



Figure 11: Typical swimming pontoons at Gracetown (L) and Coogee (R) from Shore Coastal Technical Note

3.3.7 Rowing Club Beach

The Shore Coastal Technical Note advises Site 5 the Rowing Club Beach ‘is steeper and higher elevation than Minninup Pool Beach and is understood to be made of imported fill’. The steeper banks along the old Rowing Club foundations will be revegetated and the flatter areas of beach to the north will be retained as a beach and enhanced. The concrete spoon drain and corner of the car park will be removed and the area reshaped to give larger areas of lawn which slope gently down to the beach. Beach nourishment is proposed and suitable material in terms of source, grain size and colour will need to be obtained. See section 3.4.2 and the details will be in the Technical Drawings and will require engineering and DWER approvals.

3.3.8 Fire Truck Access

SoC Emergency Services have advised they require fire truck access to a water point in a location that cannot be blocked by visitors. Consequently an access point is proposed for south east of the Rowing Club in a location that can be accessed directly off the road. Shore Coastal notes ‘A concrete pad (for vehicles to back up to) adjacent to the riverbank would be relatively straight forward. However, at this site, a structure may be required to span fringing foreshore vegetation to allow clear access to clean intake water, with steps providing direct access to the water for installing and retrieving hoses. This type of structure may require piles in the riverbed, although further consultation is required’. This proposal requires additional design work by an engineer in consultation with SoC and then approving by DWER. The river edge is well vegetated in this area and, provided the vegetation is protected during construction, the area should not require any additional vegetation.

Access could also be provided cross the beach but SoC does not favour this due to the possibility of parked cars blocking access.

3.4 Foreshore Stabilisation and Revegetation

3.4.1 Proposed Stabilisation

Between defined access points detailed in section 3.3, it is proposed that erosion is stabilised and the river’s edge is revegetated. There will be reed beds established along the water’s edge, and woody trees and shrubs established upslope of the reed beds and existing logs along the foreshore will be retained as habitat. Access to these areas will be temporarily restricted while the vegetation establishes, with a temporary fence of timber posts (possibly with steel posts between) with plain wire and a top wire of white colour so it can

be seen. This will discourage rather than prevent access, but as most people will not climb through the fence it should be enough to allow the foreshore to regenerate.

Some sections of the foreshore are already stable and these will remain as they are and will inform proposed revegetation.



Figure 12: L: Established reed beds and stable foreshore at mouth of drain line R: Typical temporary fence

Refer Swan River Trust publications for all available stabilising options⁴, but in keeping with the natural theme a low key, natural looking approach is proposed for Minningup Pool and natural and biodegradable materials will be used wherever feasible. Coir logs are proposed for along the shoreline as necessary with the need for these logs primarily affected by the slope of the bank and the amount of existing erosion along the High Water Level (HWL). The logs are 300mm diameter and 3m long and expected to last for 6 – 12 years. In steep and or unstable areas coir or jute mesh or matting will also be considered for interim stabilisation until vegetation establishes⁵.

Planting will be an important component of stabilising the foreshore with riverine shrubs and trees planted to supplement the existing vegetation as needed on the banks and appropriate sedges and rushes established along the waterline. Coir logs are proposed to be established about 1m beyond HWL to assist with establishing reeds along the HWL. Natural regeneration is expected to be significant once the use pressures are removed.

3.4.2 River Edge Treatments

The range of proposed foreshore rehabilitation treatments expected to be used in the Minningup Pool and Sandy Beach areas is summarised below. Where they are to be installed is shown indicatively on Map 4 Indicative Planting and Treatments which is in Appendix 6C. They are illustrated in detail in Part D and incorporated into the relevant detailed area plans. For proposed planting associated with the treatments see section 3.5.5. All existing fallen trees and logs are to be retained but rubbish and debris such as old bricks is to be removed. The treatments should be approved by a (marine?) engineer prior to installation and / or they need approving by DWER. The rock pitching around the culvert outfall may also need coir logs installed where it is undercut.

⁴ Reference to Swan River Trust publications such as, Best Management Practices for Foreshore Stabilisation, Direct Shore Stabilisation Approaches, December 2009 and Best Management Practices for Foreshore Stabilisation, Erosion Control Matting, December 2009 is recommended to give greater detail on installation processes.

⁵ See above.

1. Gently (less than 1:5, 1 Vertical: 5 Horizontal) sloping shorelines with no vegetation or some vegetation and minimal erosion on HWL – Retain existing vegetation if any. Coir Log (300mm diameter) may be required along HWL if there is any evidence of erosion and if there is no stabilising vegetation present. Old access tracks will likely need coir logs. To establish reed beds below HWL a second coir log should be installed 1m beyond HWL with rushes and sedges planted up slope of the coir log.



Figure 13: L: Sandy Beach - location for Type 1 Treatment R: Either side of Terrace Beach use Type 1 Treatment

2. Steeply sloping banks (greater than 1:5) with shrub vegetation, possibly with eroding shoreline – Retain vegetation and coir logs to be placed at HWL in gaps in the vegetation, such as along old access tracks. To establish reed beds below HWL a (second) coir log should be installed 1m beyond HWL with rushes and sedges planted up slope of the log.



Figure 14: L: Steep bank W of old pump needs Type 2 Treatment R: Coir logs needed along eroding edge of pitching and to continue below steep bank as Type 2 Treatment

3. Steeply sloping banks (greater than 1:5) with no shrub vegetation, possibly with eroding HWL – reshape bank if feasible (i.e. if there's enough space and the bank is not bound by roots) and place 1 – 3 coir logs along the HWL to prevent further erosion while vegetation establishes. To encourage rushes and sedges to establish below HWL a second log should be installed 1m beyond HWL with rushes and sedges planted up slope of the log. If there is no root mat in the remaining bank consider surfacing with jute matting, but likely mulching may be sufficient until vegetation establishes.

Where there is room to grade the bank out further (i.e. achieve a 1:5 slope or less) such as in front of the Rowing Club developing / extending the beach will be considered.



Figure 15: L: Bank at old pump needs Type 3 Treatment R: Steep shoreline Type 3 near Rowing Club in foreground (retain old Rowing Club foundations) with gently sloping beach beyond

- Sections of existing reinforcing rocks –consider laying coir logs at the toe of the existing rock and where there is no vegetation above the rocks install more coir logs. This is proposed to replace lifting the existing rock work, laying geofabric and relaying (or adding new where the steps are removed) the rocks. Rushes planted in association with coir logs will assist with stabilisation. Coir logs should generally be placed above any hard toe protection works so this proposal (which aims to minimise disturbance and be a softer approach) will need considering and approving by an engineer (who may advise it is inappropriate) and DWER before installation. Ensure any new rocks match existing rocks.



Figure 16: Type 4 Treatment L: Shoreline S of concrete steps, bottom of steps in foreground R: Shoreline N of concrete steps

- Shoreline reinstatement – where the foreshore has eroded inland it is proposed it will be re-established once the erosion pressures (foot traffic) have been removed (by installing decks and stairs). Fill will be placed along the shoreline to re-establish the original banks (including under the decks), covered with jute matting and planted. Parallel coir logs will be placed along the re-established shoreline at HWL to prevent shoreline erosion and 1m beyond HWL to encourage reed bed establishment. Where the foreshore is rocky, coir logs are to be set where they can be secured

as close to LWL as is feasible. Engineers will be designing the river access structures and this foreshore treatment will need considering by the engineer and including in the construction details as appropriate.



Figure 17: L: Type 5, access stairs proposed for over exposed roots and to water's edge R: View from where person standing in previous picture. Vegetation to be established in line with remnant rushes in mid distance

6. Tree stabilisation – where the root system of a tree is exposed, coir logs should be placed just beyond (minimum 500mm or further if tree is in an area of shoreline reinstatement) the perimeter of the exposed roots in a semi-circle and rushes and sedges planted upslope of the log in soil pockets without disturbing the existing tree roots).



Figure 18: L and R: Exposed tree roots to be protected with Type 6 treatment

For coir logs to be successful the following needs to occur.

- Logs need to be secured properly with biodegradable materials. Stake size and length in the ground is dependent on river flow, wave action and soils present. Stakes should not extend more than 50mm above the log and should not pierce the log. A 25mm square stake, 600 – 900mm long (depending on soil type) is expected to be required. Coir twine should be used to tie stacked logs together and secure logs to stakes.
- Place logs at the toe of the bank in a trench that is dug slightly lower than the bed level.
- Place logs in front of any existing vegetation at or above the lower limit of the vegetation.

- Logs to be made only of biodegradable materials (no synthetic netting etc.).
- Log ends need to be effectively secured (either dug into the bank or rotated towards the bank and effectively staked).
- Logs can also be terraced say one at HWL and one at LWL, or they can be stacked, sloping back slightly and tied together.
- Logs can be used in association with coir or jute matting or mesh with jute matting the most resilient. Any fabric needs securing effectively; see Swan River Trust's Erosion Control Matting publication and next section.
- Maintenance is required to promptly address any minor failings before they cause the structure to fail in a significant manner. Failed planting also needs replacing for 2 – 3 years after initial installation to ensure the plants are established and stabilising the bank once the coir log has disintegrated.

3.4.3 Installation

It is recommended that local contractors (or community groups) who are experienced in this type of work are engaged to implement the revegetation at Minningup Pool and Sandy Beach as the works need a long implementation timeline due to the need to coordinate the production of appropriate plant material and the need to continue to replace failed plants for 2 -3 years after initial establishment to ensure the foreshore is effectively stabilised.

Installation notes for the coir logs as detailed in Swan River Trust Best Management Practices for Foreshore Stabilisation, Direct Shore Stabilisation Approaches, December 2009 are listed below. The Trust's publication 'Best Management Practices for Foreshore Stabilisation, Erosion Control Matting', December 2009 should be referred to for the erosion control matting, some key points are noted below (most of the matting will be detailed as part of the installation of the river access structures but there may be some reshaped areas of bank that also need matting). Planting techniques are detailed in Part D Detail Design

⁶The following recommended construction procedure for coir logs has been adapted from McCullah and Gray (2005) and WDFW (2003).

1. Dig a shallow trench wide enough for the log and at a depth slightly below the channel grade.
2. Lay coir logs in the trench and lace ends together. They may also be laced together on dry ground before placement in the trench.
3. Bend the upstream and downstream ends towards the bank and bury in the bank if possible.
4. Secure the coir log in the trench by driving the stakes in the ground on either side of the log. Netting should be held open and stakes driven through the netting on either side of the logs, not through the centre of the log. Pairs of stakes (one on either side) should be installed at approximately one metre intervals. Stakes should be flush with the top of the log when completed.
5. Strap together stake pairs (next to each other) to hold the coir log in place and prevent lifting. Holes can be predrilled in stakes or drilled onsite. Coir twine, plastic tree ties or similar are used to tie one stake to the other.
6. Fill and shape behind the logs if required. Additional techniques such as jute matting or brush mattsing can also be used at this stage.
7. Plants should be planted behind the coir logs and up the bank as desired'.

⁶ Swan River Trust, Best Management Practices for Foreshore Stabilisation, Direct Shore Stabilisation Approaches, December 2009.

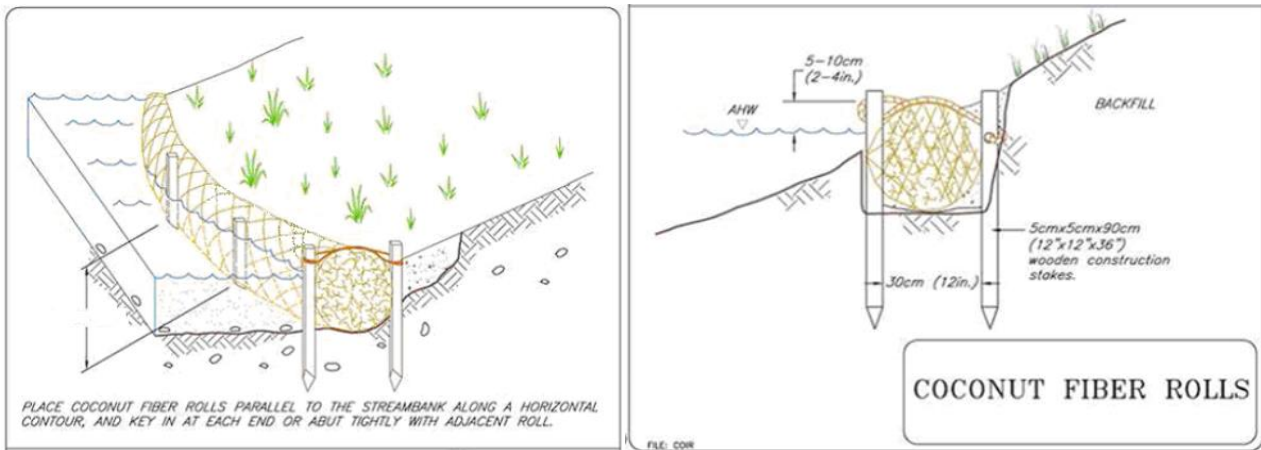
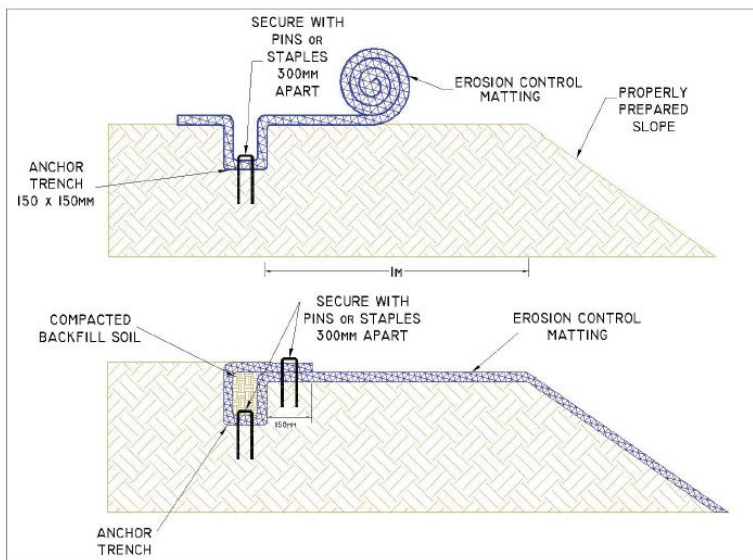


Figure 19: Typical coir log detail, source Swan River Trust 2009 adapted from McCullah and Gray (2005) and WDFW (2003)

Jute mesh is to be used on bare banks that have been reshaped, to stabilise the bank while long term vegetation establishes. The mesh is proposed to prevent minor surface erosion and to create a micro climate to help plants establish. It is expected the banks will only be subject to water flow in times of 1:5 or 1:10 flood (especially as water levels are managed by weirs), however these water flows will still be considered when installing the mesh. Reference to Swan River Trust’s Best Management Practices for Foreshore Stabilisation, Erosion Control Matting, December 2009 indicates there are a number installation considerations as follows.

1. Anchoring – secure anchoring is important. When installing matting down a slope, the top edge of the matting should be secured in a trench and also the upstream edge. It is recommended the edges are buried and anchored in a trench approx.150-200mm deep by 150mm wide, a typical anchoring detail is shown below, but biodegradable pins or staples are preferred.



Source: ECTC (2008)

Figure 20: Anchoring detail for erosion control matting source Swan River Trust 2009 source ECTC 2008⁷

⁷ ECTC 2008, Erosion Control Technology Council (ECTC) Guideline for Installing Rolled Erosion

2. Matting contact with the soil – Where feasible the soil should have an even surface so the matting is in close contact with the soil. The matting should be secured with an appropriate number of pins for degree of slope, with steeper slopes requiring more pins. As a general rule, matting should be secured with pins at 0.5-1 m intervals along the length of the matting and staggering pins 400-600 mm across the matting. Pins should be driven flush with the soil surface and be long enough to ensure sufficient ground penetration to resist pullout (WRC 2001a). Steep slopes 1:1 or 1:2 will require 6 -8 pins per m² and for gentler slopes such as 1:4, 4 pins per m² should suffice. Again biodegradable pins are recommended.
3. Matting Overlap – The joins in the matting are potential points of failure and so there should be overlap of approximately 100mm, which is secured and the upstream edge should overlap the downstream edge to minimise the likelihood of undercutting.

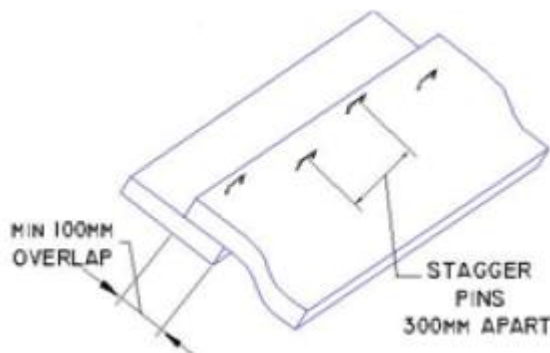


Figure 21: Overlap detail when high surface flow is not expected⁸.

4. Transition points – transition points (edges) with other treatments are potential weak points and should be carefully secured.
5. Care in storage and transportation – as the matting is biodegradable it should be stored carefully for only short periods of time before use (refer manufacturer for details) and care is needed in transportation and installation to ensure the matting is not torn as tears will be weak spots. If tearing occurs the matting should be replaced.
6. Toe protection – the toe of the matting needs firmly securing. Generally the matting should extend to LWL or 0.6m beyond the toe of the bank. As a coir log is proposed 1m below HWL to assist with reed bed establishment, the matting should extend to this coir log, be placed under it and wrap back over the log and be secured up slope. As the bank below HWL is not eroding the mesh will essentially be mulch where it extends below the HWL.
7. Maintenance – the matting should be regularly monitored for pin failures, tears etc. and repairs should be undertaken immediately to prevent greater failure of the matting. Once the vegetation is established (3 – 6 years) the matting can be left to disintegrate providing any non biodegradable elements, such as metal pins, are removed.

3.5 Vegetation Management and Proposed Planting

As the naturalness of the area is very important to the whole community and retention of trees and local vegetation is particularly important to the Noongar community there has been a focus on retaining,

Control Products in Slope, Channel and Shoreline Applications, Prepared by Erosion Control Technology Council, Texas, USA, May 2008, available at <http://www.ectc.org/pdf/ectc_may07_installationwithcaddpictures.pdf>.

⁸ Swan River Trust 'Best Management Practices for Foreshore Stabilisation, Erosion Control Matting', December 2009

rehabilitating and replanting vegetation throughout the site. The key elements of the vegetation management proposals are noted below.

3.5.1 Weed, Topsoil and Dieback Management

The SoC already has a weed management program in place around Minningup Pool as evidenced by dying patches of *Watsonia* at site visits in October 2020. It is recommended this program continues with a focus on areas that will be disturbed by proposed works to minimise the spread of weeds during construction. The extent of weeds will need confirming with the Superintendent prior to the commencement of works so that topsoil from infested areas is not used in earthworks.

The reserve was assessed as being affected with dieback⁹, however areas of dieback susceptible species occur within the site and so there may be dieback free areas and the topsoil from these areas can possibly be used for revegetation areas on the site.

The SoC is to engage a dieback specialist to assess the dieback status of the proposed road alignment and extent of clearing. Assessment of the areas to be revegetated is also recommended and the specialist is requested to prepare a dieback management plan for the works, based on these assessments. This plan should include advice on what soil can be moved where and where topsoil can be reused with the aim of reusing topsoil in areas to be revegetated wherever feasible.

The pine trees east of the Rowing Club are to be removed as they reduce the naturalness of the area, are spreading and many of them were killed in recent fires.

3.5.2 Overhead Hazard and Aboricultural Assessment

An arborist¹⁰ was engaged to assess the existing trees, identify impacts from and on proposed development and advise what is needed to sustain the trees long term. Trees also pose a risk to visitors from falling branches and so this risk to visitors was also assessed and actions to mitigate the risk were identified. This assessment was carried out using the International Society of Arboriculture Tree Risk Assessment Method (TRAQ) which is a method of qualifying risk through estimating likelihood of tree failure, likelihood of impact and consequences of impact to potential targets within the tree impact zone. It should be noted no tree can be made 'safe' as such a state is simply unattainable.

Tree assessment and impact reports have been prepared for the Minningup Pool Redevelopment park areas and proposed road alignments as noted below and contained in Appendix 7C

- Minningup Pool Day Use Area Upgrade – Stage 1: Preliminary Tree Assessment and Impact Report 2nd November 2020. This looks at the trees between the existing Minningup Road and the river in the vicinity of Minningup Pool and the Rowing Club. It contains a detailed and summarised description of all trees and a location map.
- Minningup Pool Day Use Area Upgrade – Stage 2 Sandy Beach: Preliminary Tree Assessment and Impact Report 18th November 2020. This looks at the trees between the existing access road and the river at Sandy Beach. It contains a detailed description of all trees and a location map. The summary of trees is in a separate spreadsheet.
- Minningup Pool Day Use Area Upgrade – Stage 3 – Rowing Club Precinct: Preliminary Tree Assessment and Impact Report 18th November 2020. This looks at the trees between around the Rowing Club and the north side of the existing Minningup Road that will be in future parkland areas. It contains a detailed description of all trees and a location map. The summary of trees is in a separate spreadsheet.

⁹Phytophthora Dieback Interpretation Report for Minningup Pool by NPC Consulting 2010

¹⁰ Jorgenson Ben, Kings Tree Care.

- Minninup Pool Day Use Area Upgrade – Road Alignments: 5th December 2020. This consists of a location map for all trees and a list summarising the recommendations for all trees that are likely to be impacted by the proposed alignments, but not requiring removal. Trees that would definitely have to be removed were not assessed. The generic recommendations in the previous reports will also apply.

These reports describe the trees that will be impacted by the proposals and assess their health and structure. Some tree removals are recommended as they are hazardous and tree management required is also identified including dead wood removal, removal of bitumen and concrete, aeration of the root zone, applying a mulch layer and fertilising. The indicative cost for this management is included in the overall indicative costs.

The assessment has resulted in adjustments to the road and parking layouts in the master plan and to the location of some facilities and items of infrastructure with some significant changes noted below.

- The lookout that was proposed for under the large western spotted gum *Corymbia maculata* at the southern end of the terraces will now be omitted due to the risk of falling branches as there is a lot of dead wood in the crown of the tree and if visitors are spending periods of time under the canopy the risk is increased.
- The disabled accessible path that is proposed for below the above tree will be located down slope as much as possible to reduce impact on the western spotted gum and root pruning will be allowed for, but as people are moving through the area the risk has been assessed as acceptable.
- The disabled accessible path and associated fishability deck will be omitted as the tree east of the retaining walls is hazardous making using the path a risk.
- The memorial seat by the fallen tree needs relocating.
- The picnic area and parking on the shoreline east of the Rowing Club will be moved further east to avoid a large blackbutt (*Eucalyptus patens*).

Other general recommendations include

- Not locating infrastructure under trees especially where there is dead wood in the crown, but also so it doesn't damage the root structure.
- Ideally keeping infrastructure beyond the tree protection zone (TPZ) which roughly extends to the dripline including avoiding filling those areas. Some damage can be tolerated providing this is compensated elsewhere in the zone with the arborist the best person to make these judgements.
- Avoiding damage to the structural root zone (SRZ) which is proportional to the tree trunk (approximately 5m radius for very large trees).
- Australian Standard AS4970 – 2009 Protection of trees on development sites should be referred to during the construction stage.
- Pruning should be done in accord with AS4373-2007 Pruning of Amenity Trees.
- Mulching (100mm thick) of the TPZ is recommended for all trees and where this is not feasible even reduced areas of mulch should be applied as some is better than none.
- Where tree root zones have previously been impacted, such as in the excavation area behind Sandy Beach, replacing voids/cuts in the root zone with uncompacted soil is acceptable.
- The installation of any services should consider potential impact on trees including considering the use of directional boring rather than trenching in the vicinity of trees.

Minninup Pool Day Use Area Upgrade – Road Alignments: 5th December 2020, assesses the likely impact of the new roads and car parks on existing trees on the edges of the development (excluding those trees that will need to be removed and there is no likelihood of their retention). This was needed because although the infrastructure was located to minimise the impact on trees, the impact of the development on the trees can

be underestimated, including trees where the impact is primarily to the root zone and not the actual tree trunk and the report advises what trees can be retained and what management is required to sustain their retention. This report will continue to be referred to during the preparation of the construction drawings in Part D.

it is strongly recommended that all tree management works be carried out or supervised by a certified arborist and must be done so in accordance with AS4373-2007 Pruning of Amenity Trees. Budget allowances have been made for an arborist at various stages of the project and so engaging a project arborist or referring to a relevant SoC representative on an ongoing basis is recommended so there is continuity in advice and management.

3.5.3 Amenity Tree Planting

New trees are proposed for throughout the site for various reasons such as to replace removed trees, to provide shade and shelter and to maintain the naturalness of the site. The new trees need to be low risk species and they need to be local to the area. Large (70 – 100litre with a height of 2.5 – 3m) advanced trees have been requested by SoC if available so they are established more quickly. The trees will need to be good quality and in accord with Australian Standard AS 2303:2018 Tree Stock for Landscape Use unless directed otherwise by the Shire Representative. SoC has requested the use of Local Provenance species (say within 30km of Collie) but seed does not need to be Local Provenance (though it is desirable), so there is a considerable lead time involved with producing these trees and so the tree supply should be organised as soon as funding is available.

- Jarrah trees (*Eucalyptus marginata*) – used on the upper elevated areas
- Paperbarks (*Melaleuca preissiana*) - used where space is more limited and close to the river.

Other trees that could be considered are swamp paperbark *Melaleuca raphiophylla* and WA peppermint *Agonis flexuosa* (though this can restrict views to the river depending where used) and additional species may be identified through discussions with stakeholders.

3.5.4 Amenity Shrub Planting

Shrub planting is proposed for a number of locations for a variety of reasons such as creating spaces and screening, stabilising steep areas and the foreshore, giving visual interest (colour and texture), attracting birds and other wildlife and showcasing bush tucker and useful plants. Local species are proposed and they should be from Local Provenance species (say within 30km of Collie) but seed does not need to be Local Provenance (though it is desirable) which may need a lead time of 2-3 years to produce the plants.

The report by Ecoedge, Reconnaissance and Targeted Flora and Vegetation Survey at pt. Reserve 34343, Collie, 2018 which is discussed in Part A, together with casual observation of the general area during site visits gave a preliminary list of plants to be considered for the amenity planting as follows.

- Collie grevillea (*Grevillea ripicola*)
- Myrtle (*Hypocalymma angustifolium*)
- Bottlebrush (*Callistemon glauca*)
- Basket flower (*Adenanthus obovatus*)
- (*Hibbertia stellaris*)
- Running postman (*Kennedia coccinea* or *K. prostrata*)
- Snakebush (*Hemiandra pungens*)
- Kangaroo paw *Anigozanthus mangleissi*
- Catspaw *Conosylis* sp.
- Lemon scented darwinia *Darwinia citriodora*

Smaller stock are preferred as they establish better in the long run, such as tube stock or maybe 140cm pots (planted at approximately 1m centres dependant on species) and they will be irrigated for at least the first year, depending on seasonal conditions. Clean local topsoil will be used to backfill excavated areas where feasible and appropriate and all areas will be mulched 100mm thick.

3.5.5 Rehabilitation Areas

Section 3.4 identifies the need for foreshore revegetation to stabilise the foreshore (in association with temporary fencing, coir logs etc.) and other disturbed areas such as old road alignments will also need revegetation together with appropriate site preparation techniques (appropriate use of local weed free topsoil etc.). Drainage swales and basins may also need establishing. Policies and guidelines are available for foreshore management such as the Water Notes that are available on the DWER website and species need to be from the Local Provenance (say within 30km of Collie) if feasible and practical. Some of the trees and shrubs noted above may be appropriate but specialist riverine vegetation will also be required for bank stabilisation and protection such as reeds and rushes. The flora survey notes the following species occur in the vegetation communities on site.

- Spreading Sword-sedge *Lepidosperma effusum*
- *Cyathochaeta avenacea* (peaty swamp)
- *Gahnia decomposita*

The selection of plant species that are suited to their position in the landscape is particularly important along the river's edge and the zones illustrated in the figure below (have been used to select river edge species). The emergent zone – lower and the submergent zone will not be planted as it is expected they will naturally revegetate once the upper zones are revegetated due to the likely stability of the water levels resulting from the re-established weirs.

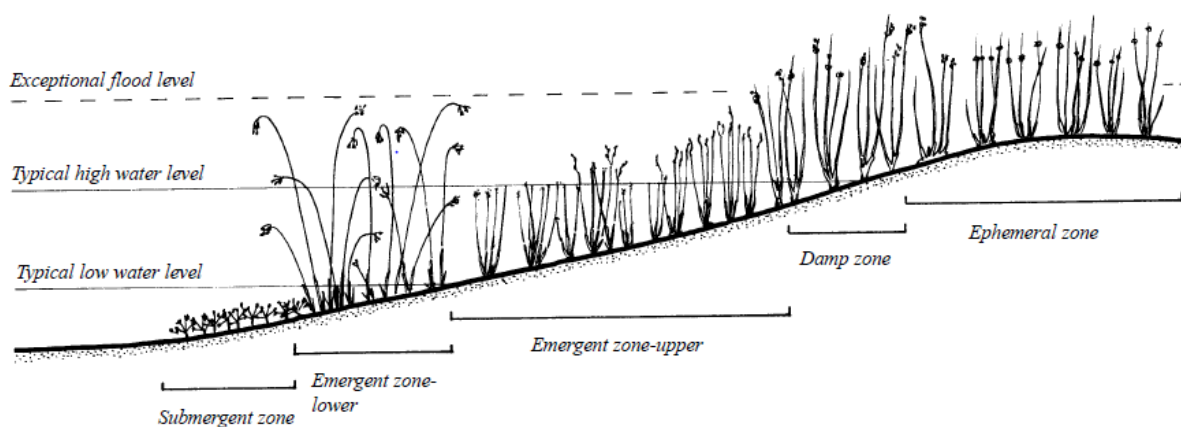


Figure 1: Wetland zones and typical distribution of some sedge and rush species.

Figure 22: Taken from Water and Rivers Commission (WRC) 2000, Using rushes and sedges in revegetation of wetland areas in the south west of WA, Water and Rivers Commission, River Restoration Report No. RR 8¹¹

¹¹ Water and Rivers Commission 2000, Using rushes and sedges in revegetation of wetland areas in the south west of WA, Water and Rivers Commission, River Restoration Report No. RR 8
<https://www.water.wa.gov.au/water-topics/waterways/managing-our-waterways2/river-restoration-manual>

Tube stock or cell plants will be used at close spacing (depending on species). Occasional mature trees will be used in the rehabilitation areas on Sandy Beach so that shade is provided more quickly. The plants will be planted at the beginning of winter and not irrigated (though mature trees will require watering for at least 2 years) and infill plantings of 20 – 30% will be allowed for in the second year. Areas will be mulched where feasible.

Where civil works occur in areas of bushland and disturbance consists of minimal cut and fill or minor disturbance to the natural topsoil or root mat, the areas will be graded to natural profiles (where necessary and may be finished by handwork) and mulched to encourage natural regeneration; planting will not be required.

3.5.6 Planting details

To improve the likelihood of the proposed plantings being appropriate for the area and practical to produce, a botanist¹², who also propagates plants, was engaged to look briefly at the plants, particularly the rushes and sedges that were growing along the river. After a site visit on 20th January 2021 a plant list was prepared that notes species observed, habitat, ease of propagation and whether it is introduced to the area, see Appendix 8C. It was acknowledged that other revegetation specialists such as the Blackwood Environment Community Nursery and the Leschenault Community Nursery, Leschenault Landcare Group and DBCA may also be able to assist. The local Noongar community and The Friends of the Collie River may also want to input to this project.

Further analysis was undertaken of the reed / rush species noted on site (noted*), together with some referred to in the WRC report to determine which wetland zone they're suited to.

- **Cyperus polystachyos*? – noted in Damp zone
- **Ficinia nodosa* syn *Isolepis nodosa*– Knotted Club Rush – Ephemeral to damp zone
- *Gahnia trifida* – Coast Saw sedge – Damp zone
- **Hypolaena exsulca*? Possibly *Leptocarpus laxus* or *Chaetanthus aristatus* –winter wet depressions so probably damp zone
- **Juncus kraussii* subsp *australiensis* – Shore Rush – Damp zone to 30cm into emergent zone
- **Juncus pallidus* – Pale Rush – Ephemeral to damp zone
- **Lepidosperma longitudinale*- Pithy sword sedge - Damp zone to 20cm into emergent zone
- **Lepidosperma squamatum* – observed in Damp – Ephemeral Zone

The Master Plan (see Appendix 2C) illustrates areas of proposed planting and these areas are identified and described briefly below together with the planting rationale for the area. The preliminary locations of these areas are shown on Map 4 Indicative Planting and Treatments which is in Appendix 6C.

Sandy Beach – generally a moist habitat especially near the river.

- Area A - Rehabilitation area south of picnic shelters which was the old access track into the Bedroom. Primarily colonising species will be planted with occasional large trees as people should not be accessing these areas, so planting trees that might drop branches is acceptable.
- Area B- Scattered infill planting proposed between the parking area and the river –These plants are to provide interest and to encourage visitors to stay on the paths.
- Area C - Rehabilitation area south of the beach (north of the rope swing) – Area A plants to be used for this area with no *Melaleuca preissiana* or *Eucalyptus rudis*.
- Area D – Sandy rehabilitation area north of the beach – Primarily colonising species suited to moist areas with the *Anigozanthus flavidus* , *Acacia pulchella* , *Eucalyptus rudis* and *E. patens* planted away

¹² Shedley, Erica, Southern Flora.

from the boundary on the beach and road boundary so people are not close to them (as they are prickly, itchy, drop branches etc.). If this area is to be a drainage basin, rushes and sedges will be used in the basin.

- Area E River Edge Planting – These plantings are to stabilise the foreshore long term and coir logs will be used on the river's edge to assist the reed establishment. Plants potentially hazardous to visitors will be excluded and the foreshore areas will be fenced during establishment. Advanced *Melaleuca preissiana* will be planted as shade trees on the beach with shrubs, small trees and reeds along the water's edge.
- Area M – Non irrigated lawn area, 10m wide on the riverside of the paths and picnic tables. A sterile creeping grass cultivar is proposed, possibly Village Green a male sterile kikuyu grass but the area could also just remain as sand.

Minningup Pool – Dry habitat on upper levels with a moist habitat by the river and in the low lying areas.

- Area F - Low amenity planting - Plantings are to give visual interest and spatial separation while still allowing views over them to the river so the plants will generally be no more than 600mm – 1m high. A few advanced jarrah trees *Eucalyptus marginata* will also be planted in these areas, as in the long term these will complement the existing jarrahs and frame rather than block views.
- Area G – Rehabilitation with low amenity planting - These areas are mostly sections of redundant road and paths in the entry area which will be revegetated with the same plants as are used for Area F so there is continuity either side of the road.
- Area H - Bank plantings (vicinity of old diving board and welcome area) –These plantings are for visual interest and to stabilise the bank areas with most of these areas also being in the root zone of established trees, mostly jarrah trees. Plantings are to be low, up to 1.2 m high.
- Area I –Occasional Drainage Line - This is currently mown grass and the current profile is to remain but sedges and rushes are proposed for the outfall area where the stepping stones are being installed. Mulch will be laid under the trees and existing lawn grasses sprayed out as necessary.
- Area J – Existing Drainage Line - a strip of medium high shrubs and an occasional advanced tree are proposed for area adjacent to the rushes to reinforce the drainage line and create spaces and interest in the park.
- Area K Foreshore – Tall shrubs and rushes / sedges, combined with coir logs, will be used to stabilise the river's edge between the hardened access points. See section 3.3 for the various stabilising treatments that will reinforce the river's edge until the planting can establish. Particularly a coir log will be placed 1m beyond HWL to encourage reed stabilisation along the HWL. Fencing will protect these areas until they are established and tube stock used. Low planting or trees (with trunks that will frame views) will be used in certain locations to maintain the views to the water from the picnic areas.
- Area L - Bush Garden - The naturally regenerating shrubs by the fallen tree, will be supplemented with a wide variety of attractive local plants to show case the beauty of the local flora. There will be rushes on the shoreline, with wetland plants set amongst the branches of the tree and jarrah forest plants at the butt end of the tree, just 1 – 3 of each plant, all to soften but not hide the tree. Any special plants that can be obtained such as *Macrozamia riedlii*, will also be added. Plants from this list will also be used to create a small planted area around the remnant *Macrozamia riedlii* in the picnic area, to give it some protection, and small areas between the central car park and the path will be planted as they are too narrow to have as irrigated lawn.

Plant lists with design criteria have been prepared for these areas see Appendix 9C and the flowering times are noted with a view to optimising the flowering at any time of the year. Planting plans will be prepared in Part D for each area, based on the plant lists. These plans will be accompanied by plant lists for each area detailing quantities required together with planting notes applicable to each area. Standard planting details

have been prepared for the range of planting types (trees, shrubs, tube stock) and general notes regarding spraying and plant supply will be included in the specification.

The staging and timing of the works and who will undertake the work will influence what plants are required at any one time and so overall plant totals are not supplied in Part D. Plant availability or propagation success may also mean species are unavailable and substitutions are required in which case reference should be made to the design criteria for each of the planting lists to ensure an appropriate substitute is selected.



Figure 23: L – C: Local Shrub Species

R: Rush species

3.5.7 Lawn Areas

Sandy Beach will have areas of dry grass established between the beach and the bush for visitors to sit on. The local couch grass species that is already growing on the river's edge is introduced *Cynodon dactylon* and so will not be used. Marine couch *Sporobolus virginicus* which comes from the South West is understood to have a poor drought tolerance, and so unless another native grass species can be identified it is proposed to use a sterile creeping grass cultivar possibly Village Green a male sterile kikuyu grass. The grass will ideally be established in autumn when the soil is still warm and will not receive any irrigation.

The main Minningup Pool area is to have irrigated grass that will withstand the high levels of use and be comfortable to sit on. Some areas of proposed lawn will need hardstand/compacted gravel removing, other areas will need aerating and in some places the existing grass will need spraying out and possibly skimming off to enable the new grass to be established. Clean soil and soil conditioner may need to be brought in. The grass species will be confirmed in Part D

The lawn areas will be established in the well-used parkland areas and will be broken up by areas of mulch under groups of trees and this will give a more informal natural appearance. There will be no edging between the grass and the mulch or between lawn areas and planting beds, to maintain naturalness.

3.6 Services

As services (power, water and sewer) are to be provided to the nearby camping area River Engineering was requested by SoC to investigate the provision of services to the Minningup Pool Foreshore Area¹³. This report is a 'high-level conceptual overview of the required services, particularly focused on spatial requirements and infrastructure provisions'. The report does not allow for arborist assessments of the potential impact on trees or visual considerations of the proposed infrastructure such as pumping stations and transformers. These preliminary concepts need refining to retain the amenity of the area (currently transformers and

¹³ River Engineering, Minningup Pool Tourism Project – Servicing Report, October 2020