study site. Indeed, communications with the City have confirmed that Aeolian sediment transport has been occurring and could be utilised through sand fencing.

Installation of sand trap fencing is proposed to take place in coordination with dune rehabilitation works (refer Section 3.2.3 below). Details regarding the construction of the fencing are provided in the Foreshore Rehabilitation Works specification and drawings and it is feasible that the fencing is installed by the local community and no heavy machinery will be required.

In order to take full advantage of the fencing following installation, they must be observed regularly, and repair damaged, or new fences installed if full. Typical sand fencing materials degrade over time, and will need to be replaced once this occurs. New fencing will need to be installed as existing fencing fills. It is assumed the fencing will be damaged or destroyed in the event of a cyclone.

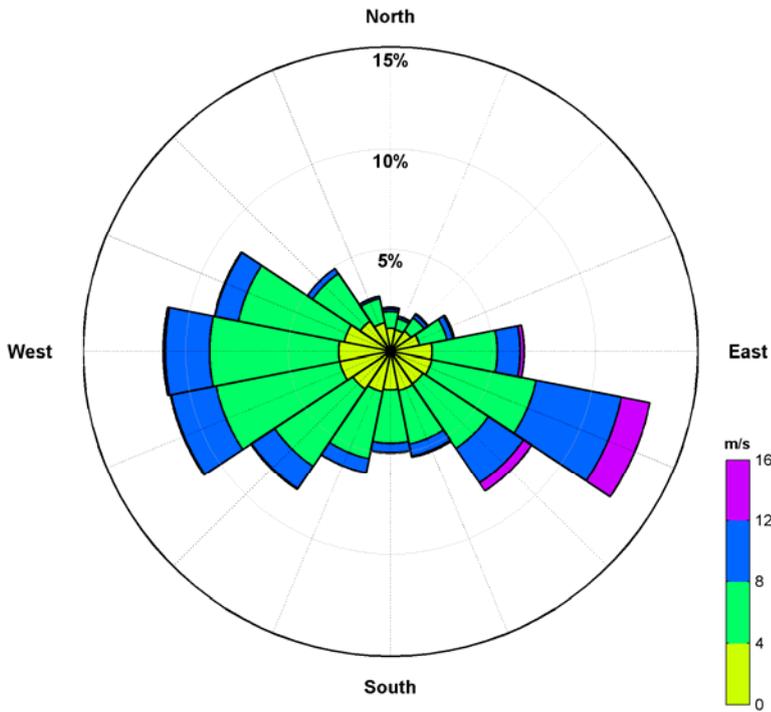


Figure 4 Point Samson coastal wind rose

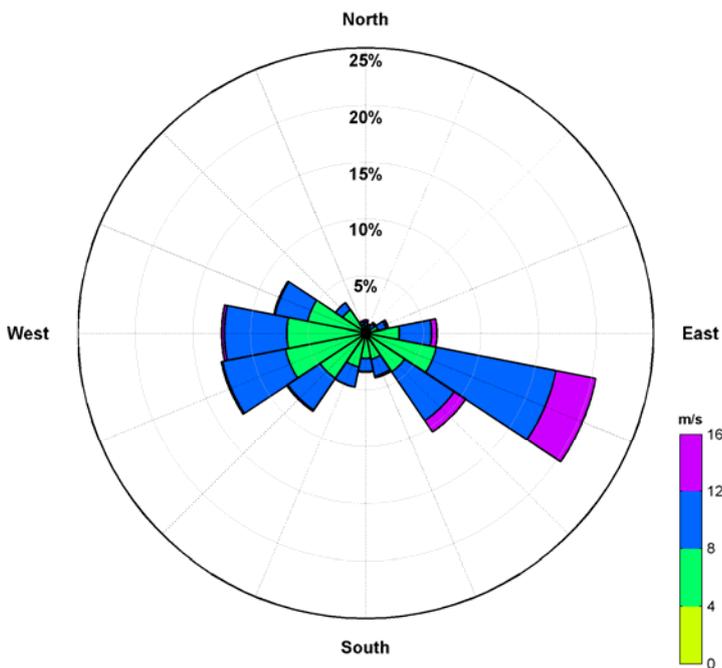


Figure 5 Point Samson wind records above the threshold wind speed for Aeolian transport

3.2.3 Dune Rehabilitation

Rehabilitation of the dunes will assist in stabilising the foreshore, and reduce the risk of coastal erosion.

Dune rehabilitation is proposed to take place to the denuded dune areas, the proposed stormwater basin (as installed as part of the community hall car park works), and to the former car park/turn-around area at Miller Close (that is proposed for removal as part of the civil works). It will involve:

- > Soil stabilisation through the installation of sand fencing along the eastern edge (the beach side) of the dunes and installation of jute matting throughout the dunes, in areas to be revegetated;
- > Installation of post and rail fencing along upper (western) edge of the dunes and formalisation of the beach accesses paths to prevent indiscriminate access throughout the dune area;
- > Weed control to minimise the presence of invasive weeds such as *Tamarix aphylla*, *Cenchrus ciliaris* (buffel grass) and *Aerva javanica* (kapok);
- > Revegetation through seeding and tubestock planting; and
- > Ongoing monitoring and maintenance.

It is recommended that revegetation works take place, nominally around December/January after the first rains of the year have begun and the ground is thoroughly-wet. Due to the variable rainfall in Point Samson, establishment watering is recommended, either through hand watering, or a temporary irrigation system. A mortality rate of 20-30% can be expected in the first dry season as the weakest plants die without access to sufficient water. Top-up planting is recommended in the years following the first installation of plants, to account for plant mortality from the first year.

As the wet season in Point Samson coincides with the cyclone season, there is the risk of extensive damage to the rehabilitation works from cyclonic activity. As such, the rehabilitation contractor will need to be mindful of the long-range weather forecasts and liaise with the City with regard to the rehabilitation programme.

3.2.4 Mass Planting to Miller Close

Following relocation of the Miller Close car park, remediation of the verge to the western side of Miller Close (between the back of kerb and the new limestone wall as installed on the caravan park boundary) is proposed through the installation of mass planting which will lift the aesthetics of this area.

It will involve installation of:

- > Irrigation – most likely as a continuation of the irrigation to the park north of Miller Close;
- > Topsoil and mulch to support plant growth; and
- > Mass planting, via 130 mm pots.

3.3 New Recreational Infrastructure

Non-urgent works to the foreshore area include new infrastructure which will enhance the recreational amenity for the local community and visitors. The proposed infrastructure, in suggested order of priority includes:

3.3.1 Decking/Lookout Structures

Two decking/beach lookout structures are proposed for the foreshore; one at the northern-most corner of Mears Drive, and another opposite the Miller Close car park. It is suggested that the Miller Close structure take precedence as it is located in the town's primary recreational area.

The structures are proposed to be constructed from a timber sub-structure and composite decking which are both cost effective options and are well suited to harsh coastal conditions. To extend the usability of the deck, it is possible to integrate picnic settings, seating and a shade structure, if the budget permits.

Cardno has prepared a design and construct package for implementation of the decking structures, and have also sought a price for the construction of each of the structures from a manufacturer that is experienced in such infrastructure.

Periodic inspections of the decking structures is recommended as part of an ongoing maintenance regime to assess the structure for termites, wear and tear.

As important feature of the decking design is permeability to facilitate sand movement. As such, the decking boards have been documented with a 5 mm gap between each, whilst the material nominated for beach access paths is fibre-reinforced polymer (FRP) grating.

3.3.2 Boat Shed

A boat shed is proposed for the foreshore area adjacent the Town Beach (next to the Miller Close turn-around) which can be used to store kayaks/canoes/jet skis.

Design of the boat shed is outside Cardno's current scope of services, although we have liaised with a supplier to provide a price for the design and construction of a boat shed which has the following characteristics:

- > Cyclone rated;
- > Is accessed via a roller door
- > Is of sufficient height to allow stacking of canoes/kayaks etc.

3.3.3 Skate Park

A skate park is proposed for the foreshore park, which will replace the existing skate park currently located near the Point Samson-Roebourne Road. The proposed location of the skate park maximises the distance from the residential properties and is outside the predicted coastal erosion and inundation hazard zones.

Design of the skate park is outside Cardno's current scope of services, although the landscape plans indicate the skate park location and nominal dimensions.

3.3.4 New Jetty Structure

A new jetty structure is proposed in one of two locations in the southern-most area of the site. Design of the jetties is outside Cardno's current scope of services, although their nominal locations are illustrated on the Staging Plan under Appendix D

The proposed jetty which is on the east-west alignment is loosely shown in the location of the historical Point Samson jetty. The second option for the jetty on the north-south alignment has been located to reduce the length (and therefore cost) of the jetty while still providing over water access.

4 Staging

Based on an analysis of the existing site conditions and following discussions with the City of Karratha, it is suggested that the following works are undertaken on the Point Samson foreshore, in order of priority:

1. Miller Close Area
 - a) Dune Fencing
 - b) Dune Rehabilitation
 - c) Public Amenity Structure (Lookout)
 - d) Civil Works – Carpark Rationalisation
 - e) Footpath Works
 - f) Rehabilitation To Former Carpark
 - g) Planting Works To Verge
2. Community Hall Area
 - a) Dune Fencing
 - b) Dune Rehabilitation
 - c) Civil Works – Carpark Rationalisation & Drainage Swale Formation
 - d) Maintenance Vehicle Access
 - e) Footpath Works
3. Miller Close Car Park – drainage improvements, car park rationalisation;
 - a) Dune Fencing
 - b) Dune Rehabilitation
 - c) Public Amenity Structure (Lookout)
 - d) Civil Works – Formalisation of Existing Carpark & Line Marking to Mears Drive
4. Long Term Recreation Infrastructure
 - a) Skate Park (in the public open space adjacent the foreshore)
 - b) Boat Shed (one the foreshore adjacent Miller Close)
 - c) Jetty (in the south-eastern corner of the site)
5. Long Term Civil Works
 - d) Sea Eagle Way Carpark Improvements (to be undertaken in coordination with development of the adjacent land; this may involve a land swap)
 - e) Vitenbergs Drive Carpark Rationalisation (to be undertaken in coordination with development of the adjacent land, and following asbestos remediation)

The above works have been grouped into separate stages for the purpose of budgeting and planning. Where feasible, it is recommended that works within the same discipline be implemented together to minimise costs associated with mobilisation and de-mobilisation on site (for example, undertake civil works to the community hall area at the same time as civil works to the Mears Drive carpark).

The proposed Staging Plan for these works is illustrated in Appendix D.

5 References

Astron (2013). *Point Samson Environmental Scoping Study*

Astron and UDLA (2013). *Point Samson Foreshore Enhancement Plan - Findings Report*

Cardno (2014). *Draft Structure Plan*

Coastal Engineering Research Center (1984a). *Shore Protection Manual Volume I*, US Army Corps of Engineers

Coastal Engineering Research Center (1984b). *Shore Protection Manual Volume II*, US Army Corps of Engineers

Department of the Environment (2003), *Weed Management Guide – Athel pine or tamarisk (Tamarix aphylla)*, Accessed 24 March 2015.

<http://www.environment.gov.au/biodiversity/invasive/weeds/publications/guidelines/wons/pubs/t-aphylla.pdf>

Essential Environmental (2014). *Foreshore Management Plan*

Hsu, S.A., and Weggel, J.R. (2002). *Coastal Engineering Manual: Chapter III-4 Wind-Blown Sediment Transport*, US Army Corp of Engineers, Report N^o: EM 1110-2-1100 (Part III)

Point Samson Foreshore

APPENDIX

A

EXISTING SITE CONDITIONS



FOOTPATH ALONG MEARS DRIVE



COLLAPSED BEACH ACCESS PATH



INFORMAL BEACH ACCESS PATH FROM MEARS DRIVE



EXISTING CONDITIONS - PEDESTRIAN ACCESS



MEARS DRIVE, INFORMAL GRAVEL CARPARK



MILLER CLOSE CARPARK TURN-AROUND



MILLER CLOSE CARPARK



MEARS DRIVE, INFORMAL GRAVEL CARPARK

COMMUNITY HALL CARPARK

MILLER CLOSE CARPARK

VITENBERGS DRIVE CARPARK

EXISTING CONDITIONS - CAR PARKING



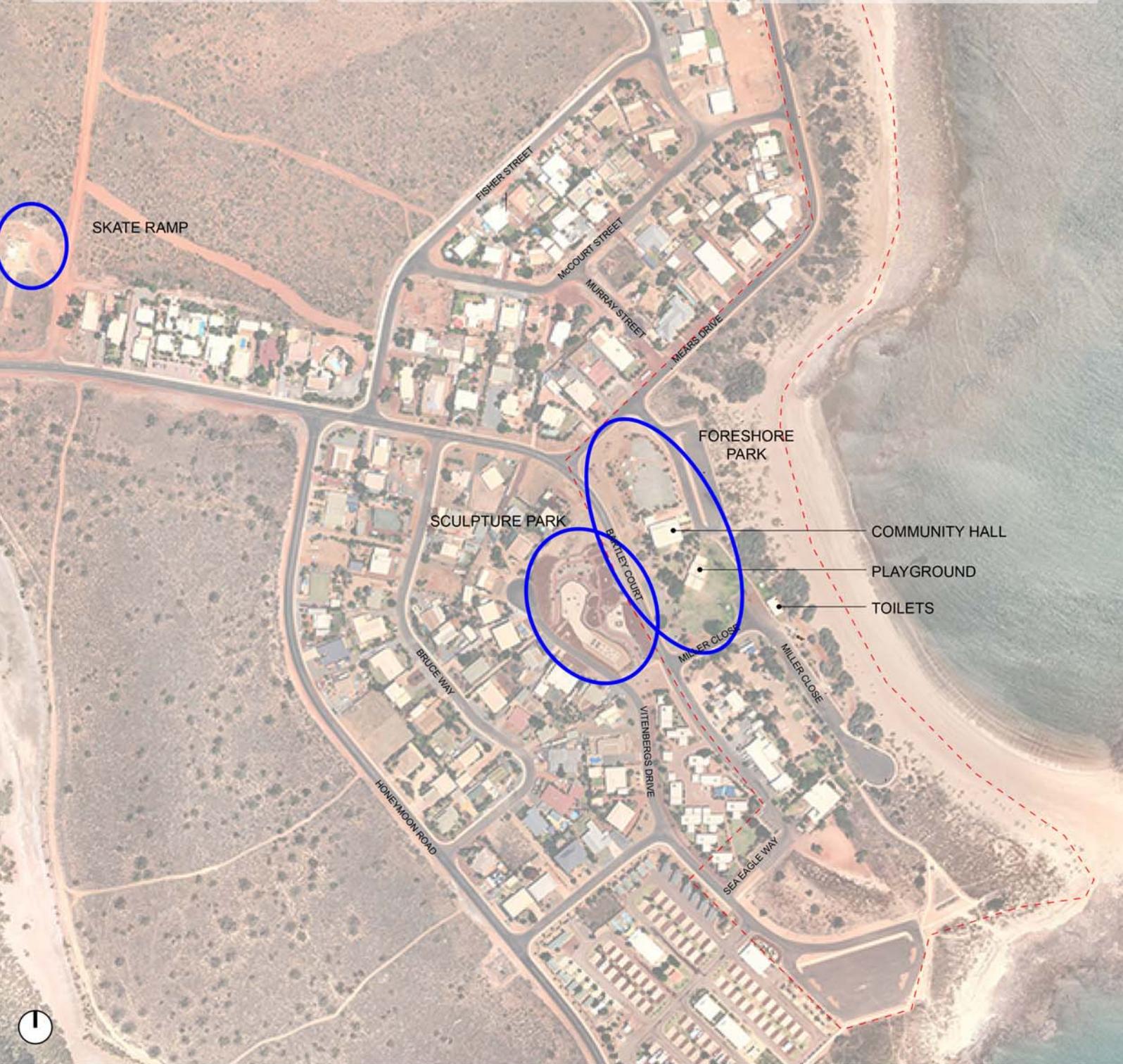
COMMUNITY HALL



FORESHORE PARK & PLAYGROUND



SCULPTURE PARK



EXISTING CONDITIONS - RECREATIONAL FACILITIES



landscape architecture
urban design
environmental management

CITY OF KARRATHA POINT SAMSON FORESHORE WORKS

Point Samson Foreshore

APPENDIX

B

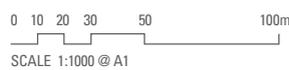
CONCEPT DESIGN



CONCEPT LANDSCAPE PLAN



landscape architecture
urban design
environmental management

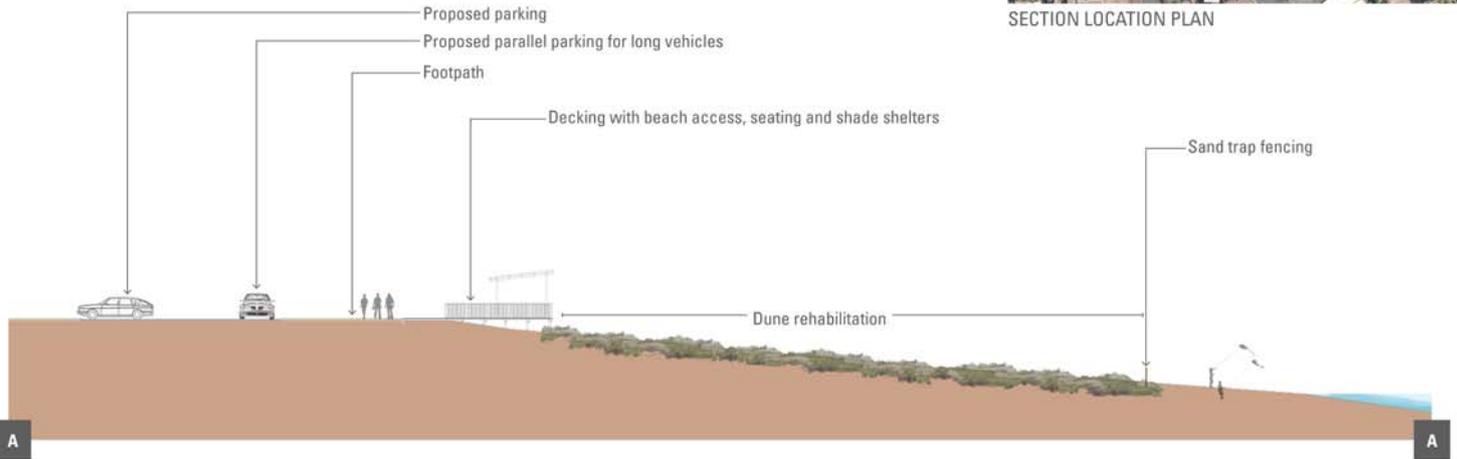


CITY OF KARRATHA POINT SAMSON FORESHORE

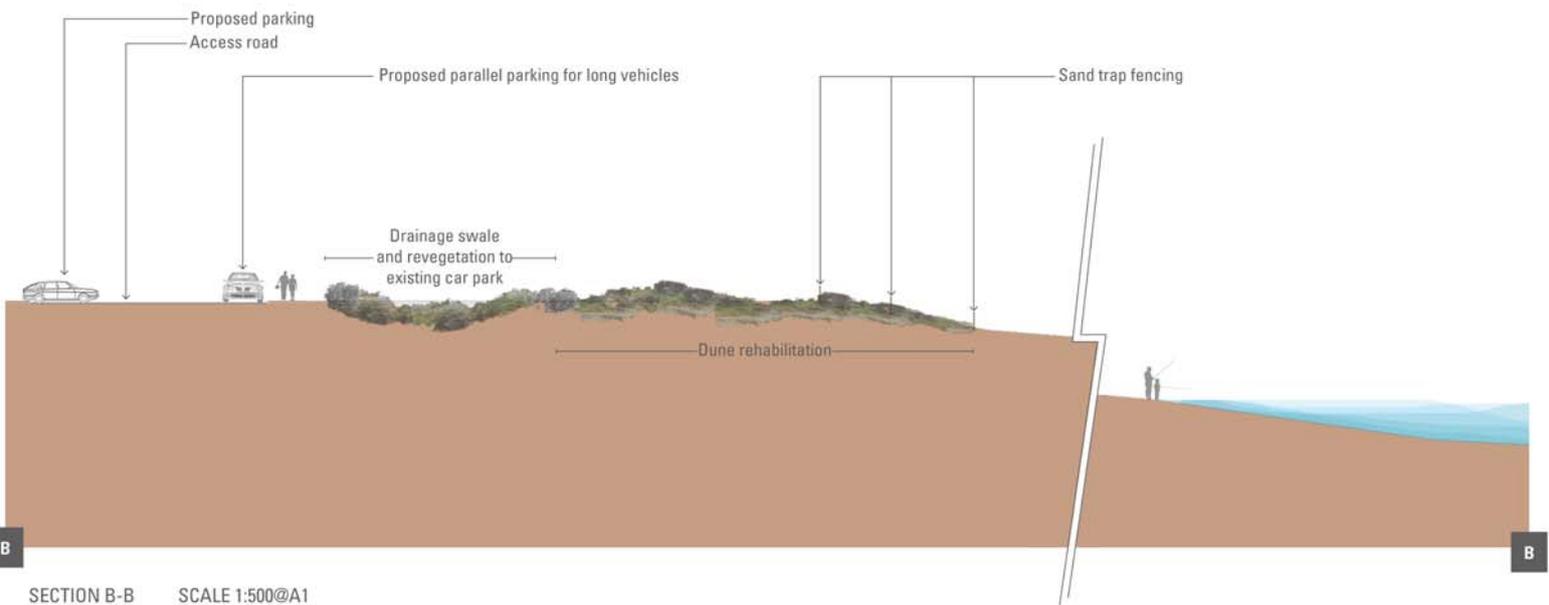
DATE	DRAWING NO	ISSUE
06.03.2015	P14007-001	D



SECTION LOCATION PLAN



SECTION A-A SCALE 1:500@A1



SECTION B-B SCALE 1:500@A1

SECTIONS



Decking examples: Image 1 and 2 courtesy of Landmark Products. Image 3: Jack Evans Boat Harbour by Aspect Studios.



Boat shed styles: Cyclone rated, examples shown by Landmark Products



St Kilda Skate Park: 'Coastal' style skate park with use of timber, concrete, skate bowls and skateable furniture



Examples of beach fencing for sand trap fencing and formalised access.



Re-establishment of coastal heath type species to dunes.

CONCEPT IMAGES

Point Samson Foreshore

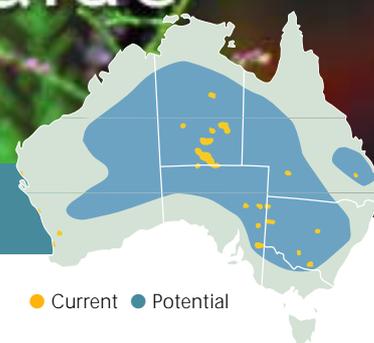
APPENDIX

C

TAMARISK FACT SHEET

Weed Management Guide

Athel pine or tamarisk –
Tamarix aphylla



Athel pine or tamarisk (*Tamarix aphylla*)

The problem

Athel pine is a *Weed of National Significance*. It is regarded as one of the worst weeds in Australia because of its invasiveness, potential for spread, and economic and environmental impacts.

Athel pine affects the pastoral industry by forming dense stands along inland rivers. It consumes water more quickly than native plants, thereby reducing the number and quality of watering holes. It concentrates salt, which is excreted by its leaves. This makes the ground beneath athel pines more salty and excludes native pasture grasses and other salt-sensitive plants. It can change river flow patterns and cause overland flooding and bank erosion.

It is harder and more expensive to muster cattle in athel pine infestations. Because they are drought tolerant and fire resistant, athel pines decrease the frequency of fires and alter vegetation structure. Infestations reduce the cultural and aesthetic value of affected land and may impact on tourism in the region.

There are several other *Tamarix* species, all commonly known as tamarisks, that are weeds in Australia.

The weed

Athel pine is a spreading tree to 15 m with pendulous, jointed branches. Immature trees have light grey trunks and stems. Mature trees have a thick,



Athel pine has infested hundreds of kilometres of the Finke River in central Australia.
Photo: Colin G. Wilson

rough, dark grey to black bark, and grey-brown stems, and can be up to 1 m in diameter. The minute, dull green leaves superficially resemble pine tree 'needles'. However, athel pine is misleadingly named as it is a flowering plant, not closely related to true pine trees (conifers).

Its small flowers are pinkish-white without stalks, growing on 30–40 mm long spikes from the ends of the previous year's branches. The fruit is bell shaped with a hairy tuft, and contains numerous small cylindrical seeds. The seeds have a tuft of fine hairs which assists wind dispersal. The trees have strong woody roots which penetrate and spread deeply throughout the soil.

Key points

- Athel pine, planted for shade, shelter and erosion control throughout arid and semi-arid Australia, can escape cultivation and naturalise, especially around riverine habitats.
- It causes significant environmental and economic damage by using up valuable water resources, hindering mustering, and altering vegetation and river structure.
- New infestations should be prevented because control is difficult and costly.
- Mechanical and chemical methods are the main control options. Care must be taken using either method around waterways.



Growth calendar

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flowering	■	■									■	■
Seed formation	■	■	■									■
Seed drop			■	■	■	■				■	■	■
Germination			■	■	■					■	■	■

■ General growth pattern

After flowering in summer, athel pine seeds drop in autumn. Germination occurs soon after seed drop. After one year's growth, seedlings are typically 600–1000 mm in height. They continue to grow rapidly, between 2 and 5 m in a year in suitable conditions. Flowering normally takes place in about the third year and continues annually thereafter.



Flower buds near Carnarvon, WA, in early February.
Photo: John Stretch

How it spreads

Athel pine can reproduce by dropping seeds or, more commonly, by revegetation of plant parts. Although athel pine seeds die quickly if not kept moist, they are easily dispersed by both wind and water and may also be spread by animals. A single tree can produce thousands of seeds every year.

Athel pine is classified as a 'sleeper' weed because it was present in Australia for some time before it became weedy. A native of northern Africa and Asia, it was first introduced into Whyalla, South

Australia, in 1930 via California. Since then it has been extensively planted as shade and wind breaks and for erosion control around rural South Australia, New South Wales, Queensland, Western Australia, and the Barkly Tablelands and Alice Springs regions of the Northern Territory.

The worst infestations of athel pine occur along 600 km of the Finke River in Central Australia near Alice Springs. The explosion in its abundance and range is thought to have been caused by large floods in the 1970s and 1980s, which washed seeds and vegetation

downstream and provided the moist conditions required for germination. Its habit of making nearby soil saltier may be assisting its expansion because it thrives in saline conditions.

Other athel pine outbreaks have occurred throughout inland Australia since the 1990s at Starvation Lake and Tilcha Flow (SA), Burnett and Darling Downs regions (Qld) and Menindie Lakes (NSW). Infestations on the Gascoyne and Avon Rivers (WA) have recently been shown to include both athel pine (*Tamarix aphylla*) and another weedy tamarisk species *Tamarix parviflora*.

Where it grows

Athel pine is drought resistant and is well suited to arid and semi-arid rangelands. It is tolerant of saline and alkaline soils and, although it flourishes best in and around rivers, is not restricted to the riverine environment. It has escaped cultivation and become naturalised in all mainland states and territories except Victoria.

Potential distribution

Based on climate, athel pine could potentially infest inland watercourses throughout Australia, including parts of northwestern Victoria. A few infestations exist outside of the projected distribution, perhaps surviving on below-ground water resources.



Numerous tiny white-pink flowers grow on the flower spike (30–40 mm long) during summer.
Photo: Colin G. Wilson

Do not confuse athel pine with native she-oaks

Athel pines resemble native she-oaks (*Casuarina* and *Allocasuarina* species), which are found in similar locations. Although both have needle-like 'leaves', they may be distinguished by careful examination of the needles and fruit. The segments of she-oak needles are 5–10 mm long, whereas the segments on athel pine needles are only 1–2 mm long. The hard, woody casuarina fruit resembles a small pine cone, whereas athel pine fruit is tiny and bell shaped. Additionally, athel pine flowers (white–pink, growing at the end of stems) are conspicuous during the summer.



The segments of athel pine needles are only 1–2 mm long.
Photo: Les Tanner

What to do about it

Prevention of spread—plant other species instead

Preventing the further spread of athel pine in Australia is critical to the successful management of this problem. As part of the prevention of spread measures, the planting of athel pine for windbreaks, shade or erosion control is now actively discouraged. Weedy *Tamarix* species should not be imported or further planted, and alternative species should be used. Generally, a native *Casuarina* or *Allocasuarina* species will make a good alternative, especially for windbreaks. However, local councils or state/territory government agencies will be able to provide appropriate advice.



The drooping needles are superficially similar to native *Casuarina* and *Allocasuarina* species.
Photo: John Gavin

Control athel pine near rivers

Athel pine needs to be carefully controlled to ensure that it does not escape cultivation. Its potential to threaten environmental integrity and human interests, especially in the extensive arid and semi-arid parts of Australia, warrants an aggressive management approach.

Athel pine in the upper catchments of rivers are the highest priority for control

Experience clearly indicates that athel pine spreads fastest along waterways, especially when summer flooding aids the downstream dispersal of vegetative material and germination of seeds. Therefore, mature athel pines in the uppermost parts of catchments are the highest priority for eradication. Control can then focus on downstream infestations. The lowest priority for control are mature trees away from water.

Early control efforts

Athel pine was not formally recognised as a weed in Australia until the late 1980s when control attempts first examined its susceptibility to different herbicides and different application techniques. In the mid 1990s mechanical control was attempted on the Finke River, and since then integrated control methods using both mechanical and chemical means have been used to combat the spread of athel pine.

Remove seedlings by hand and mature trees mechanically

Seedlings can be easily removed by hand in sandy ground, and large trees can be removed by ripping and bulldozing, taking care to remove as much of the root system as possible. A large bulldozer is required if the trees are fully grown. If possible the area should be deep ripped to bring any root material to the surface and, where appropriate, a suitable pasture should be sown to outcompete any regrowth of athel pine. Otherwise, care must be taken to reduce the amount of soil covering felled stems and exposed roots as they may re-shoot. Follow-up treatments will be required as some re-shooting is likely. Permits may be required to conduct mechanical control if native species will be affected. Weed control contacts (see table p. 4) will be able to provide relevant advice.

Herbicides may be better suited where erosion is a problem

Herbicides may be used as part of the follow-up to initial mechanical control, and are preferred in sensitive environments (eg riverbanks) where mechanical control may damage non-target species and cause erosion and habitat loss.

Herbicide control generally entails treating each stem separately.

Weed control contacts

State / Territory	Department	Phone	Email	Website
ACT	Environment ACT	(02) 6207 9777	EnvironmentACT@act.gov.au	www.environment.act.gov.au
NSW	NSW Agriculture	1800 680 244	weeds@agric.nsw.gov.au	www.agric.nsw.gov.au
NT	Dept of Infrastructure, Planning and Environment	(08) 8999 5511	weedinfo.ipe@nt.gov.au	www.nt.gov.au
Qld	Dept of Natural Resources and Mines	(07) 3896 3111	enquiries@nrm.qld.gov.au	www.nrm.qld.gov.au
SA	Dept of Water, Land and Biodiversity Conservation	(08) 8303 9500	apc@saugov.sa.gov.au	www.dwlbc.sa.gov.au
Vic	Dept of Primary Industries/Dept of Sustainability and Environment	136 186	customer.service@dpi.vic.gov.au	www.dpi.vic.gov.au www.dse.vic.gov.au
WA	Dept of Agriculture	(08) 9368 3333	enquiries@agric.wa.gov.au	www.agric.wa.gov.au
Australia wide	Australian Pesticides and Veterinary Medicines Authority	(02) 6272 5852	contact@apvma.gov.au	www.apvma.gov.au

For up-to-date information on which herbicides are registered to control athel pine and the best application methods and dosages, contact your state or territory weed management agency or local council. This information varies from state to state and from time to time. Contact details are listed above, including contacts for the Australian Pesticides and Veterinary Medicines Authority, which hosts the PUBCRIS database. This database contains information on all herbicides that are registered for use on weeds in each Australian state and territory.

When using herbicides always read the label and follow instructions carefully. Particular care should be taken when using herbicides near waterways because rainfall running off the land into waterways can carry herbicides with it. Permits from state or territory Environment Protection Authorities may be required if herbicides are to be sprayed on riverbanks.

An appropriate registered herbicide can be applied in several different ways. Frilling, where small notches are cut into the bark until the white sapwood is reached and herbicide is injected immediately into the notches, has been used successfully in the Carnarvon area. There should be about 50 mm between notches, and drenching guns or veterinary syringes can be used to deliver herbicide into each notch. An alternative approach with larger stems is the cut-stump technique, where the main stem is cut off by chainsaw and the stump is immediately painted with herbicide. Care must be taken to reach as close to the roots as possible.

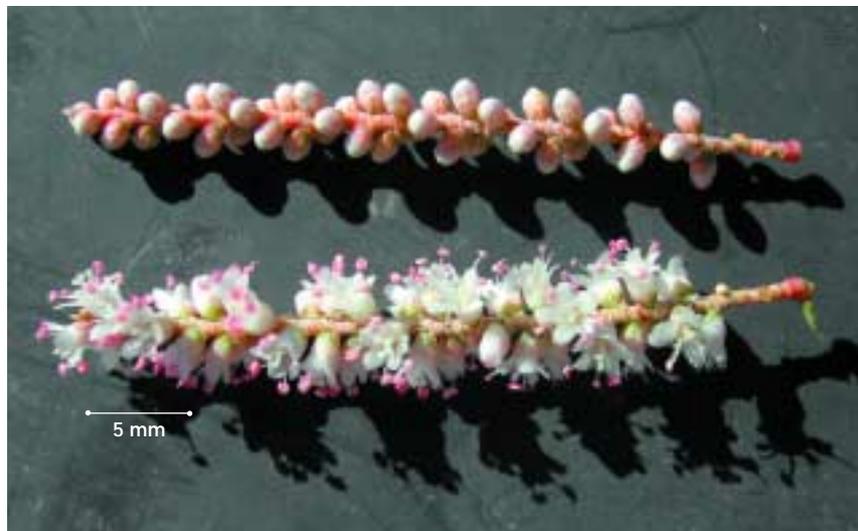
Smaller trees that have not developed rough bark can be treated by the basal bark technique, which involves soaking the circumference of the stem, to a height of 250 mm above soil level, with herbicide to the point of run-off. Very small stems can be snapped or cut, and herbicide applied to the stem. Foliar spray over the entire plant is effective on small trees (less than 2 m). However, the impacts on non-target species (both natives and crops) prevent this method being used in the Carnarvon area.

Other weedy tamarisk species

The family that athel pine belongs to – the tamarisks – includes other closely related species that are major pests in the United States, such as *Tamarix parviflora* and *Tamarix ramosissima*. These species have shown weedy tendencies in both New South Wales and Western Australia, and also deserve attention because their potential impacts are similar to *Tamarix aphylla* (athel pine).

Biological control

Experience in the United States with tamarisks may also help to provide solutions for controlling athel pine in Australia. For example, the US Department of Agriculture has introduced biological control agents against some tamarisk species. Although there are currently no biological control agents being investigated for use in Australia, this option remains a desirable part of any integrated weed management control program.



Flowers and fruit from Bingara, NSW, in February.
Photo: Les Tanner



Athel pine on the Finke River in Central Australia

The Finke River is an ancient river system. It rises in the West Macdonnell Ranges, about 150 km west of Alice Springs, and may reach Lake Eyre during extreme floods. The Finke River only flows irregularly but is nevertheless important from environmental, economic and cultural perspectives. It provides habitat and refuge for a wide range of plants and animals, supports valuable grazing lands and is a significant component of European and Aboriginal cultural heritage.

Athel pine was first planted around homesteads, communities and bores in the region in the 1940s and 1950s as shelter from the sun and wind. However, it was not until the 1970s and 1980s that the true weedy potential of this species was recognised, by which time an infestation had developed along 600 km of the Finke River. This period of sudden and rapid expansion corresponded to several large summer floods, which are thought to have provided the perfect environment for seed germination and establishment.

Following the recognition of the detrimental impacts of athel pine to the environment and economy, it was declared a noxious weed in the Northern Territory in 1988. In 1989 the Northern Territory Government tested the

effectiveness and suitability of different herbicides and application methods on athel pine in the Finke River. Stem injection was found to give a greater percentage of kills than basal bark application.

In March 1994 the mechanical control of athel pine was investigated at Horseshoe Bend Station with a 200 hp bulldozer and a 3 m blade plough. This trial was successful and was followed up by more control work with a larger bulldozer and 4 m blade plough over a 25 km stretch of infestation. Approximately 10–20 % of mature trees survived this treatment, and follow-up mechanical and chemical control was used to treat the scattered regrowth.

A strategic approach targeting upstream infestations of the Finke with integrated chemical and mechanical control was then initiated. By 1998 a distance of some 130 km of the upper Finke River from Glen Helen Gorge to the Stuart Highway had been treated. Since then, sections downstream of the Stuart Highway have been further controlled, and follow-up chemical control of seedlings and regrowth is ongoing.

The latest efforts were part of a cooperative project aimed at controlling the remaining 400 km of Northern Territory



Finke River athel pine infestation after blade ploughing.

Photo: John Gavin

infestation downstream of the Stuart Highway. The project 'Eradication of athel pine from the Finke River' involved the Northern Territory Government, Centralian Land Management Association, landholders and community groups (Landcare and Bushcare), and was funded through the Commonwealth Government's Natural Heritage Trust.

Extensive flooding in the Finke River between 2000 and 2002 resulted in the establishment of a large number of seedlings spread over an expanded range. This increase in the athel pine infestation will require a significant effort to control.

Legislation

It is illegal to introduce athel pine into the Northern Territory, and its spread must be controlled by landholders in the Northern Territory and Queensland. Its status as a weed is under consideration in other states, notably New South Wales and Western Australia. Check with your local council or state/territory government agency about the latest requirements for athel pine control.

Acknowledgments

Information and guide revision: John Gavin (NT DIPE), Richard Carter (NSW

Dept of Agriculture/Weeds CRC), Philip Maher (Qld DNRM), Damian Collopy, John Peirce and John Stretch (WA Dept of Agriculture), Les Tanner (North West Weeds County Council) and John Thorp (National Weeds Management Facilitator).

Maps: Australian Weeds Committee.



Bulldozers of at least 200 hp are required to pull large blade ploughs.
Photo: John Gavin



Although tamarisks have been planted to control erosion, especially in highly saline soils, this practice is now discouraged.
Photo: John Stretch

How to control athel pine

Quick reference guide

Do not plant athel pine

Athel pine is difficult and expensive to control when it escapes cultivation and becomes naturalised. To prevent its further spread, it should not be planted.

Target upstream infestations first...

As athel pine tends to spread downstream, upper catchment infestations should be targeted for control and eradication. Control should then focus on downstream infestations and isolated shade trees away from watercourses.

...using mechanical and chemical control

Heavy infestations of mature athel pine can be controlled by combining mechanical and chemical control:

- Mechanical control has been used most extensively on the Finke River,

where bulldozers are used to remove trees and roots.

- Two main chemical control methods (frilling and cut-stump) are effective especially when stems are treated immediately. Use only registered herbicides and follow instructions on the label.

Seedlings can be easily removed by hand or sprayed with a registered herbicide if there is no risk to other species.

Take care near waterways

Care must be taken when treating athel pine alongside rivers and in riverbeds:

- Mechanical control can impact on non-target species, especially when heavy machinery is used. Additionally, any soil disturbance can actually promote weed species and/or contribute to erosion.
- Chemicals can also affect non-target species and be washed into waterways.

Ongoing follow-up is required

Follow-up control will be required to treat plants that survive initial treatment. As athel pine shoots readily from vegetative material, it can quickly re-establish itself if left unchecked.



Athel pine was traditionally planted around homesteads for shade.
Photo: Les Tanner

Control options

Tree size	Physical	Mechanical	Chemical	Biological
Small (plants under 2 m)	Hand pulling in sandy soil will easily remove small athel pine.	Not suitable.	Snap the stem and wet the area with registered herbicide. Seedlings can also be foliar sprayed.	No biological control agents in Australia.
Medium and large trees (greater than 2 m tall)	Not suitable.	Rip and bulldoze with large bulldozer. Take care to remove all roots.	Use frilling around the base or cut-stump methods. Immediately apply registered herbicide.	

© 2003 Information which appears in this guide may be reproduced without written permission provided the source of the information is acknowledged.
Printed in Australia on 100% recycled paper.
ISBN 0-9587010-8-3

Disclaimer

While every care is taken to ensure the accuracy of the information in this publication, the CRC for Australian Weed Management and the Commonwealth Department of the Environment and Heritage take no responsibility for its contents, nor for any loss, damage or consequence for any person or body relying on the information, or any error or omission in this publication.

Point Samson Foreshore

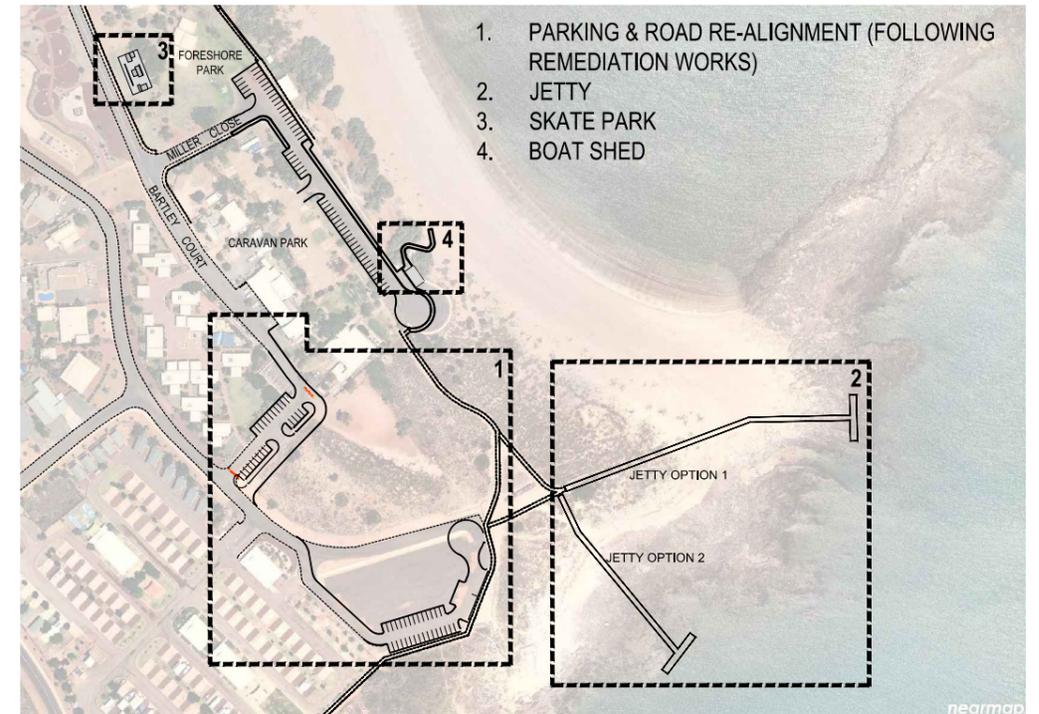
APPENDIX

D

STAGING PLAN



SHORT TO MEDIUM TERM WORKS



LONG TERM, FUTURE CIVIL WORKS AND RECREATIONAL INFRASTRUCTURE

Rev.	Date	Description	Des.	Verif.	Appd.
E	31/03/2015	CLIENT REVIEW	RL	CC	CC
D	23/03/2015	CLIENT REVIEW	RL	CC	CC
C	09/03/2015	CLIENT REVIEW	RL	CC	CC
B	04/03/2015	CLIENT REVIEW	RL	CC	CC
A	24/02/2015	ISSUED FOR INFORMATION	RL	-	CC

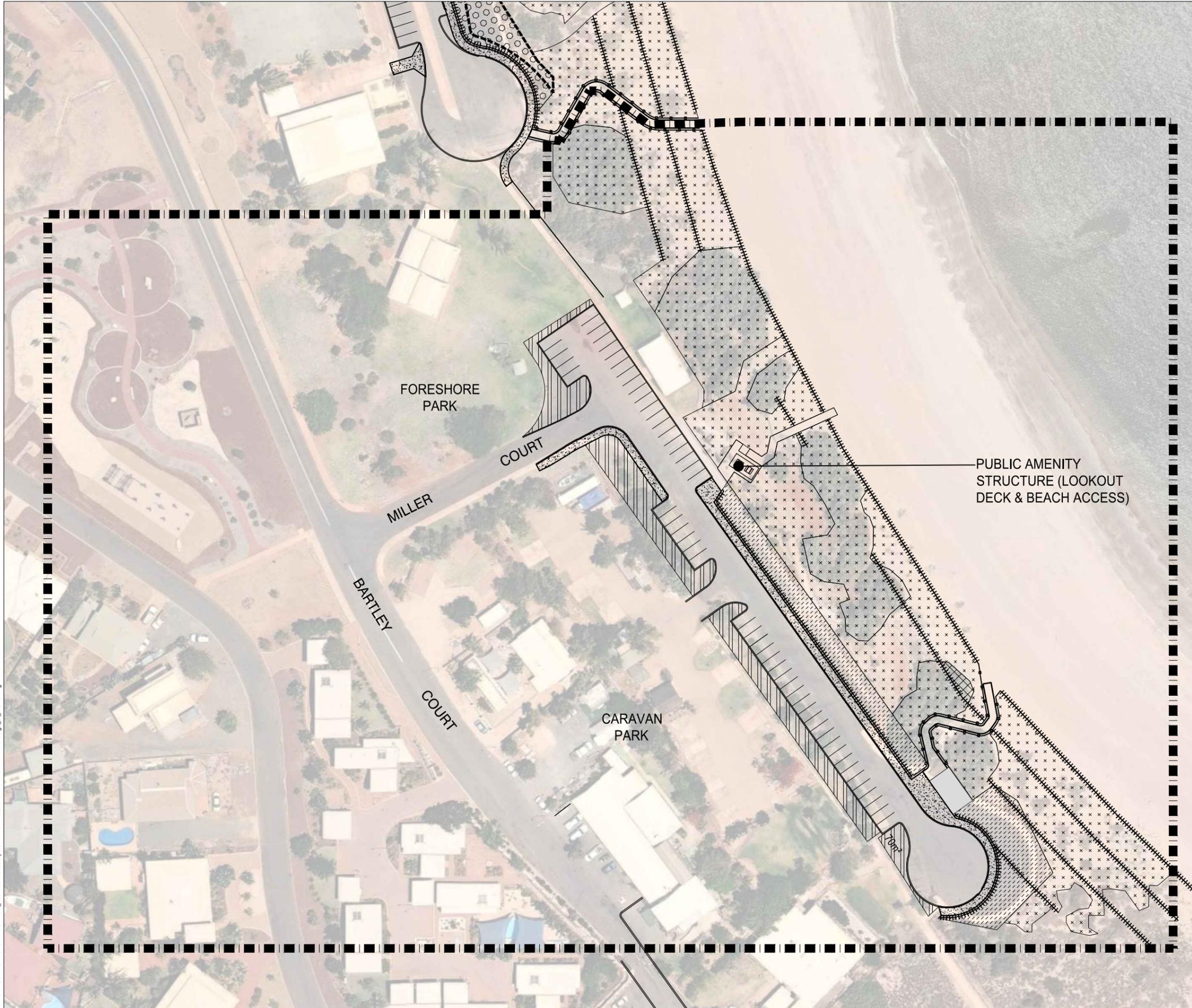
© Cardno Limited All Rights Reserved.
 This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (WA) Pty Ltd | ABN 77 009 119 000
 11 Harvest Terrace
 West Perth WA 6005
 Tel: 08 9273 3888 Fax: 08 9486 8664
 Web: www.cardno.com.au

Drawn	RL	Date	23/03/2015
Checked	CC	Date	24/02/2015
Designed	RL	Date	30/01/2015
Verified	CC	Date	04/03/2015
Approved	CC	Date	23/03/2015

Client	CITY OF KARRATHA
Project	Point Samson Foreshore Works
Title	STAGING PLAN STAGE 1,2 & 3 & FUTURE WORKS

Status	FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION PURPOSES		
Drawing Number	Scale	Size	Revision
LW15001-LA-010	1:2000	A1	E



STAGE 1 LEGEND

- ■ ■ ■ ■ EXTENT OF STAGE 1 WORKS
- STAGE 1.1 - FENCING
 - SAND TRAP FENCING
 - POST & RAIL FENCING
- (with 'x' pattern) STAGE 1.2 - DUNE REHABILITATION
- (with 'x' pattern) STAGE 1.3 - PUBLIC AMENITY STRUCTURE (REFER NOTE ON PLAN)
- STAGE 1.4 - CIVIL WORKS, INCLUDING CARPARK RATIONALISATION & DRAINAGE INFRASTRUCTURE
- (with diagonal lines) STAGE 1.5 - FOOTPATH WORKS
- (with diagonal lines) STAGE 1.6 - REHABILITATION TO FORMER CARPARK
- (with vertical lines) STAGE 1.7 - LANDSCAPING WORKS TO VERGE, INCLUDING PLANTING AND TURFING

Rev.	Date	Description	Des.	Verif.	Appd.
A	24/02/2015	CLIENT REVIEW		RL	CC
				CC	CC

© Cardno Limited All Rights Reserved.
 This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (WA) Pty Ltd | ABN 77 009 119 000
 11 Harvest Terrace
 West Perth WA 6005
 Tel: 08 9273 3888 Fax: 08 9486 8664
 Web: www.cardno.com.au

Drawn	RL	Date	23/03/2015
Checked	CC	Date	24/02/2015
Designed	RL	Date	30/01/2015
Verified	CC	Date	04/03/2015
Approved		Date	23/03/2015
CC			

Client	CITY OF KARRATHA
Project	Point Samson Foresshore Works
Title	STAGING PLAN STAGE 1 WORKS

Status	FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION PURPOSES		
Scale	1:500	Size	A1
Drawing Number	LW15001-LA-012		Revision
			A

DATE PLOTTED: 31 March 2015 12:49 PM BY: RASHEEN LEE



STAGE 3 LEGEND

- --** EXTENT OF STAGE 3 WORKS

- STAGE 1.1 - FENCING**
 - SAND TRAP FENCING
 - POST & RAIL FENCING

- STAGE 1.2 - DUNE REHABILITATION

- STAGE 1.3 - PUBLIC AMENITY STRUCTURE (REFER NOTE ON PLAN)

- STAGE 1.4 - CIVIL WORKS**
 - CARPARK UPGRADE
 - FOOTPATH UPGRADE (MINOR)
 - LINEMARKING TO MEARS DRIVE

XREF's: CAD File: Q:\PROJECTS\LW15001 - POINT SAMSON FORESHORE WORKS\Technical\Landscape\01 DRAWINGS\02 CAD\LW15001-LA-010-Stage_of_Works.dwg

Rev.	Date	Description	Des.	Verif.	Appd.
A	24/02/2015	CLIENT REVIEW			

© Cardno Limited All Rights Reserved.
 This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (WA) Pty Ltd | ABN 77 009 119 000
 11 Harvest Terrace
 West Perth WA 6005
 Tel: 08 9273 3888 Fax: 08 9486 8664
 Web: www.cardno.com.au

Drawn	RL	Date	23/03/2015
Checked	CC	Date	24/02/2015
Designed	RL	Date	30/01/2015
Verified	CC	Date	04/03/2015
Approved		Date	23/03/2015
CC			

Client	CITY OF KARRATHA
Project	Point Samson Foreshore Works
Title	STAGING PLAN STAGE 3 WORKS

Status	FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION PURPOSES		
Scale	NTS	Size	A1
Drawing Number	LW15001-LA-014		Revision
			A

About Cardno

Cardno is an ASX200 professional infrastructure and environmental services company, with expertise in the development and improvement of physical and social infrastructure for communities around the world.

Cardno's team includes leading professionals who plan, design, manage and deliver sustainable projects and community programs.

Cardno is an international company, listed on the Australian Securities Exchange [ASX: CDD].

Contact

Perth

11 Harvest Terrace
West Perth WA 6005

PO Box 447
West Perth WA 6872

Phone +61 8 9273 3888

Fax +61 8 9486 8664

wa@cardno.com
www.cardno.com



Point Samson Foreshore Implementation Works
City of Karratha
Project No. LW15001
Opinion of Cost

ITEM	DESCRIPTION	COST
1.0	Miller Close	
1.1	Dune Fencing	\$ 84,569
1.2	Dune Rehabilitation	\$ 172,971
1.3	Public Amenity Structure	\$ 561,262
1.4	Carpark Rationalisation & Drainage	\$ 424,306
1.5	Footpath Works	\$ 46,080
1.6	Rehabilitation to Former Carpark Area	\$ 63,011
1.7	Planting Works to Verge	\$ 108,434
	Subtotal (inc regional loading, exc GST)	\$ 1,460,635
2.0	Community Hall Area	
2.1	Dune Fencing	\$ 46,709
2.2	Dune Rehabilitation	\$ 107,797
2.3	Carpark Rationalisation & Drainage	\$ 339,371
2.4	Maintenance Vehicle Access	\$ 119,579
2.5	Footpath Works	\$ 28,229
2.6	Rehabilitation to Basin	\$ 75,664
	Subtotal (inc regional loading, exc GST)	\$ 717,349
3.0	Mears Drive	
3.1	Dune Fencing	\$ 193,446
3.2	Dune Rehabilitation	\$ 148,492
3.3	Public Amenity Structure	\$ 514,358
3.4	Carpark Formalisation & Linemarking	\$ 55,029
	Subtotal (inc regional loading, exc GST)	\$ 911,325
	SUB TOTAL (Excluding GST)	\$ 3,089,308
	GST	\$ 308,931
	TOTAL (Including GST)	\$ 3,398,239

Opinion of Cost - Disclaimer

- 1 This document is produced by Cardno (WA) Pty Ltd solely for the benefit of and use by the client, in accordance with this disclaimer. Cardno (WA) Pty Ltd does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by any third party on the content of this document.
- 2 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.
- 3 Contingency - Is based on 25% as advised by ARRB Group Ltd for P90 estimates at Preliminary Design Stage
- 4 A Construction Cost factor of 155 has been applied to Perth construction costs indexed at 100. (Source: Rawlinsons Construction Handbook, Edition 31, 2013)
- 5 No allowance has been made for investigations and remedial works associated with land contamination
- 6 No allowance has been made for fees and charges exclude Project Management, detailed engineering/landscape design fees and engineering certification fees.
- 7 It is assumed a suitable water source is available on site for irrigation and watering purposes.
- 8 Cost savings may be achieved through the integration of stages.
- 9 Cardno have prepared a broad price for the construction of the Jetty Structures which is based on drawings as previously prepared for this site by Rio Tinto

POINT SAMSON FORESHORE IMPLEMENTATION - OPINION OF COST					
STAGE 1 - MILLER CLOSE					
Item	Description	Qty	Unit	Rate	Amount
1.1 DUNE FENCING					
1.1.1	Preliminaries & Establishment				
	Contractor preliminaries	1	item	2.50%	\$ 1,064.60
	Sub-Total				\$ 1,064.60
1.1.2	Fencing & signage				
	Sand trap fencing	667	lin m	\$ 52.00	\$ 34,684.00
	Post & rail fencing	185	lin m	\$ 40.00	\$ 7,400.00
	Educational signage	2	Item	\$ 250.00	\$ 500.00
	Bi-monthly inspection & repair of fencing (over 3 years)	18	month	\$ 300.00	\$ 5,400.00
	Sub-Total				\$ 42,584.00
1.1.3	Contingency				
	Contingency sum	1	item	25.00%	\$10,912.15
	Sub-Total				\$ 10,912.15
	Sub-Total exc GST				\$ 54,560.75
	Regional Loading (155)				\$ 30,008.41
	Total exc GST				\$ 84,569.16

1.2 DUNE REHABILITATION					
1.2.1	Preliminaries & Establishment				
	Contractor preliminaries	1	item	2.50%	\$ 2,177.45
	Sub-Total				\$ 2,177.45
1.2.2	Rehabilitation to Denuded Areas of Existing Dunes				
	Weed control	3,153	m ²	\$ 0.10	\$ 315.30
	Soil stabilisation	3,153	m ²	\$ 4.50	\$ 14,188.50
	Tubestock planting (1 tube per sqm)	3,153	each	\$ 3.50	\$ 11,035.50
	Seeding	3,153	m ²	\$ 0.50	\$ 1,576.50
	Year 2 infill planting (20% of year 1 quantity)	631	each	\$ 3.50	\$ 2,207.10
	Year 3 infill planting (20% of year 1 quantity)	631	each	\$ 3.50	\$ 2,207.10
	Sub-Total				\$ 31,530.00
1.2.3	Rehabilitation of dune areas with existing plant cover				
	Removal of Tamarix trees (50% in year 1)	1	Item	\$3,000.00	\$ 3,000.00
	Removal of Tamarix trees (50% in year 2)	1	Item	\$3,000.00	\$ 3,000.00
	Soil stabilisation	2,293	m ²	\$4.50	\$ 10,318.50
	Tubestock planting (1 tube per sqm)	2,293	each	\$3.50	\$ 8,025.50
	Seeding	2,293	m ²	\$0.50	\$ 1,146.50
	Year 2 infill planting (20% of year 1 quantity)	459	each	\$4.50	\$ 2,063.70
	Year 3 infill planting (20% of year 1 quantity)	459	each	\$4.50	\$ 2,063.70
	Sub-Total				\$ 29,617.90
1.2.4	Maintenance (over 3 years)				
	Hand watering from water truck, once per week over the first summer	13	week	\$750.00	\$ 9,750.00
	Monitoring of the works two times per year	3	year	\$1,000.00	\$ 3,000.00
	Weed control, twice per year	6	item	\$1,200.00	\$ 7,200.00
	Rubbish removal, twice per year	6	item	\$1,000.00	\$ 6,000.00
	Sub-Total				\$ 25,950.00
1.2.5	Contingency				
	Contingency sum	1	item	25.00%	\$22,318.84
	Sub-Total				\$ 22,318.84
	Sub-Total exc GST				\$ 111,594.18
	Regional Loading (155)				\$ 61,376.80
	Total exc GST				\$ 172,970.99

1.3 PUBLIC AMENITY STRUCTURE (LOOKOUT)					
1.3.1	Preliminaries & Establishment				
	Contractor preliminaries	1	item	2.50%	\$ 6,775.00
	Sub-Total				\$ 6,775.00

1.3.2	Decking Structure / Look-out				
	Southern lookout structure & beach access	1	item	\$254,000	\$ 254,000.00
	Optional picnic setting	2	item	\$4,500	\$ 9,000.00
	Optional shade structure	1	item	\$8,000	\$ 8,000.00
	Sub-Total				\$ 271,000.00
1.3.3	Contingency				
	Contingency sum	1	item	25.00%	\$ 84,329.68
	Sub-Total				\$ 84,329.68
Sub-Total exc GST					\$ 362,104.68
Regional Loading (155)					\$ 199,157.57
Total exc GST					\$ 561,262.25

1.4 CARPARK RATIONALISATION					
1.4.1	Preliminaries & Establishment				
	Contractor Preliminaries	1	Item	15.00%	\$ 28,564.81
	Sub-Total				\$ 28,564.81
1.4.2	Site & Earthworks				
	<i>Demolition</i>				
	Remove existing pavement - full depth	3182	m2	\$ 3.96	\$ 12,608.37
	<i>Earthworks</i>				
	Import Topsoil	594	m2	\$ 15.00	\$ 8,910.00
	Regrade Area	1	Item	\$ 20,000.00	\$ 20,000.00
	<i>Other Items</i>				
	As constructed survey	1	Item	\$ 2,000.00	\$ 2,000.00
	Dilapidation Surveys	1	Item	\$ 1,500.00	\$ 1,500.00
	QA, Safety, Enviro management plans	1	Item	\$ 2,500.00	\$ 2,500.00
	Sub-Total				\$ 47,518.37
1.4.3	Roadworks				
	<i>Survey</i>				
	Setout	1	Item	\$ 2,000.00	\$ 2,000.00
	As-constructed	1	Item	\$ 2,000.00	\$ 2,000.00
	Tie-in to existing pavement	7	m	\$ 31.01	\$ 217.10
	Subgrade preparation	2262	m2	\$ 5.69	\$ 12,861.58
	<i>Pavement Construction</i>				
	Base Course	2262	m2	\$ 16.33	\$ 36,947.81
	Sub Base	2262	m2	\$ 12.20	\$ 27,593.93
	25 mm black asphalt	2262	m2	\$ 11.89	\$ 26,892.39
	<i>Testing</i>				
	NATA compaction testing	1	Item	\$ 1,500.00	\$ 1,500.00
	NATA materials quality testing	1	Item	\$ 1,500.00	\$ 1,500.00
	<i>Kerbing (adj. bituminous concrete)</i>				
	All types	469	m	\$ 23.26	\$ 10,909.24
	Verge grading	469	m	\$ 6.74	\$ 3,160.17
	Tree to be retained in carpark	2	Item	\$ 5,000.00	\$ 10,000.00
	Linemarking	250	m	\$ 5.33	\$ 1,331.46
	Sub-Total				\$ 136,913.68
1.4.4	Stormwater Drainage				
	<i>Survey</i>				
	Set-out	1	Item	\$ 1,500.00	\$ 1,500.00
	compliance with CK requirements	1	Item	\$ 1,500.00	\$ 1,500.00
	<i>Open Drains</i>				
	Construct Stone pitched open drains	24	m	\$ 75.00	\$ 1,800.00
	Side entry inlets under footpath	1	Item	\$ 1,200.00	\$ 1,200.00
	Sub-Total				\$ 6,000.00
1.4.5	Contingency				
	Contingency sum	1	item	25.00%	\$54,749.22
	Sub-Total				\$ 54,749.22
Sub-Total exc GST					\$ 273,746.08
Regional Loading (155)					\$ 150,560.34
Total exc GST					\$ 424,306.42

POINT SAMSON FORESHORE IMPLEMENTATION - OPINION OF COST					
STAGE 2 - COMMUNITY HALL AREA					
Item	Description	Qty	Unit	Rate	Amount
2.1 DUNE FENCING					
2.1.1	Preliminaries & Establishment				
	Contractor preliminaries	1	item	2.50%	\$588.00
	Sub-Total				\$ 588.00
2.1.2	Fencing & signage				
	Sand trap fencing	305	lin m	\$ 52.00	\$15,860.00
	Post & rail fencing	179	lin m	\$ 40.00	\$7,160.00
	Educational signage	2	Item	\$ 250.00	\$500.00
	Bi-monthly inspection & repair of fencing (over 3 years)	18	month	\$ 300.00	\$5,400.00
	Sub-Total				\$ 23,520.00
2.1.3	Contingency				
	Contingency sum	1	item	25.00%	\$6,027.00
	Sub-Total				\$ 6,027.00
	Sub-Total exc GST				\$ 30,135.00
	Regional Loading (155)				\$ 16,574.25
	Total exc GST				\$ 46,709.25

2.2 DUNE REHABILITATION					
2.2.1	Preliminaries & Establishment				
	Contractor preliminaries	1	item	2.50%	\$1,357.00
	Sub-Total				\$ 1,357.00
2.2.2	Rehabilitation to Denuded Areas of Existing Dunes				
	Weed control	2,833	m ²	\$ 0.10	\$283.30
	Soil stabilisation	2,833	m ²	\$ 4.50	\$12,748.50
	Tubestock planting (1 tube per sqm)	2,833	each	\$ 3.50	\$9,915.50
	Seeding	2,833	m ²	\$ 0.50	\$1,416.50
	Year 2 infill planting (20% of year 1 quantity)	567	each	\$ 3.50	\$1,983.10
	Year 3 infill planting (20% of year 1 quantity)	567	each	\$ 3.50	\$1,983.10
	Sub-Total				\$ 28,330.00
2.2.3	Maintenance (over 3 years)				
	Hand watering from water truck, once per week over the first summer	13	week	\$ 750.00	\$9,750.00
	Monitoring of the works two times per year	3	year	\$ 1,000.00	\$3,000.00
	Weed control, twice per year	6	item	\$ 1,200.00	\$7,200.00
	Rubbish removal, twice per year	6	item	\$ 1,000.00	\$6,000.00
	Sub-Total				\$ 25,950.00
2.2.4	Contingency				
	Contingency sum	1	item	25.00%	\$13,909.25
	Sub-Total				\$ 13,909.25
	Sub-Total exc GST				\$ 69,546.25
	Regional Loading (155)				\$ 38,250.44
	Total exc GST				\$ 107,796.69

2.3 CARPARK RATIONALISATION					
2.3.1	Preliminaries & Establishment				
	Contractor Preliminaries	1	item	15.00%	\$ 22,846.86
	Sub-Total				\$ 22,846.86
2.3.2	Site & Earthworks				
	<i>Demolition</i>				
	Remove existing pavement - full depth	2623	m2	\$ 3.96	\$ 10,393.39
	<i>Earthworks</i>				
	Import Topsoil	835	m2	\$ 15.00	\$ 12,525.00
	Cut to fill (bank measure) neat	820	m3	\$ 7.24	\$ 5,934.05
	Imported Fill	700	m3	\$ 25.85	\$ 18,091.60
	<i>Other Items</i>				
	As constructed survey	1	Item	\$ 2,000.00	\$ 2,000.00
	Dilapidation Surveys	1	Item	\$ 1,500.00	\$ 1,500.00

	QA, Safety, Enviro management plans	1	Item	\$ 3,000.00	\$ 3,000.00
	Sub-Total				\$ 53,444.03
2.3.3	Roadworks				
	<i>Survey</i>				
	Setout	1	Item	\$ 2,000.00	\$ 2,000.00
	As-constructed	1	Item	\$ 2,000.00	\$ 2,000.00
	Tie-in to existing pavement	10	m	\$ 31.01	\$ 310.14
	Subgrade preparation	1311	m2	\$ 5.69	\$ 7,454.26
	<i>Pavement Construction</i>				
	Base Course	1311	m2	\$ 16.33	\$ 21,414.05
	Sub Base	1311	m2	\$ 12.20	\$ 15,992.77
	25 mm black asphalt	1311	m2	\$ 11.89	\$ 15,586.17
	<i>Testing</i>				
	NATA compaction testing	1	Item	\$ 1,500.00	\$ 1,500.00
	NATA materials quality testing	1	Item	\$ 1,500.00	\$ 1,500.00
	<i>Kerbing (adj. bituminous concrete)</i>				
	All types	250	m	\$ 23.26	\$ 5,815.16
	Verge grading	250	m	\$ 6.74	\$ 1,684.53
	Brick paving to islands	72	m2	\$ 67.20	\$ 4,838.21
	Linemarking	95	m	\$ 5.33	\$ 505.96
	Sub-Total				\$ 80,601.24
2.3.4	Stormwater Drainage				
	<i>Survey</i>				
	Set-out	1	Item	\$ 3,000.00	\$ 3,000.00
	compliance with CK requirements	1	Item	\$ 1,500.00	\$ 1,500.00
	<i>Open Drains</i>				
	Construct Stone pitched open drains	20	m	\$ 75.00	\$ 1,500.00
	Side entry inlets under footpath	3	Item	\$ 1,200.00	\$ 3,600.00
	Rock pitching to spillway	93	m2	\$ 93.19	\$ 8,667.13
	Sub-Total				\$18,267.13
2.3.5	Contingency				
	Contingency sum	1	item	25.00%	\$43,789.82
	Sub-Total				\$43,789.82
	Sub-Total exc GST				\$ 218,949.09
	Regional Loading (155)				\$ 120,422.00
	Total exc GST				\$ 339,371.09

POINT SAMSON FORESHORE IMPLEMENTATION - OPINION OF COST					
STAGE 3 - MEARS DRIVE					
Item	Description	Qty	Unit	Rate	Amount
3.1 DUNE FENCING					
3.1.1	Preliminaries & Establishment				
	Contractor preliminaries	1	item	2.50%	\$ 2,435.20
	Sub-Total				\$ 2,435.20
3.1.2	Fencing & signage				
	Sand trap fencing	1,279	lin m	\$ 52.00	\$ 66,508.00
	Post & rail fencing	760	lin m	\$ 40.00	\$ 30,400.00
	Educational signage	2	Item	\$ 250.00	\$ 500.00
	Bi-monthly inspection & repair of fencing (over 3 years)	18	month	\$ 500.00	\$ 9,000.00
	Sub-Total				\$ 97,408.00
3.1.3	Contingency				
	Contingency sum	1	item	25.00%	\$24,960.80
	Sub-Total				\$ 24,960.80
	Sub-Total exc GST				\$ 124,804.00
	Regional Loading (155)				\$ 68,642.20
	Total exc GST				\$ 193,446.20

3.2 DUNE REHABILITATION					
3.2.1	Preliminaries & Establishment				
	Contractor preliminaries	1	item	2.50%	\$ 1,382.25
	Sub-Total				\$ 1,382.25
3.2.2	Rehabilitation to Denuded Areas of Existing Dunes				
	Weed control	2,934	m ²	\$ 0.10	\$ 293.40
	Soil stabilisation	2,934	m ²	\$ 4.50	\$ 13,203.00
	Tubestock planting (1 tube per sqm)	2,934	each	\$ 3.50	\$ 10,269.00
	Seeding	2,934	m ²	\$ 0.50	\$ 1,467.00
	Year 2 infill planting (20% of year 1 quantity)	587	each	\$ 3.50	\$ 2,053.80
	Year 3 infill planting (20% of year 1 quantity)	587	each	\$ 3.50	\$ 2,053.80
	Sub-Total				\$ 29,340.00
3.2.3	Maintenance (over 3 years)				
	Hand watering from water truck, once per week over the first summer	13	week	\$ 750.00	\$ 9,750.00
	Monitoring of the works two times per year	3	year	\$ 1,000.00	\$ 3,000.00
	Weed control, twice per year	6	item	\$ 1,200.00	\$ 7,200.00
	Rubbish removal, twice per year	6	item	\$ 1,000.00	\$ 6,000.00
	Sub-Total				\$ 25,950.00
3.2.4	Contingency				
	Contingency sum	1	item	25.00%	\$ 14,168.06
	Sub-Total				\$ 14,168.06
	Sub-Total exc GST				\$ 95,801.11
	Regional Loading (155)				\$ 52,690.61
	Total exc GST				\$ 148,491.72

3.3 PUBLIC AMENITY STRUCTURE (LOOKOUT)					
3.3.1	Preliminaries & Establishment				
	Contractor preliminaries	1	item	2.50%	\$ 6,475.00
	Sub-Total				\$ 6,475.00
3.3.2	Northern Look-out				
	Southern lookout structure & beach access	1	item	\$ 259,000.00	\$ 259,000.00
	Sub-Total exc GST				\$ 259,000.00
3.3.3	Contingency				
	Contingency sum	1	item	25.00%	\$ 66,368.75
	Sub-Total				\$ 66,368.75
	Sub-Total exc GST				\$ 331,843.75
	Regional Loading (155)				\$ 182,514.06
	Total exc GST				\$ 514,357.81

3.4 FORMALISATION OF EXISTING CARPARK					
3.4.1	Preliminaries & Establishment				
	Contractor Preliminaries	1	Item	15.00%	\$ 3,704.60
	Sub-Total				\$ 3,704.60
3.4.2	Site & Earthworks				
	<i>Demolition</i>				
	Remove existing pavement - full depth	160	m2	\$ 3.96	\$ 633.98
	<i>Earthworks</i>				
	Imported Fill	75	m3	\$ 25.85	\$ 1,938.39
	<i>Other Items</i>				
	As constructed survey	1	Item	\$ 1,500.00	\$ 1,500.00
	Dilapidation Surveys	1	Item	\$ 1,500.00	\$ 1,500.00
	QA, Safety, Enviro management plans	1	Item	\$ 1,200.00	\$ 1,200.00
	Jute Matting	150	m2	\$ 9.11	\$ 1,366.86
	Sub-Total				\$ 8,139.23
3.4.3	Roadworks				
	<i>Survey</i>				
	Setout	1	Item	\$ 1,000.00	\$ 1,000.00
	As-constructed	1	Item	\$ 1,000.00	\$ 1,000.00
	Tie-in to existing pavement	15	m	\$ 31.01	\$ 465.21
	Subgrade preparation	160	m2	\$ 5.69	\$ 909.75
	<i>Pavement Construction</i>				
	Base Course	160	m2	\$ 16.33	\$ 2,613.46
	Sub Base	160	m2	\$ 12.20	\$ 1,951.83
	25 mm black asphalt	160	m2	\$ 11.89	\$ 1,902.20
	<i>Testing</i>				
	NATA compaction testing	1	Item	\$ 1,000.00	\$ 1,000.00
	NATA materials quality testing	1	Item	\$ 1,000.00	\$ 1,000.00
	<i>Kerbing (adj. bituminous concrete)</i>				
	All types	56	m	\$ 23.26	\$ 1,302.60
	Verge grading	56	m	\$ 6.74	\$ 377.33
	Linemarking	570	m	\$ 5.33	\$ 3,035.73
	Sub-Total				\$ 16,558.11
3.4.5	Contingency				
	Contingency sum	1	item	25.00%	\$ 7,100.49
	Sub-Total				\$ 7,100.49
	Sub-Total exc GST				\$ 35,502.43
	Regional Loading (155)				\$ 19,526.34
	Total exc GST				\$ 55,028.76

POINT SAMSON FORESHORE IMPLEMENTATION - OPINION OF COST					
4. Future Recreational Infrastructure					
Item	Description	Qty	Unit	Rate	Amount
4.1	Skate Park				
	Concrete skate park (simple structure)	1	PS	\$ 350,000.00	\$ 350,000.00
	Contingency sum	1	item	25.00%	\$ 87,500.00
	Sub-Total exc GST				\$437,500.00
Sub-Total exc GST					\$ 437,500.00
Regional Loading (155)					\$ 240,625.00
Total exc GST					\$ 678,125.00

4.2	Boat Shed				
	10m x 12m storage shed clear height 3.0m with standard 2400 wide roller door (supply only)	1	PS	\$ 42,640.00	\$ 42,640.00
	Boat shed installation	1	PS	\$30,000	\$ 30,000.00
	Contingency sum	1	item	25.00%	\$ 18,160.00
	Sub-Total exc GST				\$ 90,800.00
Sub-Total exc GST					\$ 90,800.00
Regional Loading (155)					\$ 49,940.00
Total exc GST					\$ 140,740.00

4.3	Jetty, Option 1 (Provisional Sum)				
	Jetty Option 1 (northern jetty on the east-west alignment)	600	sqm	\$ 3,500.00	\$ 2,100,000.00
	Contingency sum	1	item	25.00%	\$ 525,000.00
	Sub-Total exc GST				\$ 2,625,000.00
Sub-Total exc GST					\$ 2,625,000.00
Regional Loading (155)					\$ 1,443,750.00
Total exc GST					\$ 4,068,750.00

4.4	Jetty, Option 2 (Provisional Sum)				
	Jetty Option 2 (southern jetty on the north-south alignment)	420	sqm	\$3,500	\$ 1,470,000.00
	Contingency sum	1	item	25.00%	\$ 367,500.00
	Sub-Total exc GST				\$ 1,837,500.00
Sub-Total exc GST					\$ 1,837,500.00
Regional Loading (155)					\$ 1,010,625.00
Total exc GST					\$ 2,848,125.00

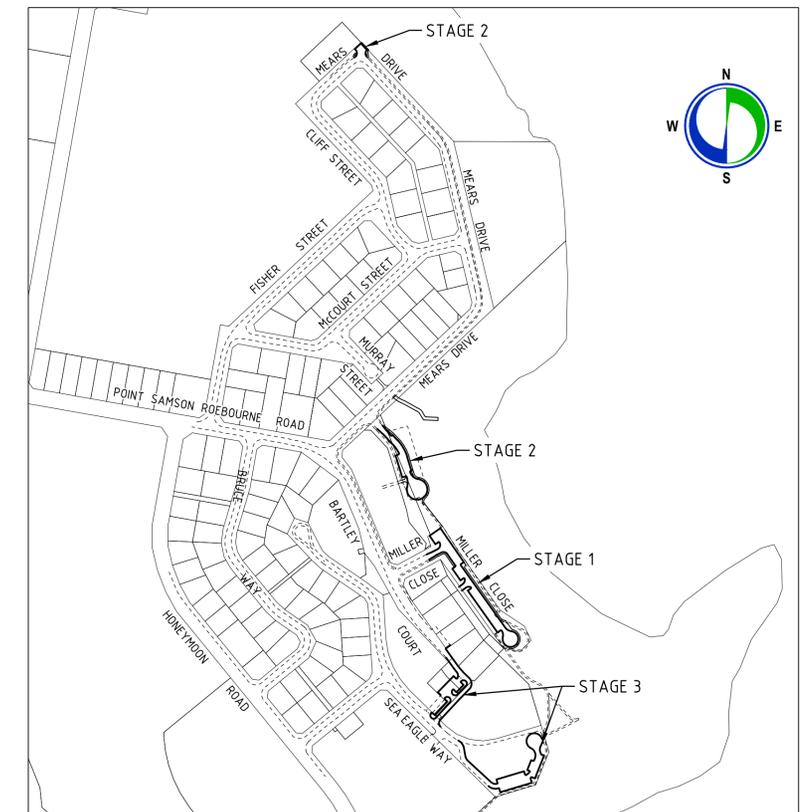
CITY OF KARRATHA POINT SAMSON FORESHORE WORKS

DATE PLOTTED: 06 March, 2015 - 4:48pm

XREF: LW15001-001-CI-D-0A
CAD FILE: G:\SP\PLAT\PROJECTS\LW15001 - POINT SAMSON FORESHORE WORKS\5_ Technical\Civil\CAD\LW15001-001-CI-D-CV1.dwg

1. SURVEY SURVEY DATUM SET OUT	THESE PLANS ARE BASED UPON THE EXISTING CONDITIONS SURVEY PROVIDED BY THE CITY OF KARRATHA. THE CONTRACTOR SHALL SET OUT THE WORKS FROM THE NOMINATED DESIGN LINES, SURVEY BENCHMARKS AND CONTROL POINTS SHOWN ON THE PLANS AND TO THE SPECIFIED DETAILS. UPON REQUEST AN ELECTRONIC BASE PLAN OF THE CIVIL DRAWING CAN BE SUPPLIED. WHERE CARDNO'S COMPUTER MODELS ARE UTILISED FOR SET OUT IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO VERIFY THAT THE PROPOSED VERTICAL AND HORIZONTAL ALIGNMENT ARE CONSISTENT WITH THE INFORMATION SHOWN ON THE DRAWINGS. ANY DISCREPANCY SHALL BE REFERRED TO CARDNO PRIOR TO CONSTRUCTION.
DIMENSIONS	ALL DIMENSIONS ARE TO FACE OF KERB AND CENTER OF LINEMARKING WHERE APPLICABLE
AS-CONSTRUCTED SURVEY	UPON COMPLETION OF THE CIVIL WORKS THE CONTRACTOR SHALL PROVIDE CERTIFIED AS-CONSTRUCTED PLANS OF THE WORKS.
2. EARTHWORKS	
COMPACTION TO AS1289	THE CONTRACTOR SHALL OBTAIN A MINIMUM OF 95% STANDARD DRY DENSITY COMPACTION ON ALL FINISHED SUBGRADES AND FORMATIONS.
FILLING	PRIOR TO THE COMMENCEMENT OF FILLING THE SITE SHALL BE STRIPPED AS NOTED. FILLING IS TO BE CARRIED OUT IN STRICT ACCORDANCE WITH THE SPECIFICATIONS AND AS3798. APPROVED MATERIAL WON FROM SITE OR APPROVED COMPACTED FILL SHALL BE MOISTURE CONDITIONED PRIOR TO BEING PLACED IN UNIFORM HORIZONTAL LAYERS OF 150mm MAXIMUM DEPTH AND COMPACTED AS SPECIFIED. ALL FINISHED SURFACES SHALL ACHIEVE A MINIMUM COMPACTION OF 95% STANDARD DRY DENSITY. COMPACTION TESTING OF ALL FILL SHALL BE CARRIED OUT IN ACCORDANCE WITH THE REQUIREMENTS OF AS 3798.
STOCKPILES	STOCKPILING OF ANY EXCAVATED MATERIALS OTHER THAN IMMEDIATELY ADJACENT TO THE EXCAVATION SHALL BE ON APPROVED SITES ONLY
INSPECTION & TESTING	THE CONTRACTOR SHALL INSTRUCT A NATA REGISTERED GEOTECHNICAL ENGINEER TO CARRY OUT LEVEL 2 SUPERVISION TESTING AND REPORTING IN ACCORDANCE WITH AS3798 AND AS1289 AND TO RELEVANT COUNCIL REQUIREMENTS FOR THIS PROJECT. THIS REQUIRES THE GEOTECHNICAL CONSULTANT TO UNDERTAKE THE SAMPLING AND TESTING ON SITE AS SPECIFIED IN ADDITION THEY ARE RESPONSIBLE FOR THE SELECTION TIMING AND LOCATION OF SAMPLING ON EACH VISIT. THE GEOTECHNICAL CONSULTANT SHALL PROVIDE TEST RESULTS TO CARDNO AS THEY ARE TAKEN AND SUBMIT A COMPREHENSIVE FINAL REPORT TO CARDNO SATISFACTION PRIOR TO PRACTICAL COMPLETION. THE FREQUENCY OF TESTING SHALL BE IN ACCORDANCE WITH AS3798 TABLE 8.1 (ADOPTING WHICHEVER GIVES THE MOST TEST RESULTS).
SOIL STABILISATION	BIODEGRADABLE JUTE MATTING SHALL BE FIXED TO BATTER SLOPES WITH BIODEGRADABLE FASTENER PINS AT THE LOCATIONS SHOWN ON THE DRAWINGS.
3. SITE CLEARANCE DEMOLITION	ALL EXISTING REDUNDANT CONCRETE, PAVEMENT, SOIL, RUBBISH AND CONSTRUCTION DEBRIS SHALL BE TAKEN UP AND REMOVED FROM SITE.
CLEAN UP	PRIOR TO COMPLETION, THE CONTRACTOR SHALL ENSURE THE SITE OF WORKS IS TIDIED AND OBTAIN A CLEARANCE FROM THE SUPERVISING ENGINEER OR THE PROJECT MANAGER.
5. TRAFFIC MANAGEMENT GENERAL	TRAFFIC MANAGEMENT SHALL BE ARRANGED BY THE CONTRACTOR FOR THE DURATION OF THE WORKS IN ACCORDANCE WITH AUSTRALIAN STANDARD AS1742.3-2009 FOR CONSTRUCTION TRAFFIC MANAGEMENT AND TO THE SATISFACTION OF ALL PARTIES, INCLUDING THE PROVISION OF ALL NECESSARY SIGNAGE, LIGHTING AND BARRICADING. TRAFFIC FLOWS IN ALL ABUTTING ROADWAYS AND ACCESS TO THE SITE SHALL REMAIN UNIMPEDED FOR THE DURATION OF THE CONTRACT. A TRAFFIC MANAGEMENT PLAN FOR ANY EXTERNAL ROADWORKS SHALL BE SUBMITTED TO 'CITY OF KARRATHA' FOR APPROVAL A MINIMUM OF TWO WEEKS PRIOR TO COMMENCEMENT OF WORKS.
6. TESTING DATA	THE CONTRACTOR SHALL SUPPLY WRITTEN TEST RESULTS FROM A NATA REGISTERED LABORATORY COMPLYING WITH THE SPECIFICATIONS FOR ALL EARTHWORKS, CONCRETE WORKS AND PAVEMENTS LAYERS.
AUDIT	TEST RESULTS WILL BE REVIEWED BY THE SUPERINTENDENT AND WHERE SO REQUIRED ADDITIONAL TESTS WILL BE PROVIDED BY THE CONTRACTOR TO THE SUPERINTENDENTS SATISFACTION.
7. SERVICES EXISTING	ALL STATUTORY AUTHORITY SERVICES MUST BE MAINTAINED AND PROTECTED BY THE CONTRACTOR AT ALL TIMES UNLESS OTHERWISE SHOWN. EXISTING SERVICE LOCATIONS ARE TO BE OBTAINED FROM STATUTORY AUTHORITY RECORDS AND/OR SITE PLANS WHERE AVAILABLE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO LOCATE AND PROTECT ALL SERVICES DURING THE DILATION OF THE WORKS.

8. INSPECTIONS GENERAL	ALL WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH THE APPROVED CONSTRUCTION PROGRAMME TO THE SATISFACTION OF THE CITY'S REPRESENTATIVE AND SUBJECT TO PERIODICAL INSPECTION AND WRITTEN STAGED APPROVAL.
EXTERNAL	ALL WORKS IN ROAD RESERVATIONS SHALL REQUIRE WRITTEN APPROVAL OF THE COUNCIL'S SUPERINTENDENT AND ARE SUBJECT TO SEPARATE INSPECTIONS. SEVEN DAYS NOTICE TO BE GIVEN OF WORK COMMENCING. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY ROAD OPENING PERMITS AND AUTHORITY APPROVALS PRIOR TO COMMENCING WORKS.
9. PAVEMENTS SAWCUTTING	ALL EXISTING PAVEMENTS ADJACENT TO PROPOSED KERB OR PROPOSED JOINTS SHALL BE SAWCUT IN A NEAT LINE TO THE SATISFACTION OF THE CITY'S REPRESENTATIVE, AND TO HAVE 300mm OVERLAP.
REMOVAL	THE CONTRACTOR SHALL REMOVE THE PAVEMENT SURFACE, BASE LAYER, SUB-BASE LAYER AND SUBGRADE OF ALL PAVEMENTS AND FOOTPATHS SHOWN FOR REMOVAL WITHIN THE REHABILITATION AREAS AND REPLACE WITH TOP SOIL FREE OF STONES, TIMBER AND LUMPS OF SOIL, BLENDING INTO ADJOINING UNDISTURBED GROUND.
REMAINING	EXISTING PAVEMENT AREAS THAT REMAIN, WHERE CRACKING IS EVIDENT SHALL BE SEALED WITH A PROPRIETARY BITUMINOUS PRODUCT TO THE MANUFACTURERS' SPECIFICATIONS.
CONCRETE JOINTING	SAWCUT OR TOOLED CONSTRUCTION JOINTS SHALL BE PROVIDED AT MAX. 2.0m CENTRES TO ALL FOOTPATHS OR PEDESTRIAN PAVING UNLESS NOTED OTHERWISE. A 19mm EXPANSION JOINT SHALL BE PROVIDED WHENEVER RIGID PAVEMENTS ABUT FIXED STRUCTURES OR AT MAX. 15m CENTRES TO FOOTPATHS. DOWELLED SAWCUT AND CONSTRUCTION JOINTS SHALL BE PROVIDED TO ALL VEHICULAR PAVEMENTS AS DETAILED ON THE DRAWINGS, TYPICALLY NOT GREATER THAN 6.0m CENTRES AND JOINT SPACING SHALL ENSURE SLAB LENGTH = 15 SLAB WIDTH.
PAVEMENT TESTING	EACH ROAD PAVEMENT LAYER SHALL BE TESTED FOR COMPACTION BY A NATA REGISTERED LABORATORY IN ACCORDANCE WITH AS1289 AND SHALL MEET THE FOLLOWING STANDARDS: BASE LAYER 98% MODIFIED DRY DENSITY SUB-BASE LAYER 95% MODIFIED DRY DENSITY SUB-GRADE 95% STANDARD DRY DENSITY COMPACTION TEST RESULT SHALL BE FORWARDED TO THE SUPERINTENDENT AND COUNCIL'S SUPERVISING ENGINEER FOR APPROVAL PRIOR TO THE PLACEMENT OF SUBSEQUENT PAVEMENT LAYERS. TESTING RATES SHALL BE: ARTERIAL ROADS 6 TESTS/LOT OTHER 3 TESTS/LOT A LOT SHALL BE THE SMALLER OF 5000m2 OR ONE DAYS PRODUCTION. WHERE SO REQUIRED, THE CONTRACTOR SHALL PROVIDE ADDITIONAL TEST TO THE SUPERINTENDENT'S SATISFACTION.
LINEMARKING	LINE MARKING SHALL BE APPLIED WHERE SHOWN ON THE DRAWING'S IN ACCORDANCE WITH CLAUSE R11 OF THE CITY OF KARRATHA SPECIFICATIONS. LINE MARKING DENOTING "NO PARKING" IS TO ALSO BE INSTALLED ALONG MEARS DRIVE ON THE BEACH SIDE. THE PRESENTATION OF THE LINE MARKING SHALL BE CONFIRMED WITH THE CITY'S REPRESENTATIVE PRIOR TO APPLYING.
10. KERBS PROPOSED	WHERE REQUIRED MATCH ALL NEW KERBS TO EXISTING LEVEL NEATLY, ENSURING MINIMUM 1 IN 250 GRADE SAW CUTTING AND REINSTATING PAVEMENT IN FRONT OF KERB TO FALL TO NEW KERB LEVEL
11. SPECIFICATIONS	'CITY OF KARRATHA' SPECIFICATIONS SHALL BE USED AS THE GENERAL SPECIFICATION FOR ALL WORKS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO OBTAIN A COPY OF THE CURRENT SPECIFICATIONS ALL RELEVANT STANDARD DRAWINGS AND ALL ASSOCIATED REVISIONS AND AMENDMENTS ETC.
12. CONTRACT CONDITIONS GENERAL	ALL WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH AS 2124 GENERAL CONDITIONS OF CONTRACT MAINTENANCE PERIOD. A 12 MONTH MAINTENANCE PERIOD WILL APPLY TO THIS CONTRACT UNLESS NOTED OTHERWISE.
ROAD CLOSURES	APPLICATION FOR PERMISSION TO CLOSE ROADS SHALL BE FORWARDED TO THE CITY OF KARRATHA FOR APPROVAL 6 WEEKS PRIOR TO INTENDED ROAD CLOSURE.
DAMAGES	ANY DAMAGES WHICH MAY OCCUR TO COUNCIL FACILITIES OR PRIVATE PROPERTY DURING THE COURSE OF THE WORKS EITHER DIRECTLY OR INDIRECTLY, OR WHICH MAY SUBSEQUENTLY BE EVIDENT FROM THE WORKS THEREOF, SHALL BE REPAIRED BY THE CONTRACTOR AT NO COST TO PRINCIPAL

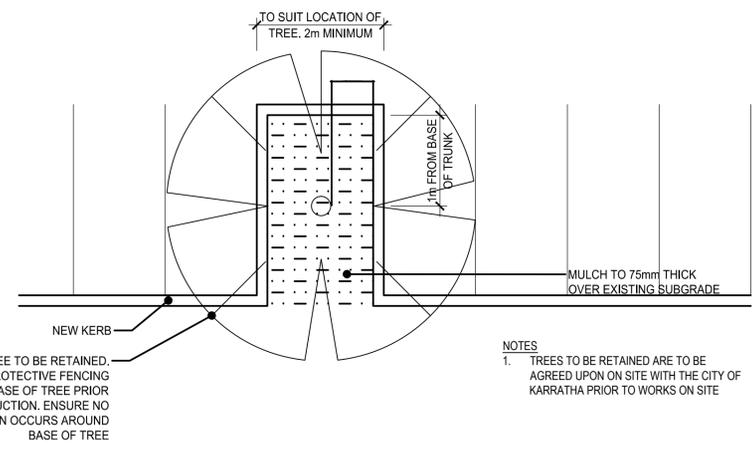
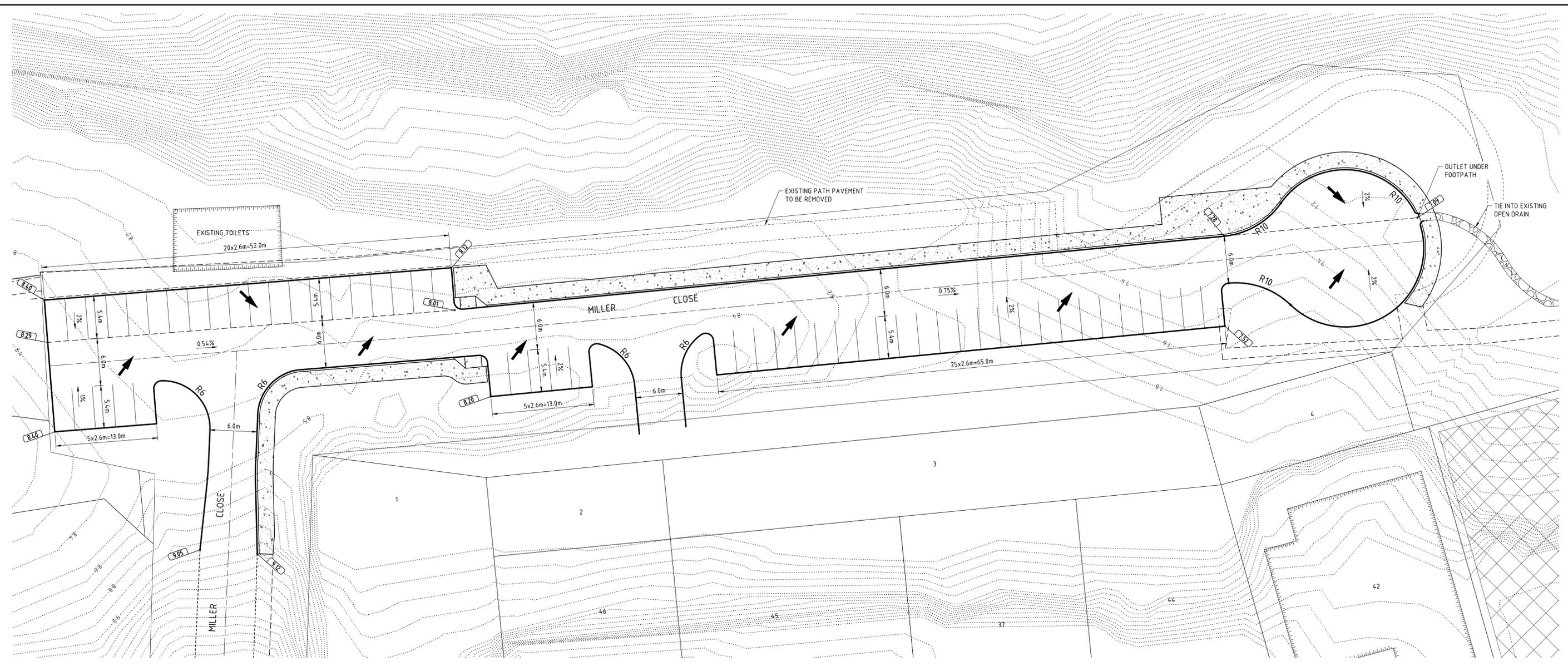


LOCALITY PLAN
N.T.S

DRAWING LIST

LW5001-001-CI-D-CV1	GENERAL NOTES AND LOCALITY PLAN
LW5001-001-CI-D-D1	CARPARK & DRAINAGE LAYOUT PLAN - STAGE 1
LW5001-002-CI-D-D1	CARPARK & DRAINAGE LAYOUT PLAN - STAGE 2
LW5001-003-CI-D-D1	CARPARK & DRAINAGE LAYOUT PLAN - STAGE 3

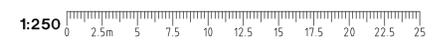
XREF: L:\15001-001-CI-D-CON\LW15001-001-CI-D-0A
 CAD FILE: \A\PERFECT\DATA\PROJECTS\PROJECTS\LW15001-001-CI-D-D1.dwg
 DATE PLOTTED: 10 April, 2015 - 4:01pm



EXISTING TREE IN CARPARK DETAIL
SCALE 1:75

LEGEND

	PROPOSED KERBING
	EXISTING EDGE OF PAVEMENT
	PROPOSED FOOTPATH
	EXISTING FOOTPATH TO BE REMOVED
	EXISTING FOOTPATH TO BE RETAINED
	PROPOSED PAVEMENT LEVEL
	EXISTING CONTOURS
	OVERLAND FLOW



Rev	Date	Description	Drawn	Appr
D	10.04.2015	ISSUED FOR TENDER	JYY	RJD
C	26.03.2015	ADDED PRIM RAMP	JYY	RJD
B	24.02.2015	STAGING	JYY	RJD
A	16.02.2015	INITIAL ISSUE	JYY	RJD



© Cardno Limited All Rights Reserved.
 This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno
 Shaping the Future

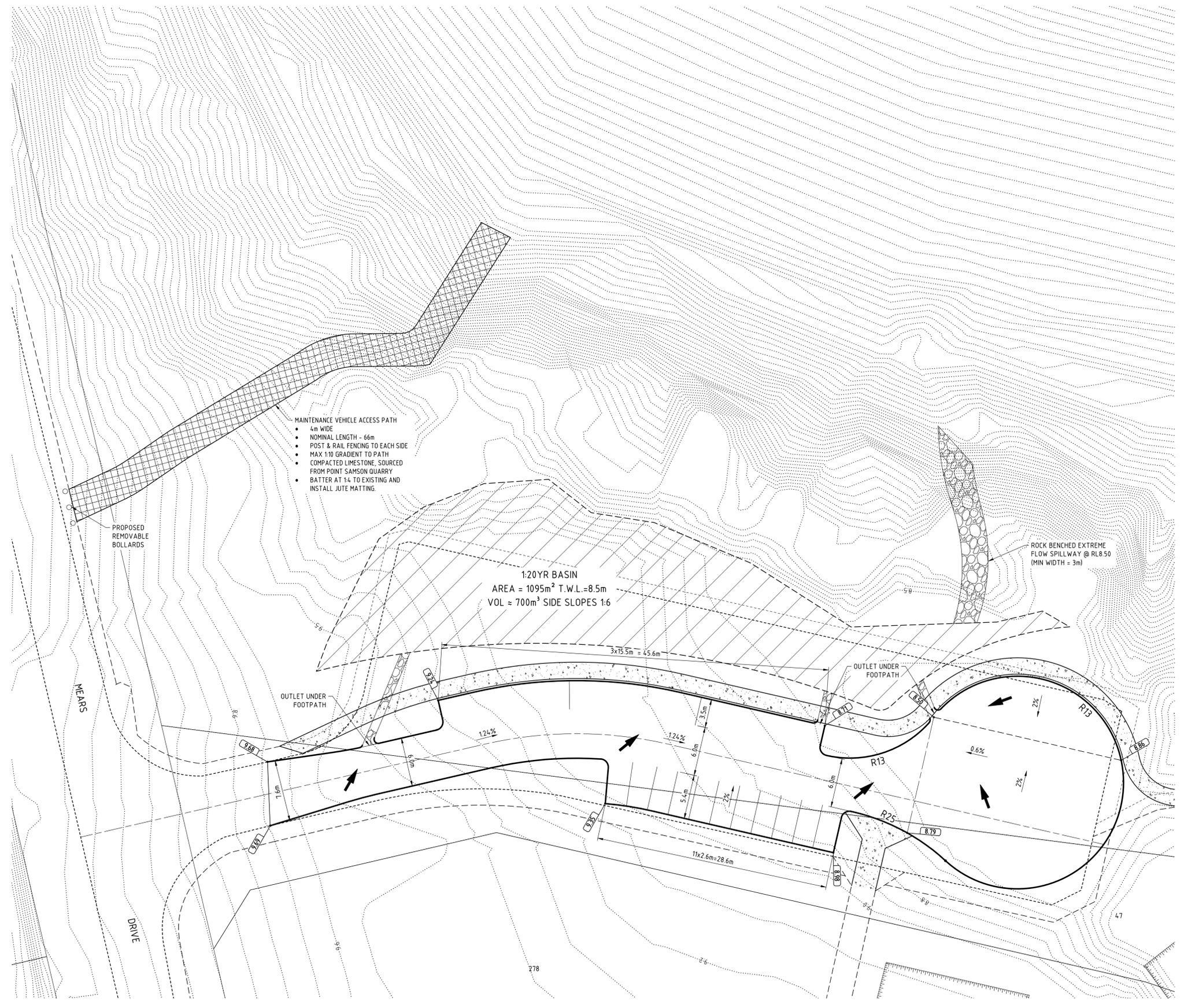
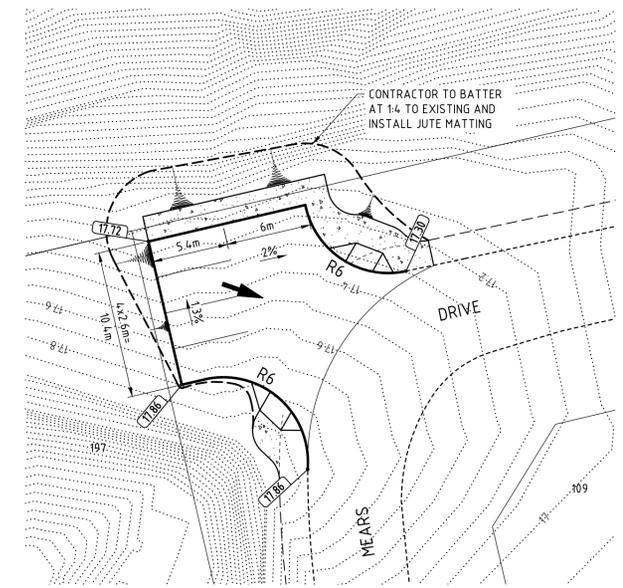
Cardno (WA) Pty Ltd
 11 Harvest Terrace, P.O. Box 447, West Perth Western Australia 6872
 Phone (08) 9273 3888 Fax (08) 9486 8664
 South West Regional Office
 Unit 2, 89 Duress Street, P.O. Box 713, Busselton Western Australia 6280
 Phone (08) 9781 1444 Fax (08) 9752 2471

Drawn	JYY	Date	16.02.2015
Designed	RJD	Date	16.02.2015
Checked	RJD	Date	16.02.2015
Reviewed	AN	Date	16.02.2015
Approved	AN	Date	16.02.2015

Client	CITY OF KARRATHA
Project	POINT SAMSON FORESHORE WORKS
Title	CARPARK & DRAINAGE LAYOUT PLAN STAGE - 1

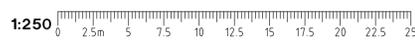
FOR TENDER ONLY							
Date	16.02.2015	Datum	A.H.D	Scale	1:250	Size	A1
Drawing Number	LW15001-001-CI-D-D1			Revision	D		

XREF: LW15001-001-CI-D-CON; LW15001-001-CI-D-OA
 CAD FILE: \\A:\PERFECT\DATA\Projects\PLAT\PROJECTS\LW15001-002-CI-D-01.dwg
 DATE PLOTTED: 10 April, 2015 - 4:01pm



LEGEND

	PROPOSED KERBING
	EXISTING EDGE OF PAVEMENT
	PROPOSED FOOTPATH
	EXISTING FOOTPATH TO BE REMOVED
	EXISTING FOOTPATH TO BE RETAINED
	PROPOSED PAVEMENT LEVEL
	EXISTING CONTOURS
	OVERLAND FLOW



Rev	Date	Description	Drawn	Appr
C	10.04.2015	ISSUED FOR TENDER	JYY	RJD
B	26.03.2015	LONG-VEHICLE PARKING ADDED	JYY	RJD
A	24.02.2015	INITIAL ISSUE	JYY	RJD



© Cardno Limited All Rights Reserved.
 This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (WA) Pty Ltd
 11 Harvest Terrace, P.O. Box 447, West Perth Western Australia 6872
 Phone (08) 9273 3888 Fax (08) 9486 8664
 South West Regional Office
 Unit 2, 89 Duchess Street, PO Box 713, Busselton Western Australia 6280
 Phone (08) 9781 1444 Fax (08) 9752 2471

Drawn	JYY	Date	16.02.2015
Designed	RJD	Date	16.02.2015
Checked	RJD	Date	16.02.2015
Reviewed	AN	Date	16.02.2015
Approved	AN	Date	16.02.2015

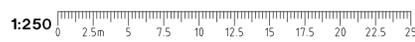
Client	CITY OF KARRATHA
Project	POINT SAMSON FORESHORE WORKS
Title	CARPARK & DRAINAGE LAYOUT PLAN STAGE - 2

FOR TENDER ONLY							
Date	16.02.2015	Datum	A.H.D	Scale	1:250	Size	A1
Drawing Number	LW15001-002-CI-D-D1			Revision	C		

XREF: L:\15001-003-CL-D-CON\LW15001-003-CL-D-0A
 CAD FILE: \A\PERFES01\15001-003-CL-D-0A\PROJECTS\LW15001-003-CL-D-01.dwg
 DATE PLOTTED: 10 April, 2015 - 4:00pm



- LEGEND**
- PROPOSED KERBING
 - EXISTING EDGE OF PAVEMENT
 - PROPOSED FOOTPATH
 - EXISTING FOOTPATH TO BE REMOVED
 - EXISTING FOOTPATH TO BE RETAINED
 - PROPOSED PAVEMENT LEVEL
 - EXISTING CONTOURS
 - OVERLAND FLOW
- NOTES:**
- CONTRACTOR TO NOTE THAT EXISTING CARPARK KNOWN TO CONTAIN ASBESTOS MATERIAL.



Rev	Date	Description	Drawn	Appr
B	10.04.2015	ISSUED FOR TENDER	JYY	RJD
A	24.02.2015	INITIAL ISSUE	JYY	RJD



© Cardno Limited All Rights Reserved.
 This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (WA) Pty Ltd
 11 Harvest Terrace, P.O. Box 447, West Perth Western Australia 6872
 Phone (08) 9273 3888 Fax (08) 9486 8664
 South West Regional Office
 Unit 2, 89 Duress Street, PO Box 713, Busselton Western Australia 6280
 Phone (08) 9781 9444 Fax (08) 9752 2471

Drawn	Date
JYY	16.02.2015
Designed	Date
RJD	16.02.2015
Checked	Date
RJD	16.02.2015
Reviewed	Date
AN	16.02.2015
Approved	Date
AN	16.02.2015

Client	CITY OF KARRATHA
Project	POINT SAMSON FORESHORE WORKS
Title	CARPARK & DRAINAGE LAYOUT PLAN STAGE - 3

FOR TENDER ONLY							
Date	16.02.2015	Datum	A.H.D	Scale	1:250	Size	A1
Drawing Number	LW15001-003-CI-D-D1			Revision	B		

CITY OF KARRATHA

POINT SAMSON FORESHORE WORKS - DECKING STRUCTURES

DECKING SPECIFICATION

The contractor is to design, certify, fabricate and install a look-out deck and beach access path as shown on the drawings, in accordance with the following specification:

1. All construction work shall comply with the requirements of the local authority workplace health and safety legislation.
2. The contractor is to provide a geotechnical report to certify that the capacity of the timber piers complies with the design loadings
2. The contractor is to undertake detailed site measurements to confirm dimensions and finish levels of the decking structures and staircases prior to construction
3. Decking structures and staircases shall be designed in accordance with the Building Code of Australia, and AS1428 Design for access and mobility series
4. Construction of all structural and civil works shall comply with current editions of relevant SAA codes.
5. Loads and load combinations to be considered in accordance with AS1170.1.
6. The following data shall be used in determining wind loads in accordance with AS1170.2
 - 6.1. Wind Region D
 - 6.2. Terrain Category 1
 - 6.3. Importance Level 2
 - 6.4. V_u 88 m/s
7. The following data shall be used in determining earthquake loads in accordance with AS1170.4
 - 7.1. Hazard Factor (Z) 0.12
 - 7.2. Site Sub-soil Class Ce generally
 - 7.3. Importance Level 2
 - 7.4. K_p 1.0
8. Bearers and joists to be solid, unjointed timber. All timber to be joint group JD4 minimum.
9. Bearers and joists are to be designed for long term deflection of L/400 or a maximum of 9mm.
10. Deck wearing layer shall be recycled 100% solid HDPE.
11. Beach access path wearing layer shall be FRP grating.
12. All proprietary items will require certification from the manufacturer demonstrating compliance with the requirements of AS1170.1 and AS1170.2.
13. Submit shop drawings for approval to City of Karratha prior to manufacture of decking structures.

DRAWING LIST

- LW15001-LA-101-D DECKING LOCATION PLAN & SPECIFICATION
- LW15001-LA-101-D NORTHERN LOOK-OUT DECK - PLAN & DETAILS
- LW15001-LA-101-D SOUTHERN LOOK-OUT DECK - PLAN
- LW15001-LA-101-D NORTHERN LOOK-OUT DECK - DETAILS

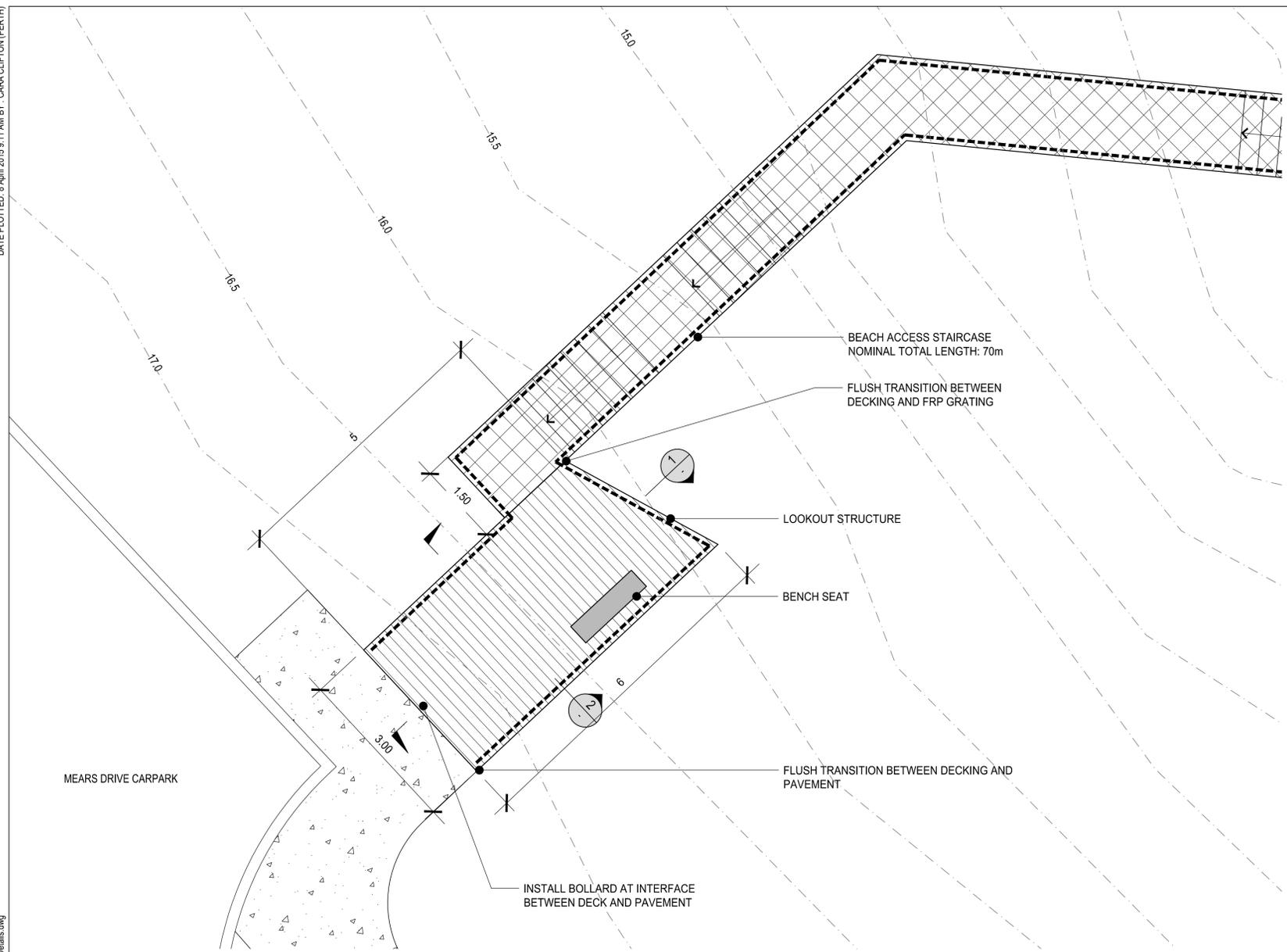


LOCATION PLAN

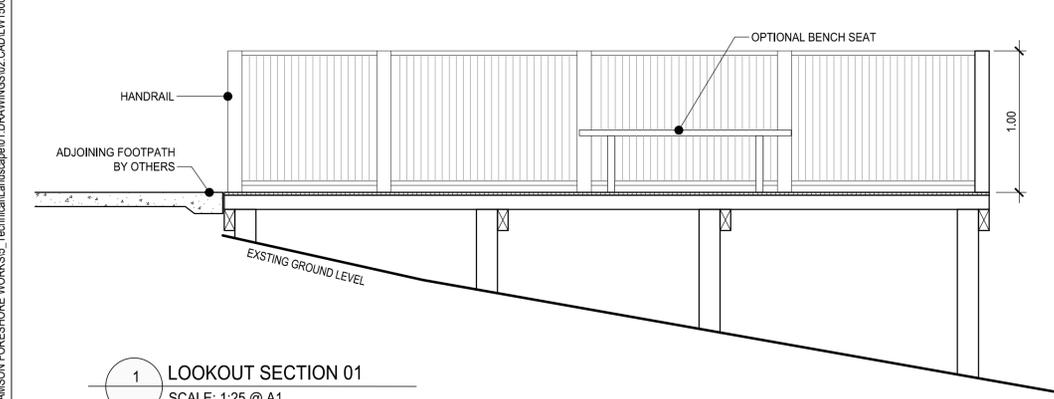
NTS

DATE PLOTTED: 8 April 2015 9:11 AM BY: CARA CLIFTON (PERTH)

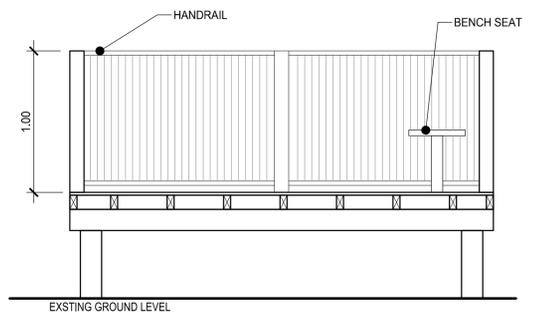
XREFs: LW15001-LA-D-Site_Plans
 CAD File: G:\SP1\PROJECTS\LW15001 - POINT SAMSON FORESHORE WORKS\5_tech\Landscapes\01 DRAWINGS\02 CAD\LW15001-LA-100-D-Decking_Details.dwg



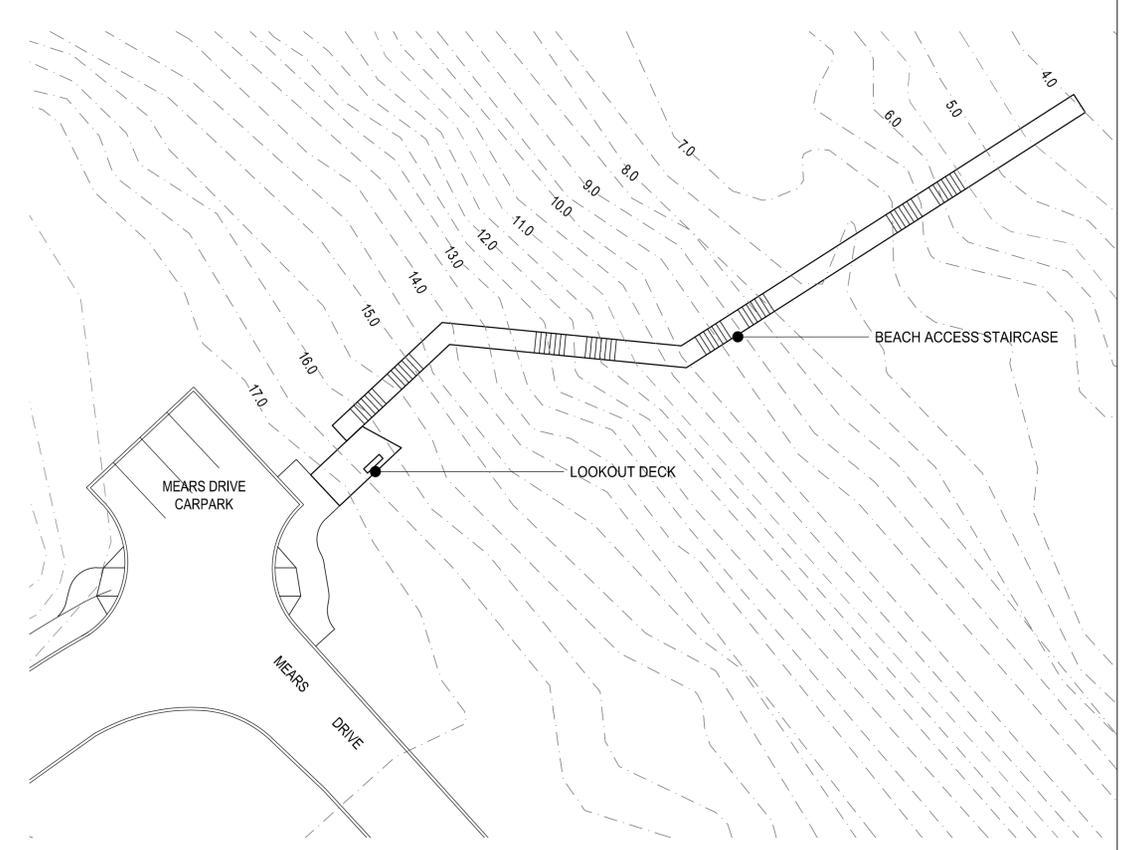
A DETAILED PLAN
 SCALE: 1:50 @ A1



1 LOOKOUT SECTION 01
 SCALE: 1:25 @ A1



2 LOOKOUT SECTION 02
 SCALE: 1:25 @ A1



B LOCATION PLAN
 SCALE: 1:250 @ A1

THE CONTRACTOR IS TO DESIGN, CERTIFY, FABRICATE AND INSTALL A LOOK-OUT DECK AND BEACH ACCESS PATH IN ACCORDANCE WITH THE DRAWINGS AND SPECIFICATION

- LEGEND**
- EXISTING 0.5m CONTOUR
 - [Composite Decking Symbol] COMPOSITE DECKING WITH 5mm GAP BETWEEN BOARDS
 - [FRP Grating Symbol] NON-SLIP FRP GRATING
 - [Handrail Symbol] HANDRAIL / BALUSTRADE
 - [Concrete Pavement Symbol] CONCRETE PAVEMENT (BY OTHERS)
 - [Steps Symbol] STEPS - 150mm RISERS & 350mm TREADS. FINAL QUANTITY & LOCATION OF STEPS TO BE DETERMINED DURING DETAILED DESIGN OF STAIRCASE

Rev.	Date	Description	Des.	Verif.	Appd.
C	08/04/2015	FOR D&C QUOTATION	CC	CV	CC
B	04/03/2015	ISSUED FOR REVIEW	CC	-	CC
A	16/02/2015	ISSUED FOR REVIEW	CC	-	CC

© Cardno Limited All Rights Reserved.
 This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (WA) Pty Ltd | ABN 77 009 119 000
 11 Harvest Terrace
 West Perth WA 6005
 Tel: 08 9273 3888 Fax: 08 9486 8664
 Web: www.cardno.com.au

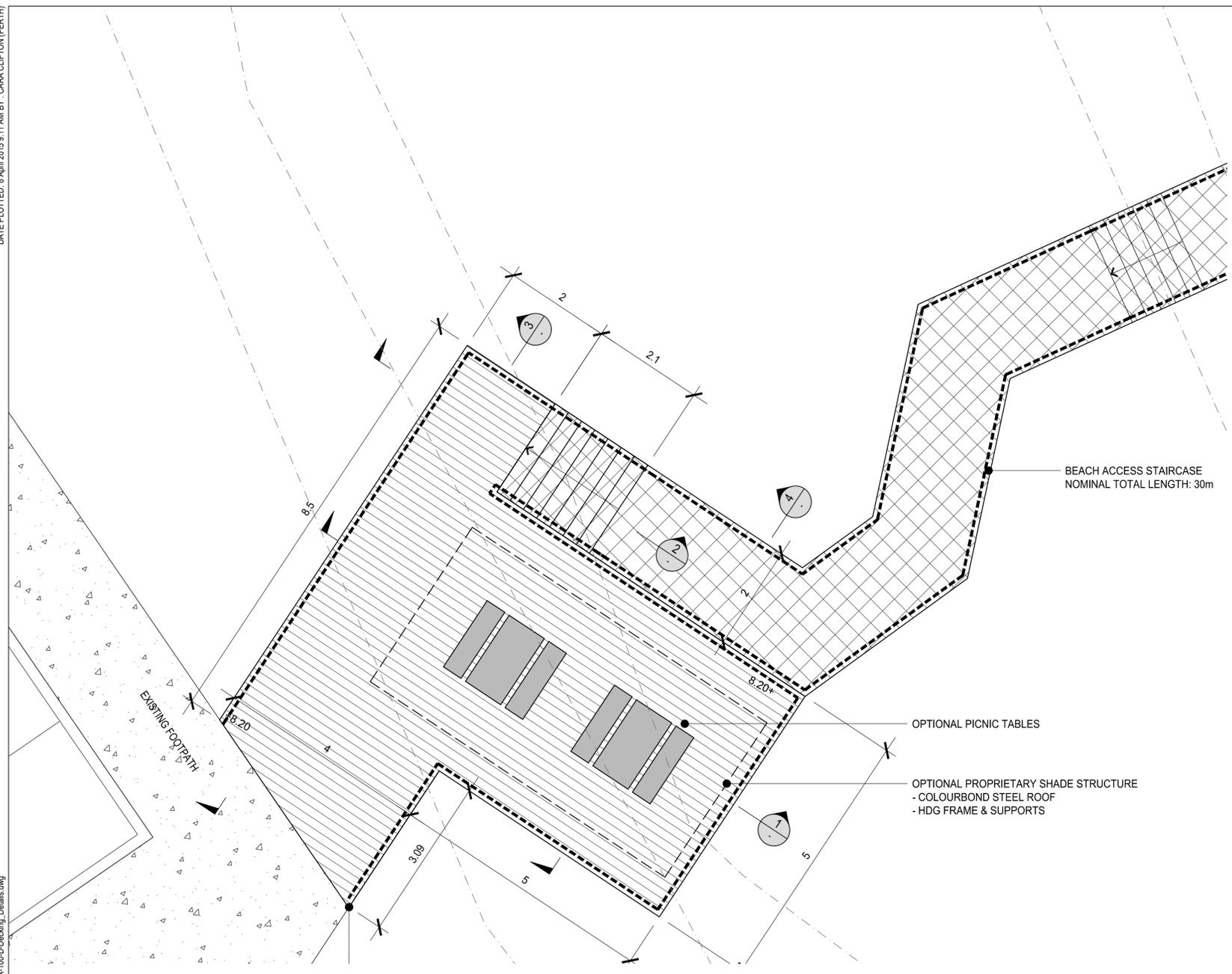
Drawn	CC	Date	03/02/2015
Checked	CV	Date	20/03/2015
Designed	CC	Date	30/01/2015
Verified		Date	
Approved			
CC		03/02/2015	

Client **CITY OF KARRATHA**
 Project **POINT SAMSON FORESHORE WORKS & IMPLEMENTATION PLAN**
 Title **NORTHERN LOOK-OUT DECK PLAN & DETAILS**

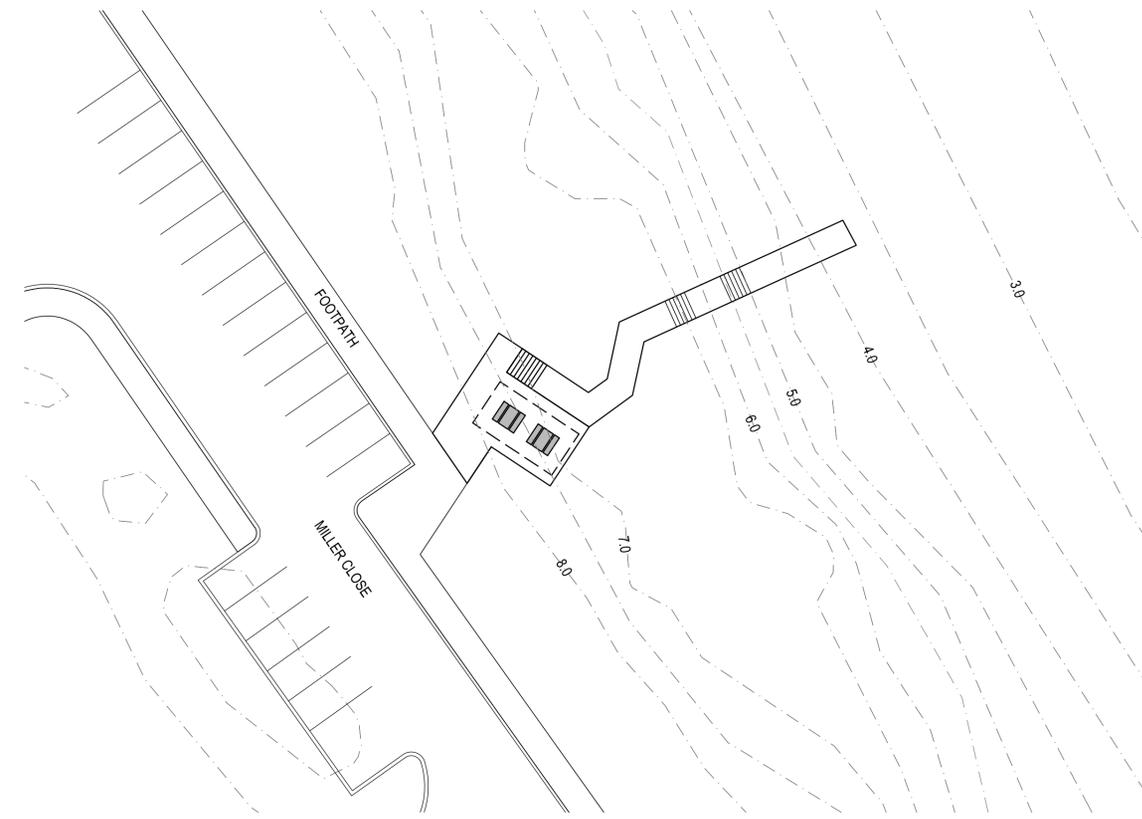
Status	FOR TENDER ONLY		
	NOT TO BE USED FOR CONSTRUCTION PURPOSES		
Scale	1:50 (PLAN)	Size	A1
Drawing Number	LW15001-LA-101-D	Revision	C

DATE PLOTTED: 8 April 2015 9:11 AM BY: CARA CLIFTON (PERTH)

XREFs: LW15001-LA-D-Site_Plans
 CAD File: G:\SP\LA\PROJECTS\LW15001 - POINT SAMSON FORESHORE WORKS\5_Technical\Landscapes\02 CAD\LW15001-LA-100-D-Decking_Details.dwg



A DETAILED PLAN
 SCALE: 1:50 @ A1



B LOCATION PLAN
 SCALE: 1:250 @ A1

THE CONTRACTOR IS TO DESIGN, CERTIFY, FABRICATE AND INSTALL A LOOK-OUT DECK AND BEACH ACCESS PATH IN ACCORDANCE WITH THE DRAWINGS AND SPECIFICATION

- LEGEND**
- EXISTING 0.5m CONTOUR
 - [Grid Pattern] COMPOSITE DECKING WITH 5mm GAP BETWEEN BOARDS
 - [Cross-hatch Pattern] NON-SLIP FRP GRATING
 - HANDRAIL / BALUSTRADE
 - [Stippled Pattern] CONCRETE PAVEMENT (BY OTHERS)
 - [Step Symbol] STEPS - 150mm RISERS & 350mm TREADS. FINAL QUANTITY & LOCATION OF STEPS TO BE DETERMINED DURING DETAILED DESIGN OF STAIRCASE

Rev.	Date	Description	Des.	Verif.	Appd.
C	08/04/2015	FOR D&C QUOTATION	CC	CV	CC
B	04/03/2015	ISSUED FOR REVIEW	CC	-	CC
A	16/02/2015	ISSUED FOR REVIEW	CC	-	CC

© Cardno Limited All Rights Reserved.
 This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno
 Shaping the Future

Cardno (WA) Pty Ltd | ABN 77 009 119 000
 11 Harvest Terrace
 West Perth WA 6005
 Tel: 08 9273 3888 Fax: 08 9486 8664
 Web: www.cardno.com.au

Drawn	RL	Date	03/02/2015
Checked	CV	Date	20/03/2015
Designed	CC	Date	30/01/2015
Verified		Date	
Approved		Date	
CC		03/02/2015	

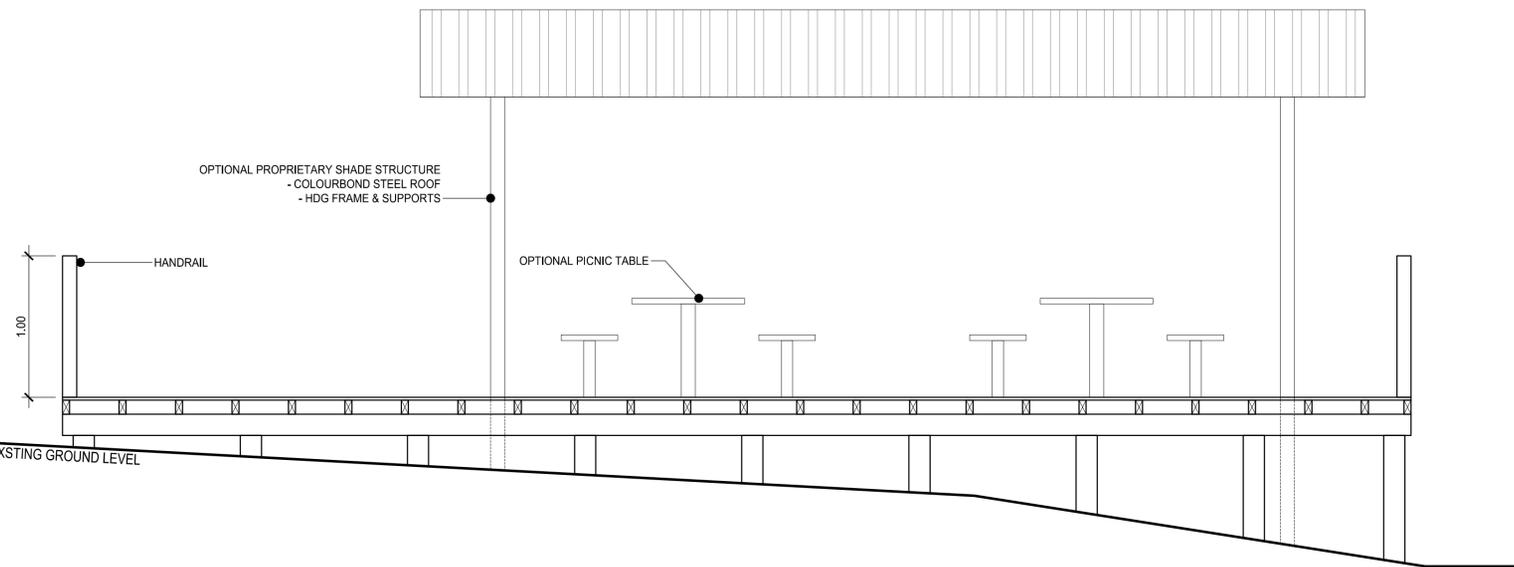
Client **CITY OF KARRATHA**

Project **POINT SAMSON FORESHORE WORKS & IMPLEMENTATION PLAN**

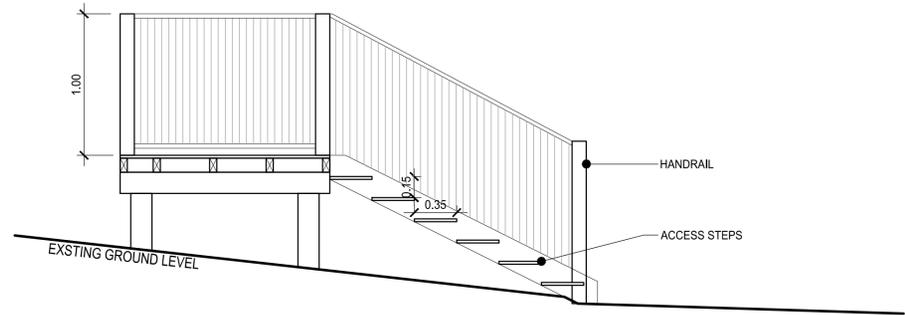
Title **SOUTHERN LOOKOUT DECK PLAN**

Status	FOR TENDER ONLY		
	NOT TO BE USED FOR CONSTRUCTION PURPOSES		
Scale	1:50	Size	A1
Drawing Number	LW15001-LA-102-D		Revision
			C

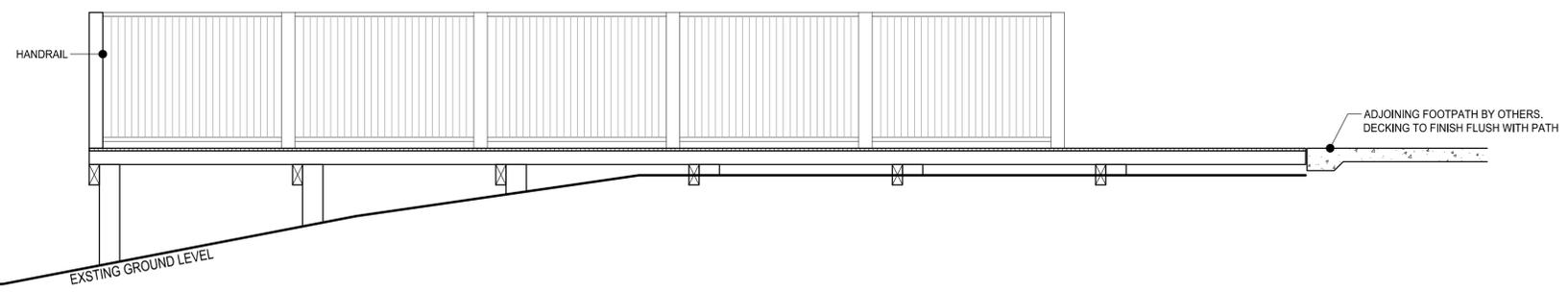
THE CONTRACTOR IS TO DESIGN, CERTIFY, FABRICATE AND INSTALL A LOOK-OUT DECK AND BEACH ACCESS PATH IN ACCORDANCE WITH THE DRAWINGS AND SPECIFICATION



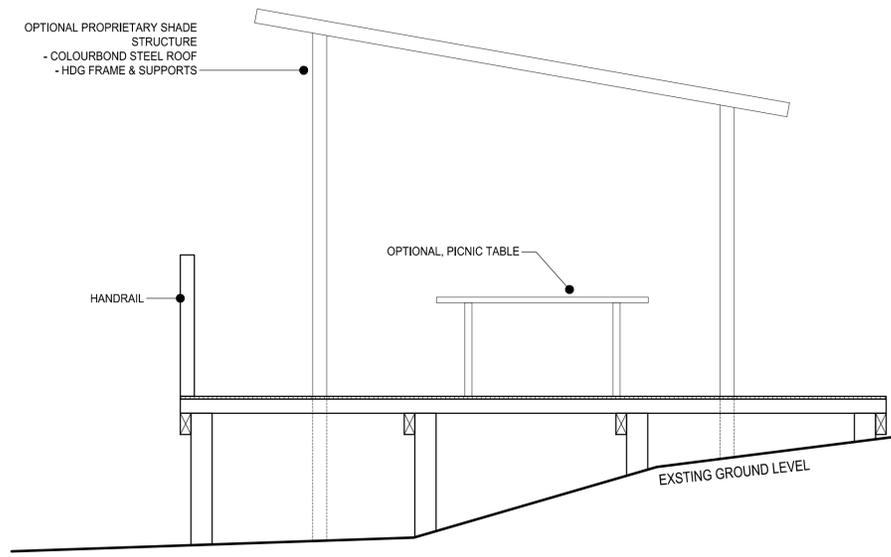
1 LOOKOUT SECTION 01
SCALE: 1:25 @ A1



2 LOOKOUT SECTION 02
SCALE: 1:25 @ A1



3 LOOKOUT SECTION 03
SCALE: 1:25 @ A1



4 LOOKOUT SECTION 04
SCALE: 1:25 @ A1

Rev.	Date	Description	Des.	Verif.	Appd.
C	08/04/2015	FOR D&C QUOTATION	CC	CV	CC
B	04/03/2015	ISSUED FOR REVIEW	CC	-	CC
A	16/02/2015	ISSUED FOR REVIEW	CC	-	CC

© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (WA) Pty Ltd | ABN 77 009 119 000
11 Harvest Terrace
West Perth WA 6005
Tel: 08 9273 3888 Fax: 08 9486 8664
Web: www.cardno.com.au

Drawn	RL	Date	03/02/2015
Checked	CV	Date	20/03/2015
Designed	RL	Date	30/01/2015
Verified		Date	
Approved	CC	Date	03/02/2015

Client	CITY OF KARRATHA
Project	POINT SAMSON FORESHORE WORKS & IMPLEMENTATION PLAN
Title	SOUTHERN LOOKOUT DECK DETAILS

Status	FOR TENDER ONLY NOT TO BE USED FOR CONSTRUCTION PURPOSES		
Scale	AS SHOWN	Size	A1
Drawing Number	LW15001-LA-103-D	Revision	C

Landscape Architecture

CITY OF KARRATHA

POINT SAMSON FORESHORE WORKS - DUNE REHABILITATION

REHABILITATION SPECIFICATION

1 General

Rehabilitation works shall be undertaken in line with this specification, and best practice methods for coastal foreshore rehabilitation.

The extent of works area totals 13,534sqm, and includes existing dunes, a section of former carpark that has been removed, and a newly constructed stormwater basin.

The following comprise the works proposed for this project:

- Fencing;
- Weed control and removal of Tamarisk trees;
- Soil stabilisation;
- Machine ripping;
- Direct seeding and tubestock planting;
- Hand watering;
- Ongoing monitoring; and
- Ongoing maintenance.

1.1 Program For Works

Submit programs for erosion control, weed control, seeding and tubestock installation.

1.2 Other Works On Site

1.2.1 Civil Works

It is expected that civil construction works involving the removal of car-parking and installation of stormwater infrastructure (including a stormwater basin) will have been completed prior to rehabilitation works taking place.

It is within the civil contractor's scope of works to remove and replace road-base with clean topsoil to the former carpark areas, although some further machine ripping by the rehabilitation contractor, to facilitate planting works, may be required.

The civil works drawings may be provided for information purposes, upon request.

1.2.2 Decking Structures

Future construction works within the rehabilitation area includes the construction of two beach look-out decks and beach access stair-cases. The proposed location of the decks and staircases is indicated on the rehabilitation drawings for information only. No rehabilitation works are required on these alignments.

1.3 Timing Of Works

Seeding and planting shall occur when the likelihood of survival and establishment is greatest. Although the works shall be scheduled to suit the seasonal variations and dictated by winter rains, December/January is the likely required timing for tubestock planting, as it is possible that the rains would have begun and the sand is thoroughly-wet.

1.4 Construction Vehicle And Personnel Access

Access shall be restricted to the dune and foreshore areas, and there shall be no uncontrolled access into other areas of the foreshore reserve. Should any vehicle access be required as part of the construction works, it is the responsibility of the contractor to advise as permission from the City of Karratha may be required.

1.5 Signage

Areas of active rehabilitation shall be marked with "Coastcare - Dune Rehabilitation" signs, in locations as agreed on-site with the City of Karratha.

2 Rehabilitation Works

2.1 Weed Control

Undertake weed control to all rehabilitation areas indicated on the plans, using hand applicators and sprayed with either Glyphosate or a grass specific herbicide (e.g. Fusilade) depending on the type of weed and its position within existing

vegetation.

Weeds shall be spot sprayed using a hand applicator. Hand (manual) clearing shall also be undertaken where larger weeds exist. Care shall be exercised in the short term to ensure that weed control does not lead to de-stabilisation of areas with the foreshore reserve.

2.1.1 Replacement Of Tamarisk Trees

Tamarisk trees as illustrated on the Rehabilitation Plans shall be removed via a staged process over two years. Fifty percent of the Tamarisk trees shall be removed in the first year of works, with the remaining trees to be removed in the second year.

Rehabilitation works (including soil stabilisation and planting) to these areas shall be implemented following tree removal.

2.2 Ripping

Existing compacted ground shall be loosened via machine ripping. Ripping shall be confined to the compacted ground only and care will be taken to avoid disturbance to other areas.

Compacted areas that may require ripping include:

- Former carpark areas;
- Stormwater basin; and
- Existing beach access tracks to be closed.

2.3 Fencing

2.3.1 Post & Rail Fencing

Install 1.2m high post and rail fencing to all areas as shown on the landscape plans to the landward side of the dunes, and the edges of the beach access paths, in the locations shown on the rehabilitation plans.

2.3.2 Sand Trap Fencing

Sand trap fencing, in the form of shade cloth fixed to timber fence posts, shall be erected at the base of the dune at the vegetation line and parallel to the shoreline in the locations shown on the rehabilitation plans.

The fencing shall be continuous, without any gaps.

The sand trap fencing shall be constructed in accordance with the following specifications:

- Fence height: 1.2 m (plus a minimum 0.8m into the sand)
- Posts material: hardwood timber
- Sand trap material: shade cloth with a porosity of 30-50%.

Soil stabilisation shall be installed and vegetation planted as soon as possible following fence construction.

2.4 Soil Stabilisation

Biodegradable matting shall be installed to all rehabilitation areas to stabilise sand and assist with plant/seed establishment. Fix matting with biodegradable fastener pins.

2.5 Planting

All seed and tubestock for planting works shall be endemic species of local provenance, as collected by a bushland professional.

Install plants into ground that is thoroughly-wet.

2.5.1 Existing Dunes

Existing dune areas (including areas where Tamarisk trees are removed) shall be planted with tubestock at a density of one (1) plant per square metre and direct seeded at a rate of 4 kg/ha, in the locations shown on the plans.

The primary dune areas shall be planted with grasses and spinifex species, secondary dunes shall be planted with a mix of grasses and shrubs.

2.5.2 Former Car Park Areas

The Former Car Park Areas shall be planted with tubestock at a density of one (1) plant per square metre and direct seeded at a rate of 4 kg/ha, in the locations shown on the plans.

These areas shall be planted with a mix of native grasses and low-growing shrubs.

2.5.3 Stormwater Basin

The stormwater basin shall be planted with tubestock at a density of one (1) plant per square metre using a mix of native grasses.

3 Monitoring & Maintenance

Monitoring and maintenance of the revegetation works shall be undertaken at a frequency of no less than two times per year, and continue for a period of three years after the initial rehabilitation/restoration works have been carried out.

During this period, the Contractor must undertake all necessary works to establish the vegetation as nominated in the contract specifications.

3.1 Monitoring

Monitoring shall involve an inspection of the works to assess the condition of the plant health and establishment, and the success of the stabilisation works.

Submit a report upon completion of each monitoring session to advise on these items.

3.2 Watering

Undertake watering of plant stock as necessary to facilitate establishment, whilst also 'hardening' the stock to a minimal watering regime in the long term.

Liaise with the superintendent in determining a watering regime that is suited to the local conditions.

3.3 Maintenance

Maintenance works shall include:

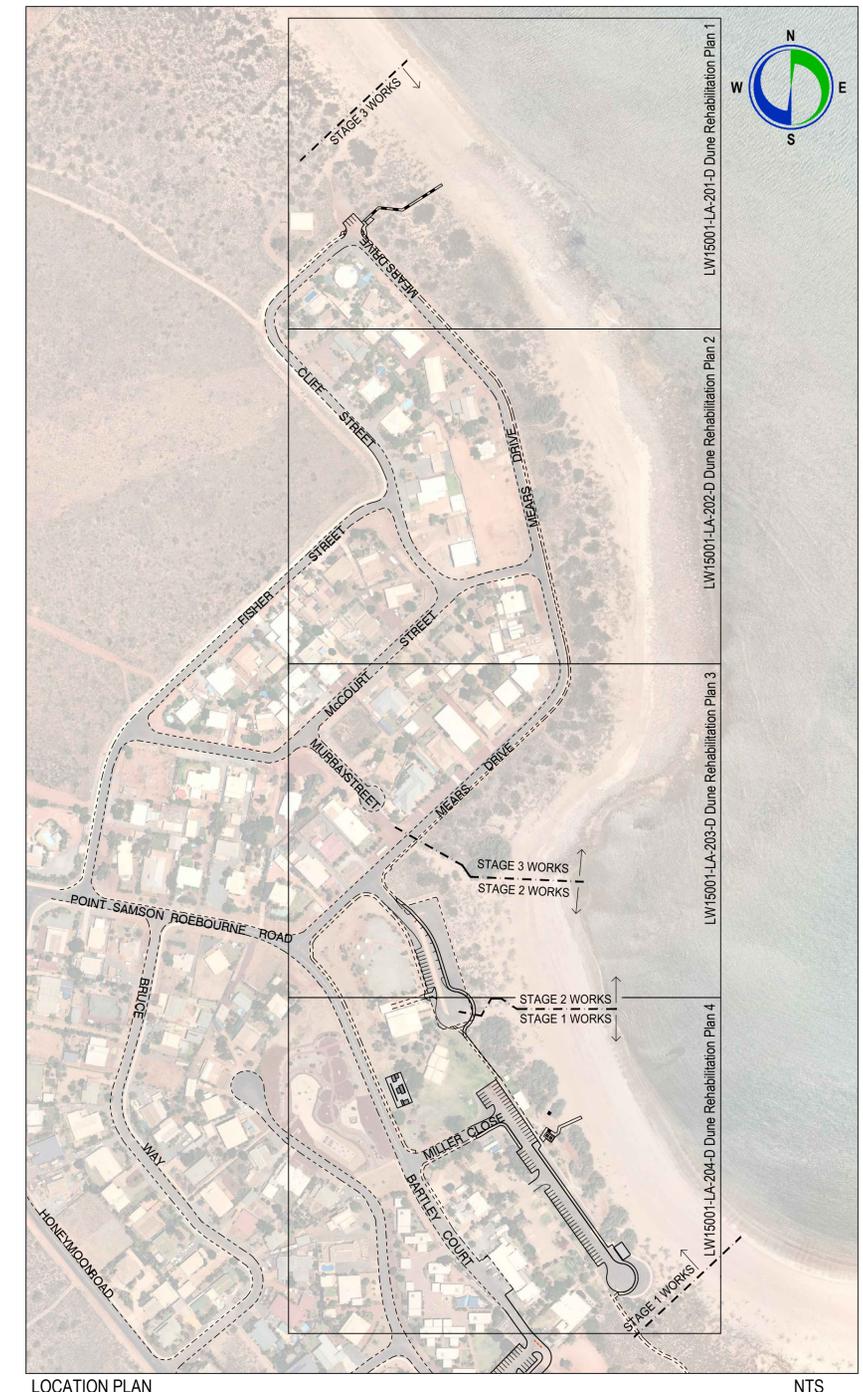
- Inspection and repair to fencing;
- Repair to stabilisation material;
- Weed control as a minimum of twice per year;
- Rubbish removal.

3.4 Top Up Planting

Undertake refill planting works in the two years following the installation to account for plant mortality in the first year.

Refill planting quantities shall be at 20% of the first year quantity.

No further revegetation works shall take place following the third year of planting.



DRAWING LIST

- LW15001-LA-200-S Location Plan & Specification
- LW15001-LA-201-D Dune Rehabilitation Plan 1
- LW15001-LA-202-D Dune Rehabilitation Plan 2
- LW15001-LA-203-D Dune Rehabilitation Plan 3
- LW15001-LA-204-D Dune Rehabilitation Plan 4
- LW15001-LA-205-D Fence Details 01

Dwg No: LW15001-LA-200-S

Rev: A

W.A.P.C. No: -

Date: 08.04.15

DATE PLOTTED: 8 April 2015 9:07 AM BY: CARA CLIFTON (PERTH)



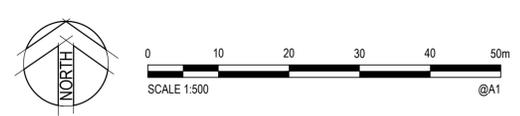
- ### LEGEND
- EXISTING 500mm CONTOUR
 - EXISTING EDGE OF PAVEMENT
 - PROPOSED ROAD/CARPARK (CIVIL WORKS)
 - EXISTING FOOTPATH
 - PROPOSED FOOTPATH (CIVIL WORKS)
 - +++++ SAND TRAP FENCING
 - POST & RAIL FENCING
 - ▨ BEACH ACCESS PATH
 - ▩ REHABILITATION TO FORMER CARPARK
 - ×××× REHABILITATION TO EXISTING DUNES
 - ××○ REHABILITATION TO STORMWATER BASIN
 - ▩ EXISTING TAMARIX TREES TO BE REPLACED WITH DUNE VEGETATION
 - S EDUCATIONAL SIGNAGE - NOMINAL LOCATION TO BE CONFIRMED BY THE CITY OF KARRATHA

- ### NOTES
- DUNE REHABILITATION PLANS ARE TO BE READ IN COORDINATION WITH DUNE REHABILITATION SPECIFICATION
 - DEMOLITION & REMOVAL OF CARPARKS, PAVEMENT ETC WILL BE COMPLETED BY THE CIVIL CONTRACTOR



XREF: LW15001-LA-201-D-Plans.dwg
CAD File: C:\SPL\PROJECTS\LW15001 - POINT SAMSON FORESHORE WORKS\5_Technical\landscape\01 DRAWINGS\02 CAD\LW15001-LA-201-D-Revng_Plan.dwg

Rev.	Date	Description	Des.	Verif.	Appd.
C	08/04/2015	FOR D&C QUOTATION	RL	CC	CC
B	06/03/2015	ISSUED FOR REVIEW	RL	-	CC
A	04/03/2015	ISSUED FOR REVIEW	RL	CC	CC



© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (WA) Pty Ltd | ABN 77 009 119 000
11 Harvest Terrace
West Perth WA 6005
Tel: 08 9273 3888 Fax: 08 9486 8664
Web: www.cardno.com.au

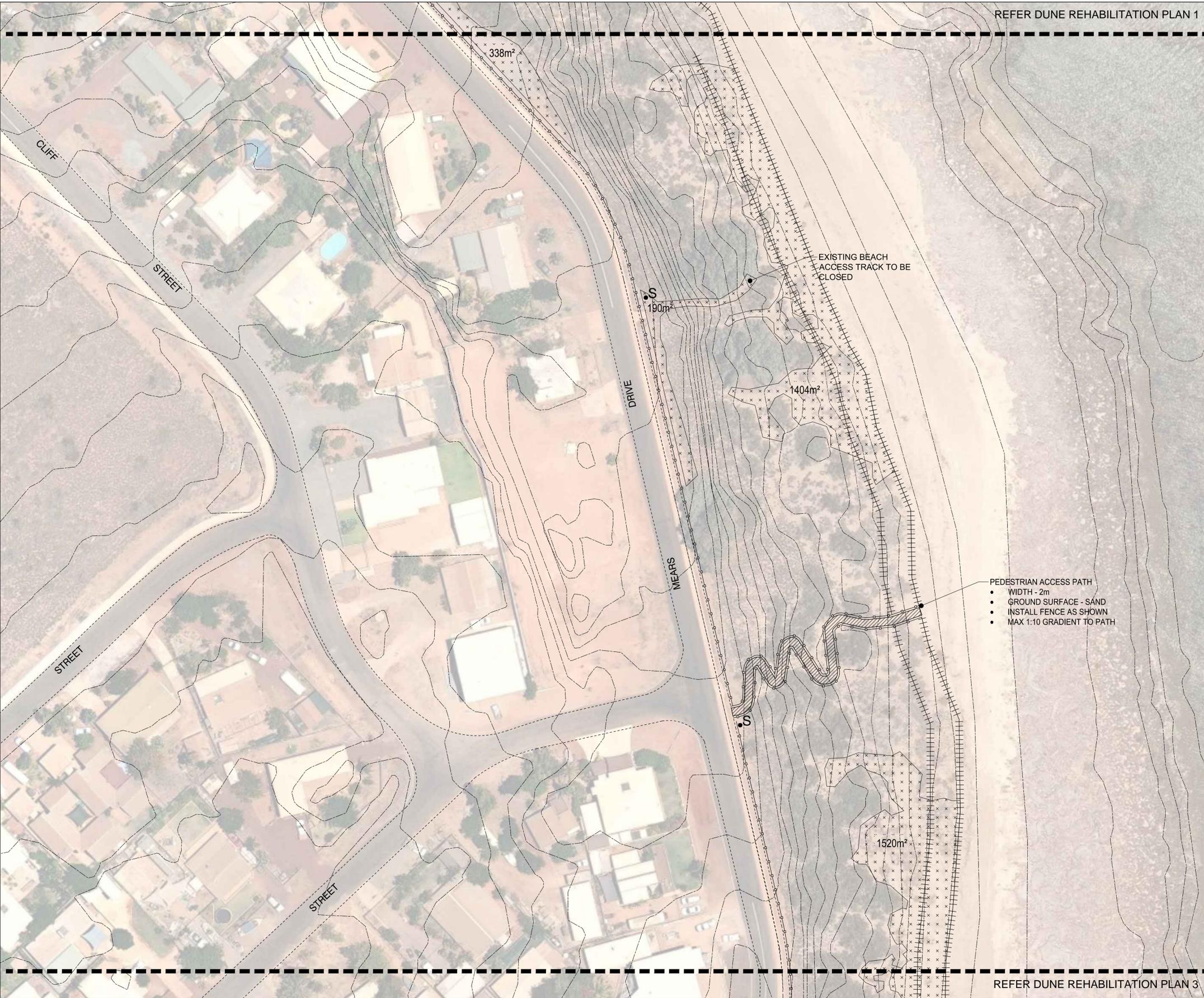
Drawn	RL	Date	03/02/2015
Checked	CC	Date	06/03/2015
Designed	RL	Date	30/01/2015
Verified	CC	Date	08/04/2015
Approved	CC	Date	06/03/2015

Client	CITY OF KARRATHA
Project	POINT SAMSON FORESHORE WORKS & IMPLEMENTATION PLAN
Title	DUNE REHABILITATION PLAN 1

Status	FOR TENDER ONLY	
	NOT TO BE USED FOR CONSTRUCTION PURPOSES	
Drawing Number	Scale	Size
LW15001-LA-201-D	1:500	A1
Revision		C

DATE PLOTTED: 8 April 2015 9:07 AM BY: CARA CLIFTON (PERTH)

XREF: LW15001-LA-D-Sub-Plans
CAD File: C:\SPL\PROJECTS\LW15001 - POINT SAMSON FORESHORE WORKS\5. Technical\landscape\01 DRAWINGS\02 CAD\LW15001-LA-202-D-Revag_Plan.dwg



REFER DUNE REHABILITATION PLAN 1

REFER DUNE REHABILITATION PLAN 3

LEGEND

- EXISTING 500mm CONTOUR
- EXISTING EDGE OF PAVEMENT
- PROPOSED ROAD/CARPARK (CIVIL WORKS)
- EXISTING FOOTPATH
- PROPOSED FOOTPATH (CIVIL WORKS)
- ||||||| SAND TRAP FENCING
- o--- POST & RAIL FENCING
- ▨ BEACH ACCESS PATH
- ▩ REHABILITATION TO FORMER CARPARK
- ×××× REHABILITATION TO EXISTING DUNES
- ○ ○ ○ REHABILITATION TO STORMWATER BASIN
- ▩ EXISTING TAMARIX TREES TO BE REPLACED WITH DUNE VEGETATION
- S EDUCATIONAL SIGNAGE - NOMINAL LOCATION TO BE CONFIRMED BY THE CITY OF KARRATHA

NOTES

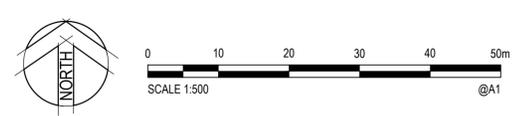
1. DUNE REHABILITATION PLANS ARE TO BE READ IN COORDINATION WITH DUNE REHABILITATION SPECIFICATION
2. DEMOLITION & REMOVAL OF CARPARKS, PAVEMENT ETC WILL BE COMPLETED BY THE CIVIL CONTRACTOR

PEDESTRIAN ACCESS PATH
 • WIDTH - 2m
 • GROUND SURFACE - SAND
 • INSTALL FENCE AS SHOWN
 • MAX 1:10 GRADIENT TO PATH



LOCATION PLAN (NTS)

Rev.	Date	Description	Des.	Verif.	Appd.
C	08/04/2015	FOR D&C QUOTATION	RL	CC	CC
B	06/03/2015	ISSUED FOR REVIEW	RL	-	CC
A	04/03/2015	ISSUED FOR REVIEW	RL	-	CC



© Cardno Limited All Rights Reserved.
 This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

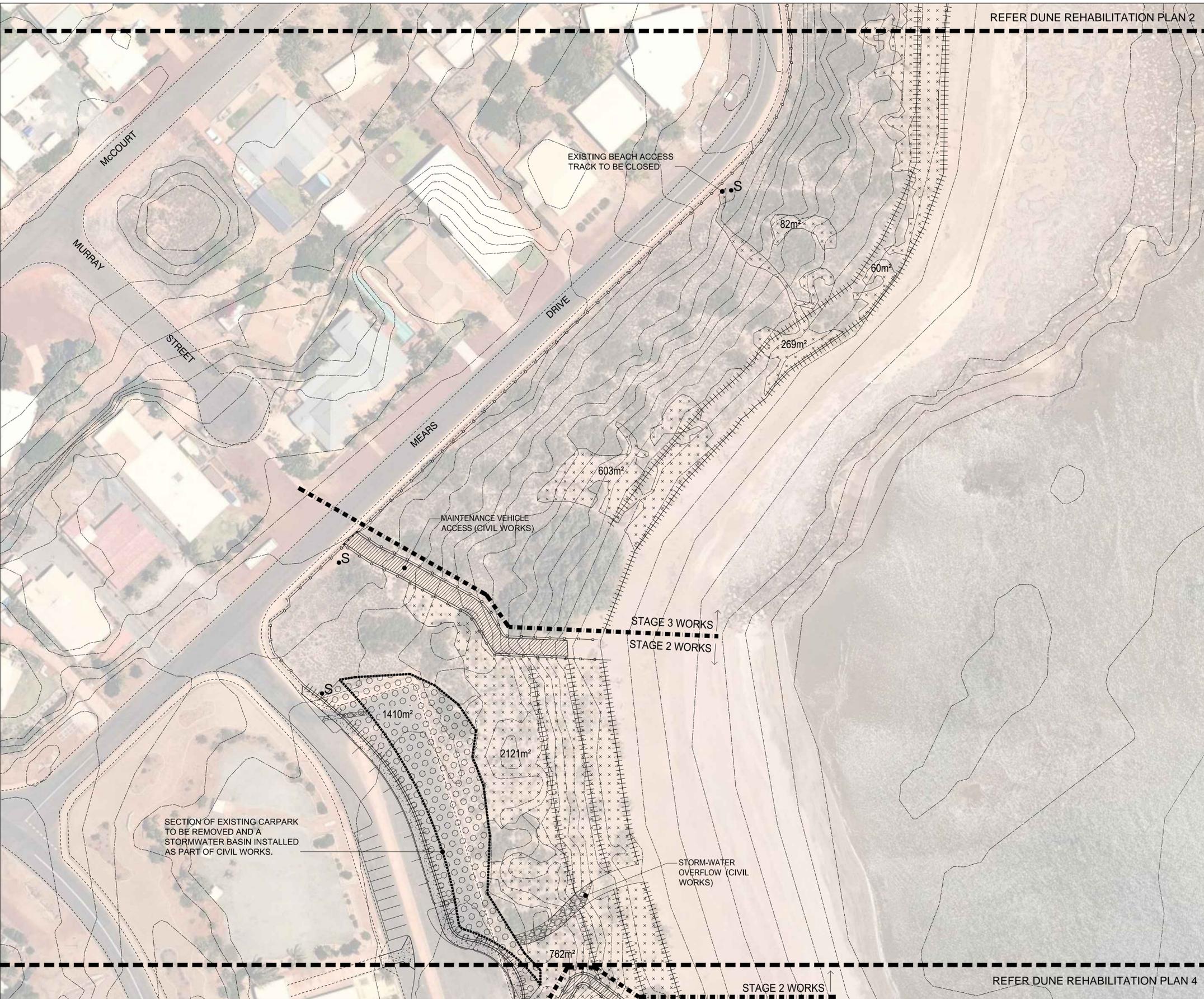
Cardno
 Shaping the Future
 Cardno (WA) Pty Ltd | ABN 77 009 119 000
 11 Harvest Terrace
 West Perth WA 6005
 Tel: 08 9273 3888 Fax: 08 9486 8664
 Web: www.cardno.com.au

Drawn	Date	Client
RL	03/02/2015	CITY OF KARRATHA
Checked	Date	Project
CC	06/03/2015	POINT SAMSON FORESHORE WORKS & IMPLEMENTATION PLAN
Designed	Date	Title
RL	30/01/2015	DUNE REHABILITATION PLAN 2
Verified	Date	
CC	08/04/2015	
Approved	Date	
CC	06/03/2015	

Status	Scale	Size
FOR TENDER ONLY NOT TO BE USED FOR CONSTRUCTION PURPOSES	1:500	A1
Drawing Number	Revision	
LW15001-LA-202-D	C	

DATE PLOTTED: 8 April 2015 9:07 AM BY: CARA CLIFTON (PERTH)

XREFS: LW15001-LA-D-Sub-Plans
CAD File: C:\SPL\PROJECTS\LW15001 - POINT SAMSON FORESHORE WORKS\5. Technical\landscape\01 DRAWINGS\02 CAD\LW15001-LA-200-D-Revag_Plan3.dwg



REFER DUNE REHABILITATION PLAN 2

REFER DUNE REHABILITATION PLAN 4

LEGEND

- EXISTING 500mm CONTOUR
- EXISTING EDGE OF PAVEMENT
- PROPOSED ROAD/CARPARK (CIVIL WORKS)
- EXISTING FOOTPATH
- PROPOSED FOOTPATH (CIVIL WORKS)
- +++++ SAND TRAP FENCING
- o--- POST & RAIL FENCING
- ▨ BEACH ACCESS PATH
- ▩ REHABILITATION TO FORMER CARPARK
- ×××× REHABILITATION TO EXISTING DUNES
- ○ ○ ○ REHABILITATION TO STORMWATER BASIN
- ▤ EXISTING TAMARIX TREES TO BE REPLACED WITH DUNE VEGETATION
- S EDUCATIONAL SIGNAGE - NOMINAL LOCATION TO BE CONFIRMED BY THE CITY OF KARRATHA

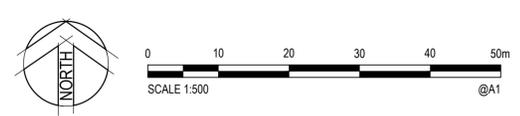
NOTES

1. DUNE REHABILITATION PLANS ARE TO BE READ IN COORDINATION WITH DUNE REHABILITATION SPECIFICATION
2. DEMOLITION & REMOVAL OF CARPARKS, PAVEMENT ETC WILL BE COMPLETED BY THE CIVIL CONTRACTOR



LOCATION PLAN (NTS)

Rev.	Date	Description	Des.	Verif.	Appd.
C	08/04/2015	FOR D&C QUOTATION	RL	CC	CC
B	06/03/2015	ISSUED FOR REVIEW	RL	-	CC
A	04/03/2015	ISSUED FOR REVIEW	RL	-	CC



© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (WA) Pty Ltd | ABN 77 009 119 000
11 Harvest Terrace
West Perth WA 6005
Tel: 08 9273 3888 Fax: 08 9486 8664
Web: www.cardno.com.au

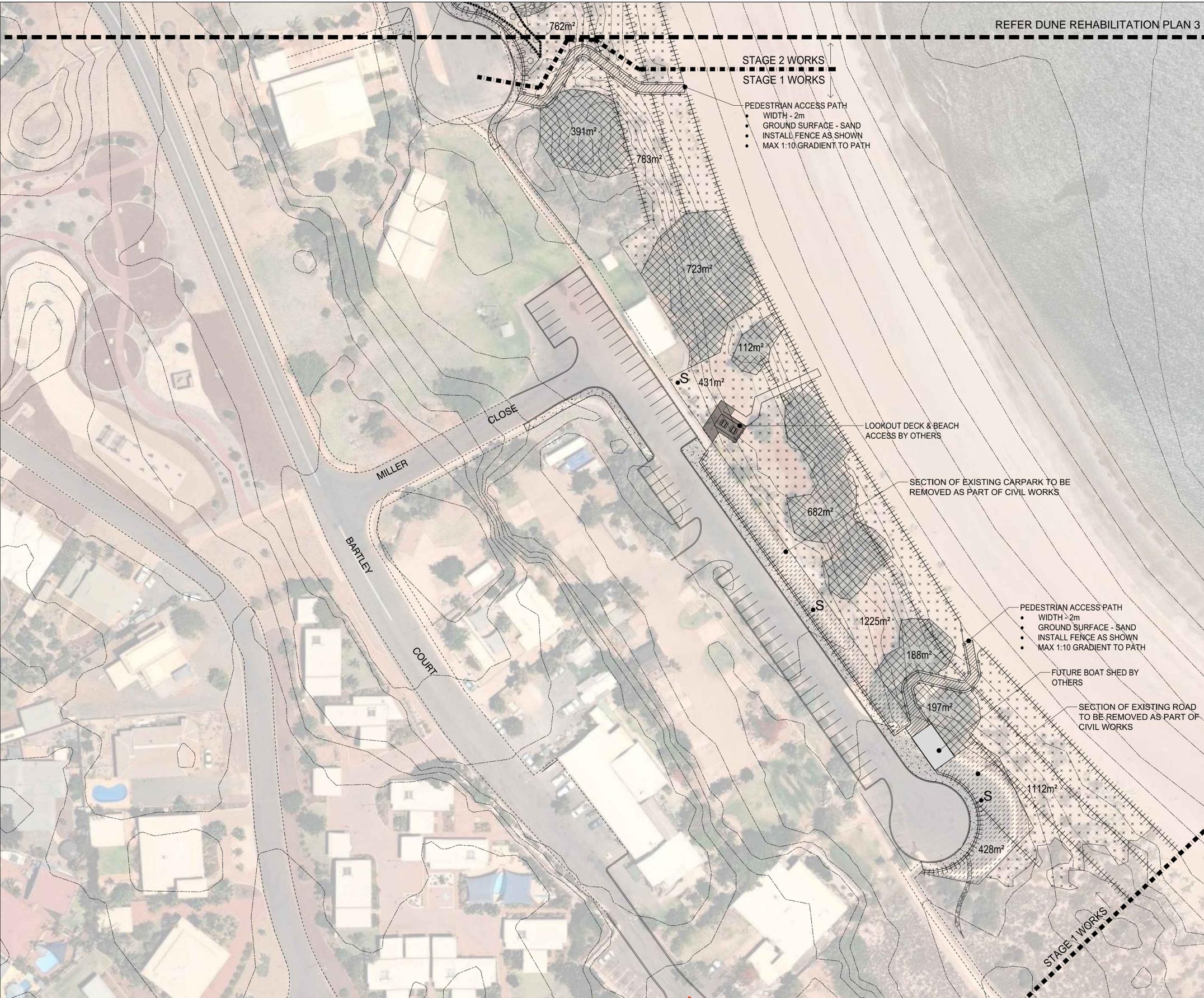
Drawn	RL	Date	03/02/2015
Checked	CC	Date	06/03/2015
Designed	RL	Date	30/02/2015
Verified	CC	Date	08/04/2015
Approved	CC	Date	06/03/2015

Client	CITY OF KARRATHA
Project	POINT SAMSON FORESHORE WORKS & IMPLEMENTATION PLAN
Title	DUNE REHABILITATION PLAN 3

Status	FOR TENDER ONLY	
	NOT TO BE USED FOR CONSTRUCTION PURPOSES	
Drawing Number	Scale	Size
LW15001-LA-203-D	1:500	A1
Revision		C

DATE PLOTTED: 8 April 2015 9:07 AM BY: CARA CLIFTON (PERTH)

XREF: LW15001-LA-D-Sub-Plans
CAD File: C:\SPL\PROJECTS\LW15001 - POINT SAMSON FORESHORE WORKS\5. Technical\Landsc\01 DRAWINGS\02 CAD\LW15001-LA-200-D-Revng_Plan.dwg



REFER DUNE REHABILITATION PLAN 3

STAGE 2 WORKS
STAGE 1 WORKS

- PEDESTRIAN ACCESS PATH
- WIDTH - 2m
 - GROUND SURFACE - SAND
 - INSTALL FENCE AS SHOWN
 - MAX 1:10 GRADIENT TO PATH

- PEDESTRIAN ACCESS PATH
- WIDTH - 2m
 - GROUND SURFACE - SAND
 - INSTALL FENCE AS SHOWN
 - MAX 1:10 GRADIENT TO PATH

LEGEND

- EXISTING 500mm CONTOUR
- - - EXISTING EDGE OF PAVEMENT
- PROPOSED ROAD/CARPARK (CIVIL WORKS)
- - - EXISTING FOOTPATH
- ▨ PROPOSED FOOTPATH (CIVIL WORKS)
- ||||| SAND TRAP FENCING
- POST & RAIL FENCING
- ▨ BEACH ACCESS PATH
- ▨ REHABILITATION TO FORMER CARPARK
- ▨ REHABILITATION TO EXISTING DUNES
- ▨ REHABILITATION TO STORMWATER BASIN
- ▨ EXISTING TAMARIX TREES TO BE REPLACED WITH DUNE VEGETATION
- S EDUCATIONAL SIGNAGE - NOMINAL LOCATION TO BE CONFIRMED BY THE CITY OF KARRATHA

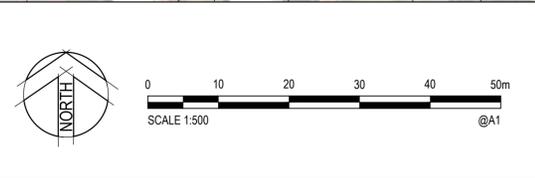
NOTES

1. DUNE REHABILITATION PLANS ARE TO BE READ IN COORDINATION WITH DUNE REHABILITATION SPECIFICATION
2. DEMOLITION & REMOVAL OF CARPARKS, PAVEMENT ETC WILL BE COMPLETED BY THE CIVIL CONTRACTOR



LOCATION PLAN (NTS)

Rev.	Date	Description	Des.	Verif.	Appd.
C	08/04/2015	FOR D&C QUOTATION	RL	CC	CC
B	06/03/2015	ISSUED FOR REVIEW	RL	-	CC
A	04/03/2015	ISSUED FOR REVIEW	RL	-	CC



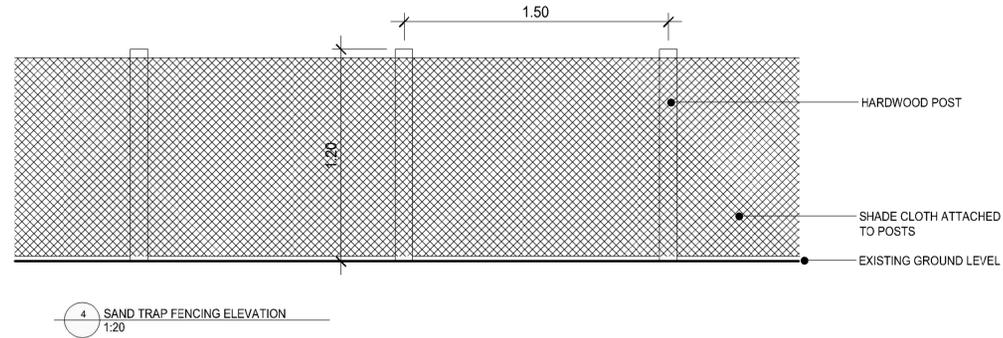
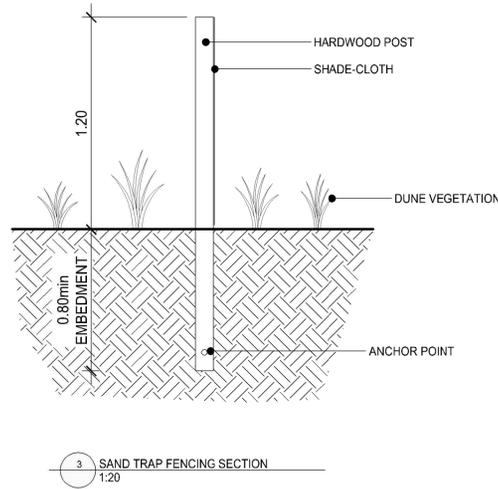
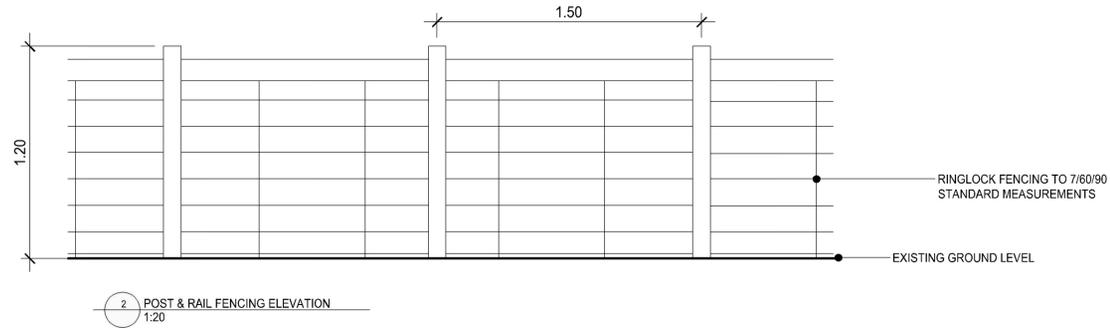
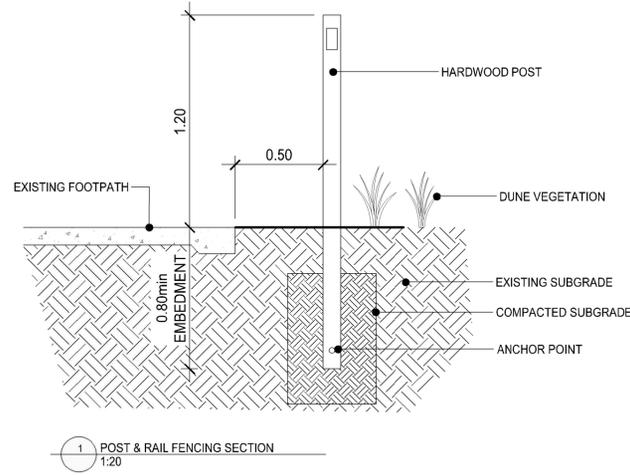
© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (WA) Pty Ltd | ABN 77 009 119 000
11 Harvest Terrace
West Perth WA 6005
Tel: 08 9273 3888 Fax: 08 9486 8664
Web: www.cardno.com.au

Drawn	RL	Date	03/02/2015
Checked	CC	Date	06/03/2015
Designed	RL	Date	30/01/2015
Verified	CC	Date	08/04/2015
Approved	CC	Date	06/03/2015

Client **CITY OF KARRATHA**
Project **POINT SAMSON FORESHORE WORKS & IMPLEMENTATION PLAN**
Title **DUNE REHABILITATION PLAN 4**

Status FOR TENDER ONLY	
NOT TO BE USED FOR CONSTRUCTION PURPOSES	
Scale	1:500
Size	A1
Drawing Number	LW15001-LA-204-D
Revision	C



Rev.	Date	Description	Des.	Verif.	Appd.
A	08/04/2015	FOR D&C QUOTATION	RL	CC	CC



© Cardno Limited All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno (WA) Pty Ltd | ABN 77 009 119 000
11 Harvest Terrace
West Perth WA 6005
Tel: 08 9273 3888 Fax: 08 9486 8664
Web: www.cardno.com.au

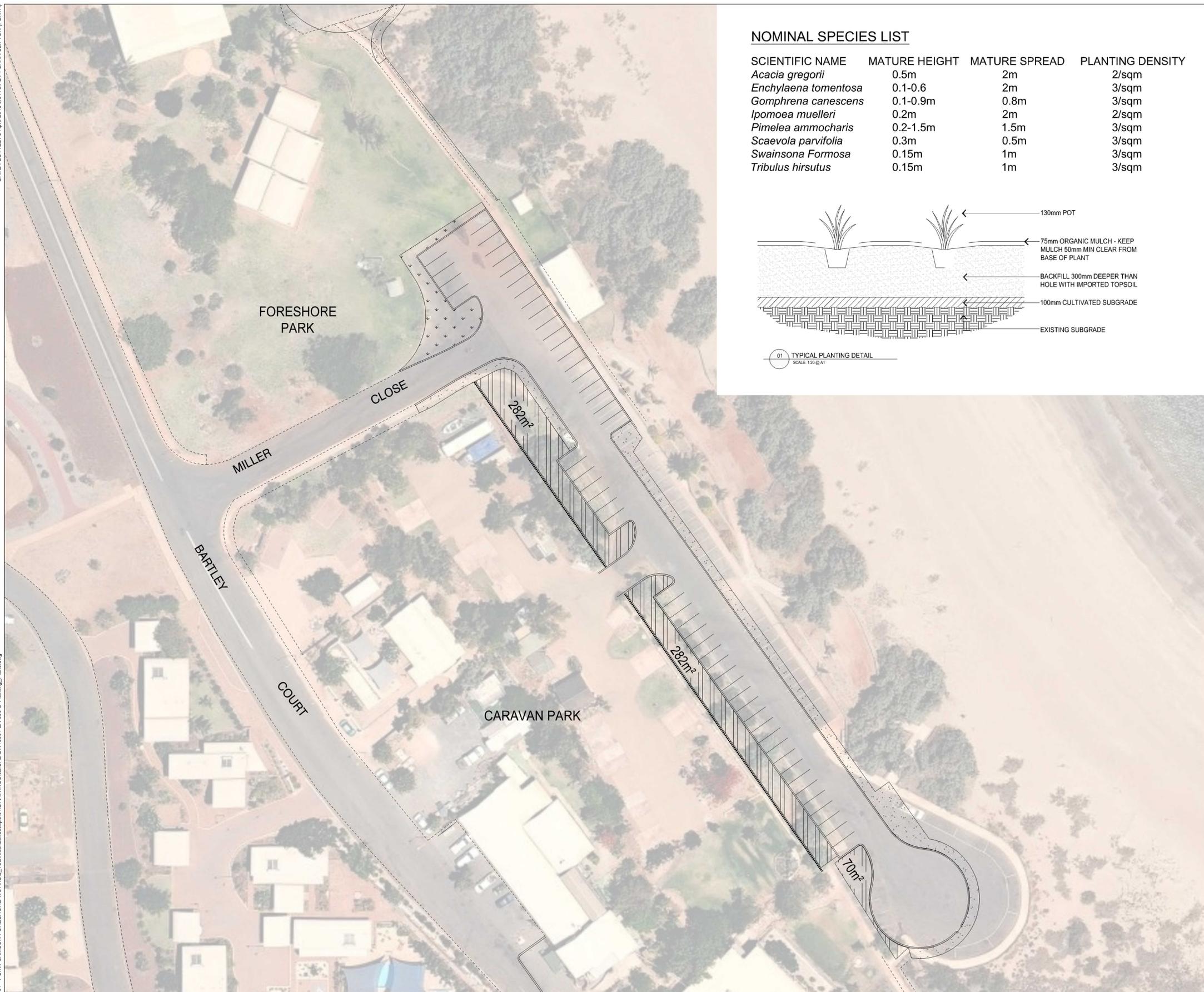
Drawn	RL	Date	03/02/2015
Checked	CC	Date	06/03/2015
Designed	RL	Date	30/01/2015
Verified	CC	Date	08/04/2015
Approved	CC	Date	06/03/2015

Client	CITY OF KARRATHA
Project	POINT SAMSON FORESHORE WORKS & IMPLEMENTATION PLAN
Title	DUNE FENCE DETAILS 01

Status	FOR TENDER ONLY NOT TO BE USED FOR CONSTRUCTION PURPOSES		
Drawing Number	Scale	Size	Revision
LW15001-LA-205-D	AS SHOWN	A1	A

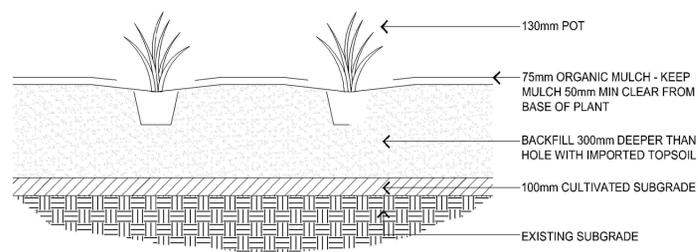
DATE PLOTTED: 8 April 2015 8:04 AM BY: CARA CLIFTON (PERTH)

XREFs: LW15001-LA-300-Planting_Plan.dwg
 CAD File: G:\SPAT\PROJECTS\LW15001 - POINT SAMSON FORESHORE WORKS\LA-300-D-Planting_Plan.dwg



NOMINAL SPECIES LIST

SCIENTIFIC NAME	MATURE HEIGHT	MATURE SPREAD	PLANTING DENSITY
<i>Acacia gregorii</i>	0.5m	2m	2/sqm
<i>Enchylaena tomentosa</i>	0.1-0.6	2m	3/sqm
<i>Gomphrena canescens</i>	0.1-0.9m	0.8m	3/sqm
<i>Ipomoea muelleri</i>	0.2m	2m	2/sqm
<i>Pimelea ammocharis</i>	0.2-1.5m	1.5m	3/sqm
<i>Scaevola parvifolia</i>	0.3m	0.5m	3/sqm
<i>Swainsona Formosa</i>	0.15m	1m	3/sqm
<i>Tribulus hirsutus</i>	0.15m	1m	3/sqm



01 TYPICAL PLANTING DETAIL
 SCALE: 1:20 @ A1

LEGEND

- EXISTING EDGE OF PAVEMENT
- ===== PROPOSED KERBING (REFER CIVIL DRAWINGS)
- EXISTING FOOTPATH
- PROPOSED FOOTPATH (REFER CIVIL DRAWINGS)
- [Hatched Box] MASS PLANTING USING 130mm POTS - PLANTING SHALL BE IRRIGATED
- [Dotted Box] TURF (SPECIES TO MATCH EXISTING ON SITE) - TURF SHALL BE IRRIGATED
- EXISTING LIMESTONE WALL (NOMINAL LOCATION)

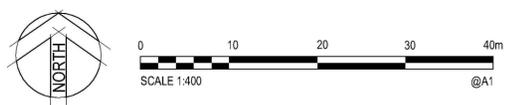
NOTES

- DESIGN AND CONSTRUCT AN IRRIGATION SYSTEM FOR NEW PLANTED AND TURFED AREAS, WHICH CONNECTS TO THE EXISTING IRRIGATION SYSTEM IN THE FORESHORE PARK. SUBMIT IRRIGATION DESIGN TO CITY OF KARRATHA FOR APPROVAL.
- PREPARE A PLANTING PLAN IN ACCORDANCE WITH THE NOMINAL SPECIES LIST, USING LOCALLY AVAILABLE PLANT STOCK. SUBMIT PLAN TO CITY OF KARRATHA FOR APPROVAL.



LOCATION PLAN (NTS)

Rev.	Date	Description	Des.	Verif.	Appd.
B	08/04/2015	FOR D&C QUOTATION	RL	CC	CC
A	04/03/2015	ISSUED FOR REVIEW	RL	-	CC



© Cardno Limited All Rights Reserved.
 This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.

Cardno
 Shaping the Future
 Cardno (WA) Pty Ltd | ABN 77 009 119 000
 11 Harvest Terrace
 West Perth WA 6005
 Tel: 08 9273 3888 Fax: 08 9486 8664
 Web: www.cardno.com.au

Drawn	RL	Date	03/02/2015
Checked	CC	Date	16/02/2015
Designed	RL	Date	30/01/2015
Verified		Date	
Approved			
CC		Date	16/02/2015

Client	CITY OF KARRATHA
Project	POINT SAMSON FORESHORE WORKS & IMPLEMENTATION PLAN
Title	PLANTING PLAN MILLER CLOSE VERGE

Status	FOR TENDER ONLY		
NOT TO BE USED FOR CONSTRUCTION PURPOSES			
Drawing Number	Scale	Size	Revision
LW15001-LA-300-D	1:400	A1	B