CURTIN UNIVERSITY PROJECT DELIVERY GUIDELINES

LIVING KNOWLEDGE STREAM DESIGN GUIDANCE



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CONTACT

Portfolio Manager Public Places Curtin University Kent Street Bentley WA 6102 GPO Box U1987 Perth WA 6845 Tel: +61 8 9266 2031 Email: gardens@curtin.edu.au

DOCUMENT CONTROL

The Living Knowledge Stream Design Guidance has been prepared for Curtin University by Syrinx Environmental PL in collaboration with sync7 and Dr Noel Nannup (Elder custodian).

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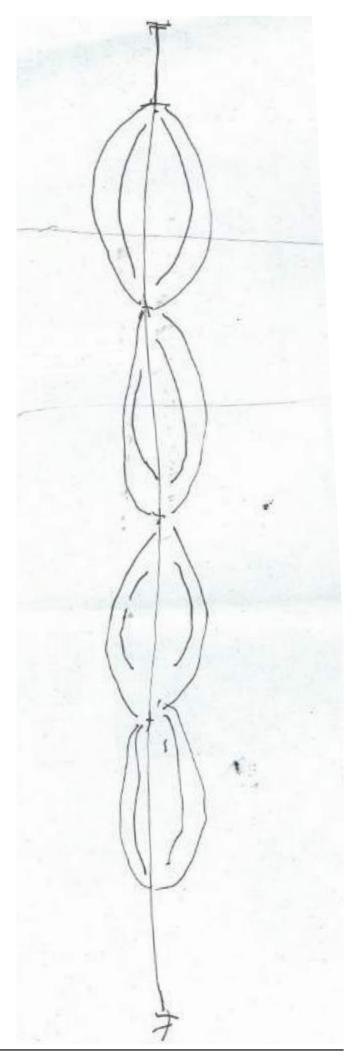
PART 1.0 INTRODUCTION

1.1 THE LIVING KNOWLEDGE STREAM

The 'Living Knowledge Stream' (the Stream) represents the major green infrastructure and Indigenous cultural trail network within Greater Curtin. It is a composite of different functional and structural ecological elements, rooted in the character of the Curtin site and its people and their connection to water. The Stream provides a high amenity landscape, reinstating cultural connections with water, and providing a platform for education, art and technology installations. The Stream provides enormous opportunities for integration with many schools of learning at Curtin and has logical ties to key research centres. In its various expressions, the Stream is seen as a premier outdoor research and learning laboratory.

> The Songlines provide connection to earth and country. Aboriginal perception of country is not just at a surface level, but a deeper understanding of the Dreaming or Nyitting period before living memory. Nyitting means 'cold', 'ice age', 'cold time' or 'ancestral times'. Dr. Noel Nannup

FIGURE 1: SKETCH COURTESY OF DR NOEL NANNUP, 2012



1.2 THE PURPOSE OF THE DOCUMENT

This is a Design Guidance document to assist 1. Provide physical, interpretive and program Curtin in ensuring that the Living Knowledge Stream and its connecting elements are ultimately designed and constructed to deliver a fully integrated ecological, cultural, educational and interactive landscape while maintaining its water management functions. A key objective of this document is to ensure the Indigenous importance of the 'Kujal Kela' (Twin Dolphin) and 'Djiridji' (Zamia) Whadjuk Nyoongar Songlines embedded in the Stream and its infrastructural network, are interpreted in a visionary yet pragmatic way.

All new developments that abut the Stream are required to engage with this key structuring landscape element imaginatively. As such, design guidance contained in this document is 4. Assist Curtin's staff and resources (including focused on creating tangible experiences through the practical understanding of place and the relationship between water, soils, flora, fauna, seasonality and people within the specific context of the site.

THIS DOCUMENT IS TO BE USED TO FACILITATE THE FOLLOWING:

guidance to both Curtin University and individual developers for the detailed design of the Stream network

2. Provide Curtin with an appropriate toolkit that can guide the ongoing long-term recovery and restoration of key ecological and cultural nodes across the site independent of development staging and timelines

3. Establish a precedent for the integration of outdoor learning, interpretation, art and technology installations to complement Curtin's teaching curriculum

various specialised centres and research institutes) to drive the development, assessment and delivery of initiatives and themes outlined within this document

5. Encourage an ongoing commitment to future water management, including its capture, conveyance and reuse to enhance ecological and cultural connections and interpretation throughout the public realm

1.3 STRUCTURE OF THE DOCUMENT

PART 1: INTRODUCTION (THIS SECTION)

of the document and the process involved in developing the content.

PART 2: VISION

Outlines the vision for The Living Knowledge Stream.

PART 3: DEFINING THE STREAM **NETWORK**

Provides an overview of the key themes, character and development influences which inform the structuring elements and define the Living Knowledge Stream network.

- Defines the regional context, the story, and the objectives for the Stream
- Defines the structuring elements and extent of the Stream network
- · Defines the structuring elements in detail of the Songlines and Character Zones

PART 4: DEFINING THE PALETTES

Outlines the character, stories, planting and materiality influences to assist designers and developers in achieving the vision set out in Part 1 and Part 2.

- Defines the key cultural and ecological stories across the Stream network
- Defines the hard and soft material palettes

PART 5: DEVELOPER GUIDANCE

Describes the purpose, structure and context Provides specific design guidance and requirements for each of the Stream Typologies

- Defines the Stream Typologies within the network
- Defines design integration criteria for water • management and ecological enhancement
- Provides design criteria for spatial arrangement
- · Provides design guidance for materiality, planting, artwork, etc
- Provides design guidance for ephemeral/ programming response - temporal event spaces, outdoor teaching spaces, etc

PART 6: DELIVERY

Outlines the key requirements and conditions for the formulation, review and approval of design and interpretation features within the Stream network.

- Describes the delivery process for the Stream ٠
- Roles and responsibilities •
- Reference Group involvement •
- Design review and approval process

PART 7: APPLICATION OF **GUIDELINES**

1.4 THE PROCESS

WRITTEN STUDIES

A number of studies have preceded the work that Key reference documents are the Local Water forms the basis of this document.

Those highlighted here should be used as additional reference documents in the design process as they outline specific guidance and regulatory compliance requirements which are not repeated in this document.

As such, this current Living Knowledge Stream Design Guidance should be seen as part of the suite of documents Curtin has to guide the delivery of the Greater Curtin Master Plan.

Management Strategy (LWMS) and the LWMS Implementation Plan for the Local Water Management Strategy, which contains specific requirements related to flood management, hydraulics and water quality improvement, and contains the complete hydraulic infrastructure drawing set.

There will be additional documents prepared that may also be relevant as reference materials and users of this document should ensure they seek an understanding of these ahead of commencing a design process.

KEY REFERENCE DOCUMENTS

Bentley-Curtin Specialised Activity Centre

Department of Planning, Lands and Heritage 2018. Bentley-Curtin Specialised Activity Centre - Specialised Activity Centre Plan. Western Australian Planning Commission, W.A.

Curtin Academic Heart Framework

Curtin University 2013. Creating the City of Innovation Part D - Greater Curtin Academic Heart. Curtin University, W.A.

Curtin University Biodiversity Study Syrinx 2012. Curtin University Biodiversity Study. Curtin University, W.A.

Greater Curtin - Integrated Urban Water Management Strategy (IUWMS) Syrinx 2013. Greater Curtin - Integrated Urban Water Management Strategy. Curtin University, W.A.

Greater Curtin Local Water Management Strategy Syrinx 2017. Greater Curtin Local Water Management Strategy. Curtin University, W.A.

Greater Curtin Master Plan

Curtin City Project Group 2013. Creating the City of Innovation Part B - Greater Curtin Master Plan. Curtin University, W.A.

Greater Curtin Stage One Development Guidelines

Curtin University 2016. Creating the City of Innovation Stage One Part A - Greater Curtin Stage One Development Guidelines. Curtin University, W.A.

Tree Replacement Plan For Black Cockatoo Habitat Improvement

Syrinx 2014. Tree Replacement Plan For Black Cockatoo Habitat Improvement. Curtin University, W.A.

ORAL STUDIES AND KNOWLEDGE SHARING

This document is the result of an iterative consultation and review process, which included numerous workshops and site walkovers with Syrinx, sync7, Dr Noel Nannup (Elder/Custodian and Traditional Ecological Knowledge (TEK) consultant), and The Centre for Aboriginal Studies (CAS) and Curtin staff. The inclusion of Aboriginal knowledge and wisdom and active engagement by Aboriginal people is a developing area to ensure long term equitable roles in biodiversity management. Traditional Ecological Knowledge (TEK) a corre component of conservation legislation (e.g. Convention of Biological Diversity 2004

It builds on work originally undertaken with sync7 and Dr Noel Nannup in 2012 during the master planning process, which identified two key Indigenous Songlines that intersect on university grounds. These Songlines were ground truthed as part of this current study, with key nodes and linkages along the walking trails identified.

This document communicates guidelines for appropriate interpretation that explores the interconnected relationship between the Songlines, water and ecology. An oral recording of this process is held by Curtin and can be accessed with permission from the Curtin Reference Group at CAS.

wisdom and active engagement by Aboriginal people is a developing area to ensure long term equitable roles in biodiversity management. Traditional Ecological Knowledge (TEK) is now a core component of conservation legislation (e.g. Convention of Biological Diversity 2004 and Australia's key piece of environmental legislation, the Environment Protection and Biodiversity Conservation (EPBC) Act 1999). The EPBC Act includes TEK as 'a partnership approach to environmental protection and biodiversity conservation' that recognises and promotes 'indigenous peoples' role in, and knowledge of, the conservation and ecologically sustainable use of biodiversity'. Hence, TEK is seen as fundamental to contemporary natural resource management and, through this, to more resilient social-ecological systems¹.

TEK has been embraced extensively throughout the process of this project by the project team.

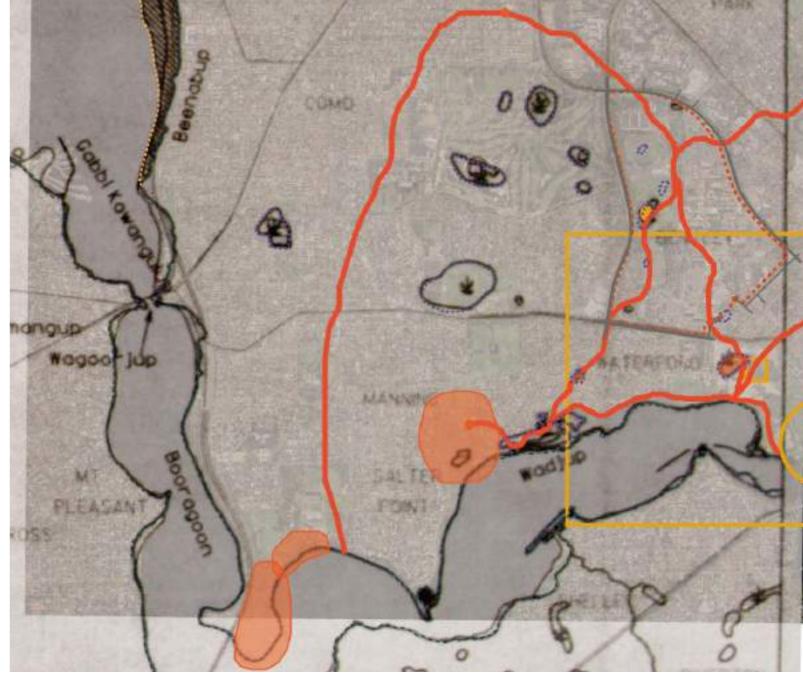


FIGURE 2: INDIGENOUS SONGLINES AND SITES OF SIGNIFICANCE

1. Prober et al. 2011. Australian Aboriginal peoples' seasonal knowledge: a potential basis for shared understanding in environmental management. Ecology and Society 16(2): 12.

PART 2.0 VISION

2.1 INTRODUCTION

The Living Knowledge Stream (the Stream) concept was embedded into the Greater Curtin Master Plan in 2012 and implementation of the Stream forms a substantial component of achieving the overall Greater Curtin Master Plan and Vision.

This document provides a framework that considers the Stream as an infrastructural and interpretive landscape network across Curtin University and supports the six guiding principles embedded in the Master Plan.





The plan for Greater Curtin embeds a progressive strategy to achieve sustainable development outcomes. Feeding and supporting the future city is a network of integrated infrastructure systems designed to anticipate the growth of the future city, and supported by strategies that will enable adaption to accommodate innovation in services provision.



PLATFORMS FOR PARTNERSHIPS

The approach to architecture and urban planning is embedded in this concept, promoting the delivery of spaces that facilitate knowledge networks, establishing an attitude to architecture of open plans and the provision of spaces for interaction and community, enabling the evolution of a city that thrives on collaboration, diversity and innovation.



LIVING LABORATORY

The evolution of the city, its design, construction and life, will provide a focus for education and life-long learning, exploiting academic and research opportunities, and providing platforms for collaboration, innovation and the exchange of knowledge. The evolution and delivery of the master plan will provide opportunities for and be inclusive and draw on the knowledge and experience of its resident communities.



NETWORKED

Embedded within the Greater Curtin structure is an integrated movement network that provides access to convenient and attractive public transport, and transit enabled streets that are safe, walkable and cycle able. This network will extend strong links beyond the city, effectively connecting the Greater Curtin community to its neighbourhood, to Perth and beyond into the region.

COLLECTION OF CULTURES

Greater Curtin will be home to a diverse and integrated community. It will be a vibrant place characterised by intimate, local, human scale neighbourhoods with easy access to everyday needs. It will be an environment that enables its residents to live, work and play in Greater Curtin.

FIGURE 3: GREATER CURTIN MASTER PLAN PRINCIPLES





DISTINCTLY

Greater Curtin will grow from established foundations. The distinctive characteristics of its land and cultures providing the building blocks for the future city, establishing the framework for the evolution of a place that is responsive and respectful of its heritage, looking forever forward from its past.

2.2 THE VISION

The vision for the Stream is to ensure that Greater Curtin connects people with place, regardless of their cultural backgrounds, through an immersive local experience focused on revealing the richness of the ecological and cultural landscape.

Essentially, the Stream is intended as a surface expression (water, vegetation, materials and program) of a richer and more complex story. It is a story of ecological and cultural *recovery, connection* and *knowledge sharing*, encompassing the social, cultural, physical, and spiritual elements that make up the layers of life and determine community and environmental wellbeing.

The Stream and the activities it supports celebrate a new, modern Curtin University culture, which, via connection and knowledge sharing, is inclusive, accepting and invitational.



PART 3.0 DEFINING THE LIVING KNOWLEDGE STREAM

The Curtin Living Knowledge Stream Design Guidance

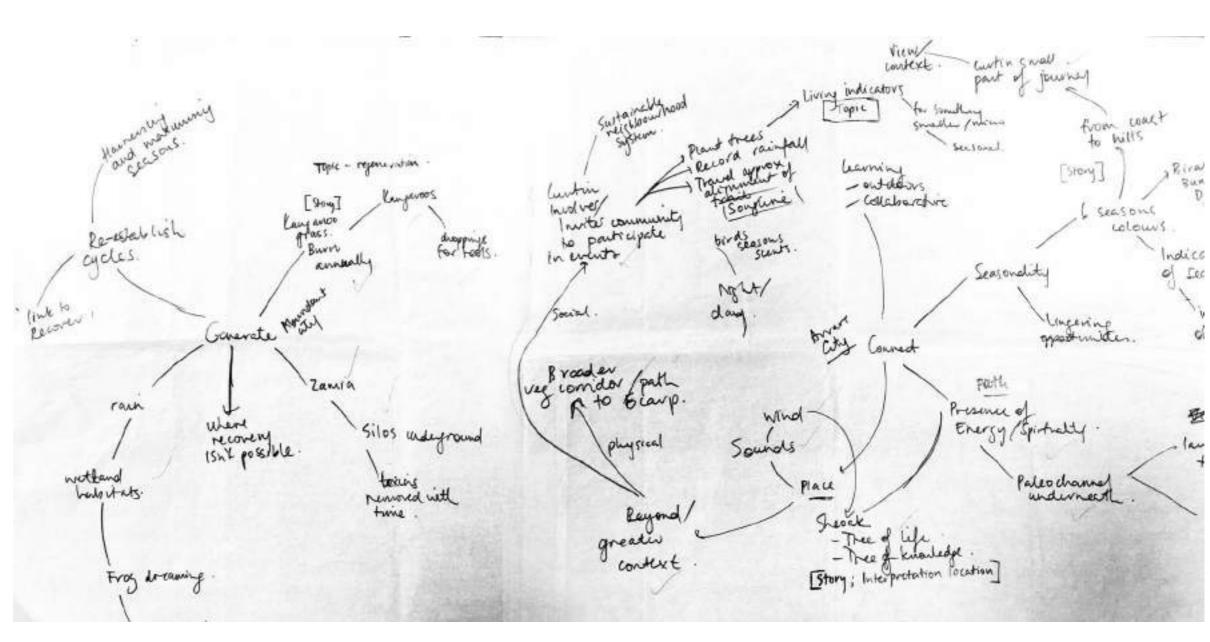
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3.1 DEFINING THE LIVING KNOWLEDGE STREAM

The Stream in its entirety forms an integrated network of interpretive, landscape and water management features that flow across the site and provide an ecological and cultural landscape based on an interconnected system of people, ecology and water. There are two key northsouth and multiple (predominantly) east-west structuring elements.

The location of the Stream is critical to the objective of celebrating and recovering the story of water and our relationships with it. The location aligns spatially with wider connections to the Swan and Canning River systems, following the alignment of a former river channel (paleochannel), the chain of predevelopment wetlands, existing groundwater springs and **'Kujal Kela'** (Twin Dolphin) and **'Djiridji'** (Zamia) Songlines which are ultimately linked to the watercourses and wetlands.

The Stream also incorporates management of stormwater within it, hence part of the Stream network is a multi-functional constructed waterway and swale network, which are water sensitive urban design (WSUD) components. These reflect the functions of a natural stream as far as practicable within the context of its urban setting and enable collection, conveyance, storage, treatment, and reuse/infiltration of stormwater within Greater Curtin.



...We can then bring this type of information to people that are studying there, to realise that there is way, way, more to what Aboriginal people are about and it's not necessarily just the story, song, dance, and art. It's a deeper, deeper thing, it's spiritual... When opportunities like this come along, where we can articulate it as Aboriginal people and what it means to us and where it is, despite all this new world, we are still hanging on to that old way, we still know it, we still understand it, and like that old way, it is all about sharing. - Dr Noel Nannup.

3.2 DEFINING THE STORY

RELATIONSHIPS

Experientially, the Stream is conceived as an and understand complexity. ecological and cultural landscape built on an understanding of the relationships between water flow, the energy this emanates, and the life it supports.

The story of these relationships is embedded in the design of the Stream, its location, its form, and its elements and, as such, the Stream is the key interpretive feature and storyteller. The story is also to be told in artworks, teaching and learning curricula, programming, and incidental conversations—a universal oral tradition which becomes part of the cultural fabric of Greater Curtin and beyond.

The Stream design is informed by both Traditional Ecological Knowledge (TEK) and westernscientific knowledge, and seeks to communicate this unity by creating an immersive experience in a restorative landscape.

TEK is based on large-scale interconnectivity between systems (geology, water, vegetation, fauna) and the processes (physical and spiritual) sustaining them. This aligns with the contemporary western-scientific definition of systems ecology, and as such TEK and mainstream science are well aligned. TEK , however, contributes a highly integrated sense of ecological cycles, plant-animal interactions and natural climate change developed over thousands of years of observational science and interaction with the landscape. TEK also uses pattern thinking and holistic approaches to map

Embedding TEK into the Stream acknowledges the many layers and deeper connections that exist, and helps encourage a multi-dimensional perspective in appreciating the values of the land and water within Curtin.

The stories collected are about respecting old memories and creating new ones to deepen and evolve connections to place. Artistic, creative responses through different plant, landscape or architectural forms, for example, are intended to provide both strong physical connections to the Curtin landscape and offer comfort and security of place, whilst other elements offer change to refresh and reignite connections to place.

TEK and the cultural stories used to inform the Stream come from Whadjuk Nyoongar people of this area, as told to Dr Noel Nannup who is the Elder with authority over this area.



The Curtin site sits on the Swan Coastal Plain within the large, deep (15 km) Perth Basin, which was formed ~200 million years ago and which has been infilled over progressive sea level changes with layers of sediment and water. The depth of water in this giant 'bucket' is about 4.5 km and is held in four different aquifers. The shallow (Swan) aquifer is 70 m deep, and this is the aquifer that forms most of the wetlands and springs, including those within Curtin. This groundwater is the lifeblood of our ecosystems and the most vulnerable due to over-extraction and pollution.

CONNECTIONS

The land underlying Greater Curtin is part of a much larger landscape linked by water catchments, subterranean and surface water features, plant and animal habitats, and people and animal movements.

The Swan and Canning Rivers are significant sites for Nyoongar people and as such are listed on the Register of Aboriginal Sites under the Aboriginal Heritage Act 1972. Although the Stream is less than 2 km long, its linkage to these rivers adds to its significance, and its ecological and cultural connections make it part of a much larger, interconnected system that spans well beyond the Perth region.

Ecologically, the Curtin site captures a fragment of the wider climate and geological history of the Swan Coastal Plain. This is a story of sea level rise and fall, of sediments deposited by rivers and floodplains filling in wetlands and creeks, a story of wind-blown dunes forming hills and swales, a thin veneer of land overlying buried creeks and an expansive groundwater reservoir.

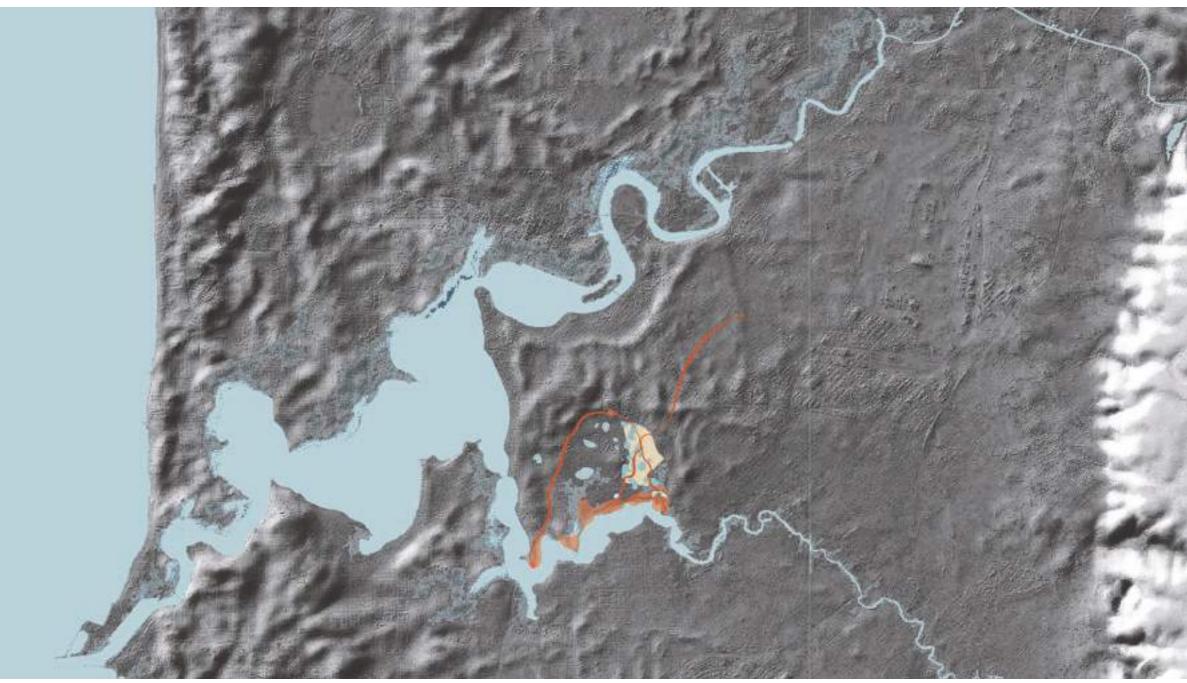


FIGURE 4: SITE CONTEXT, SWAN COASTAL PLAIN

CONNECTIONS

Within this wider framework, the Curtin site has its own pattern, largely linked to groundwater, which defines its sense of place. The vegetation and fauna that define Curtin respond to the interactions between water, topography, and soils at macro- and micro-scales.

The topography is variable with a high ridge running along the eastern boundary grading down to interdunal depressions to the west, which support a chain of wetlands oriented northsouth. The topographic changes are mirrored by shifts in the dominant vegetation associations.

The dune ridge is comprised of Bassendean sands—bleached, quartz materials overlying laterite—and is characterised by Banksia-Jarrah Woodland (*Banksia attenuata, Eucalyptus marginata*). Many plant species, including the banksias, tap into the shallow groundwater table to supplement their water requirements in summer when soil moisture levels are low.

The vegetation transitions into Banksia Woodland on the sandy slopes (*Banksia attenuata*, *Banksia menziesii*), to Marri-Sheoak Woodland along the flats. Melaleuca Woodland (*Melaleuca rhaphiophylla*, *Melaleuca preissiana*) characterises the wetlands.



The groundwater supports a rich biodiversity. The trees on the University grounds—banksias, marris, jarrahs, sheoaks—and the deeper rooted shrubs tap into the groundwater for their water supply. These support the Carnaby Cockatoos and a myriad of other fauna dependent on their nectar, bark, hollows, leaves and shade. The wetlands depend on this water to sustain the paperbarks, rushes, sedges, aquatic invertebrates and other fauna, including frogs and long-necked turtles. Restoring groundwater levels is key to restoring Jack Finney Lake, which is the last remaining wetland within Curtin. The groundwater also forms the springs, which, in turn, once supported their own permanent water flow dependent biodiversity.

3.3 THE WATER STORY

The water cycle describes the continuous movement of water on, above and below the surface of the Earth.

At a local level and at the scale relevant to the water story interpreted in the Stream, this cycle is The locations and various expressions of the viewed as the flow and energy of water as it falls, runs, collects, infiltrates and migrates across and beneath the land to the river, sustaining life on its way. At every point, every water droplet, has a function as part of this story.

Functionally, the Stream facilitates water flow across the site and forms a stormwater management infrastructure network that enables collection, conveyance, storage, treatment, and reuse/infiltration of stormwater within a natural channel network which largely replaces conventional pit and pipe drainage infrastructure.

These approaches to stormwater management provide the opportunity to incorporate water flow visibly, and express the story of the water cycle within the Stream landscape more tangibly.

restored water flows are informed by the naturally occurring historical landscape. In most cases, the Stream aligns with a historic buried channel (paleochannel) which once connected to the Canning River. Hence, the Stream seeks to uncover, reveal and recover this water flow path.

FIGURE 5: THE WATER SETTING





3.4 THE CULTURAL STORY

The **'Kujal Kela**' (Twin Dolphin) and '**Djiridji**' (Zamia) Songlines respond to, and follow, energy flow or energy lines. These energy flows are ultimately tied to, and follow, the historic underground and surface water flows which support life. Energy flows generate a feeling of vitality where the water is healthy.

Water flow and water health are intrinsically linked to the cultural and spiritual identity and wellbeing of Aboriginal people. The land and water form an integral part of who Aboriginal people are—and they, in turn, form a part of the land and waters.

Universally, we are all intrinsically connected and drawn to water and we all depend on these flows, whether or not we have the same awareness as Aboriginal people.

This is why the sustainable management of water and the protection, restoration and sustainable use of ecosystems, formed two of the United Nations' Sustainable Development Goals in 2015.



The water flows underneath the ground as well, not just above it. So when you have a place where there's the run-off going one way and then the other, you have running through a landscape, down underneath, it's oh so easy to find when you're trained and you know what you're looking for because in the old way it was as simple as reading a landscape and looking at it and going large diameter tree, large diameter tree, large diameter tree. The reason they are there, is because they're tapped straight into copious amounts of beautiful sweet water. - Dr. Noel Nannup.

3.5 COMMUNICATING THE **STORY**

A critical component of the Stream's richness lies In order to achieve this, the following in the effective communication of the relationship between the water flows and energy flows in the landscape and the dependency of all life forms on these flows.

As such, the Stream-through its materiality and expression-aims to tangibly demonstrate the notions of respect, recovery and connection to the environment, connection to the community, and connection to the University as a place of learning, research and information exchange.

This is intended to be realized through both visible expressions of water in the landscape and more abstract, nonrepresentational expressions of the water cycle.

This includes the use of visible markers—artwork, installations, physical soils and other materials, and 'Living Indicators'. Living indicators include the particular plants and animals that respond to the different water 'types' (groundwater, surface water, springs etc).

objectives are intended to guide the Stream design process:

- Recover and reinterpret aspects of the predevelopment landscape character in a modern university town setting.
- Restore connections and linkages (physically, ecologically and culturally) across Curtin University grounds to the Canning River.
- Communicate the interconnectedness • between the water cycle and the dreaming trails.
- Facilitate recovery of the flora and fauna • associated with Indigenous cultural stories (Songlines) of the Whadjuk Nyoongar people.
- Provide outdoor knowledge sharing spaces to • continue the oral history and traditions of the Whadjuk Nyoongar people.
- Provide spaces for outdoor labs, art, technology installations and programming to occur which promote inclusiveness, experimentation and innovation through different mediums such as song, dance, storytelling and art.
- Establish a high amenity landscape through ٠ inclusion of water and water-related stories that provide recreational opportunities for the wider community.



3.6 STRUCTURING THE STREAM

GREATER MASTER PLAN PUBLIC REALM STRUCTURING ELEMENTS

The Greater Curtin Master Plan established a set of structuring elements to drive future development in a cohesive and integrated way. These elements form the key building blocks at a site-wide scale and set in place the fundamental structures and systems within which the finer grain details of design and development are to be shaped. The key relevant public realm structuring elements are:



Living Stream – This key element of the Master Plan draws on the legacy and characteristics of the historic natural landscape to define a major north–south orientated corridor connecting neighbourhoods across Curtin and focussing on aquatic and ecological initiatives.



The East-West Links – These form strongPoints of Ignition (Nodes) – The points of ignitionand formal vegetated armatures that connectare created at the intersection between the Livingpedestrians and cyclists from the existing hill-Stream and the Links. They are places of intensitytop of the Academic Heart of campus into eachand focus across community, educational,development band. They also form a critical partcommercial and ecological themes.of the water management strategy.of the water management strategy.



DEFINING THE SPATIAL EXTENT OF THE STREAM

All future development is guided by the Greater In turn, the influence of the Stream's character, Curtin Master Plan which proposes both the retention and refurbishment of existing buildings and POS as well as new development (individual buildings and super-lots); the reconfiguration of green space for active sport and civic purposes; and new and modified vehicular and pedestrian connections across the site to improve connectivity.

The land use, built form and programming that are associated with this human influence, defines the spatial extent of the Stream. This results in a defined public realm easement (the Living Stream Corridor) dedicated to achieving both the water management and broader recreational and cultural landscape objectives.

materiality and programming extends beyond this defined Living Stream Corridor to influence adjacent built form responses.

All built form in adjacent private development lots and existing and new University buildings abutting the Stream are required to engage and respond with the Stream.

FIGURE 6: SPATIAL EXTENT OF STREAM NETWORK



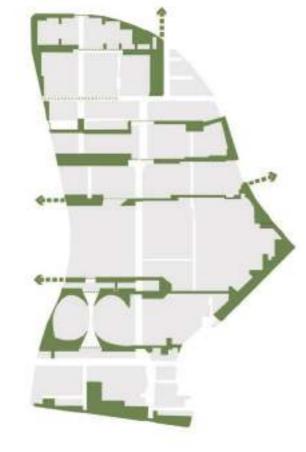


THE STREAM STRUCTURING ELEMENTS

Defining the Stream network builds and expands on these pre-defined Greater Curtin Master Plan public realm structuring elements and responds to the development context described above. Collectively, the structuring elements described below form the Stream network.

The Stream's structuring elements are organised around water flow, cultural connections with country, historic and future centres of significance or activity, and the physical movement network across the site. These elements are:





CONNECTORS

These form part of broader scale regional connectors running north-south across Curtin University grounds, connecting the Canning River to the Swan River and beyond, and strengthening regional biodiversity connections. They map the Songlines (dreaming trails) and relate to both underlying and surface water flows and energy lines.

Links

These form key 'green' linkages running east-west, facilitating pedestrian and water movement, and connecting the wider campus to the main north-south stream alignment. They provide linkages between the Songlines, relate to surface water conveyance and flow, and link 'fragmented' areas of remnant vegetation.



Nodes

These are key intersection points between the connectors and links, bringing people together and responding to significant cultural and ecological expressions in the landscape. They provide key meeting, gathering and rest points, and relate to points where water slows, is expressed at the surface, or changes direction.

3.7 THE STREAM NETWORK

Each of these broad-scale structuring elements, These zones are broad expressions of water flow, are broken down into the two **Songlines**—the 'Kujal Kela' (Twin Dolphin) and 'Djiridji' (Zamia) Songlines—and five Character Zones (distinct zones that have unique features that create a sensation of being in that particular place).

with the term Character Zone used to describe a common understanding of that place. They include the following:

- Paleochannel
- Groundwater Aquifer •
- Seasonal Wetlands
- Springs •
- Swales

Together, the Songlines and the Character Zones tell the stories of the ecological system and the connections between the Whadjuk Nyoongar people of this area and inform the design palette for the Stream across Curtin University.

FIGURE 7: THE STREAM NETWORK



Seasonal Wetlands, Springs



SONGLINES

The Songlines form regional connectors running north-south across the site and follow the two Whadjuk Nyoongar Songlines-'The Kujal Kela' (Twin Dolphin) and 'Djiridji' (Zamia) walking trails.

The Songlines reflect the flow of underground and overland water across the site, aligning with existing and historic paleochannels, wetlands, springs, surface water and groundwater flows.

These Songlines represent distinct walking trails which are associated with dreaming stories and navigation across a broader landscape to regional destinations. Each distinct path generates unique opportunities for design responses in character, expression of water, vegetation, soils, and cultural and educational activity.

Even though the sections of the trails across the Curtin site cover less than 2 km, they form a key part of the regional story and it is important that this is recognised and the link to the Canning River is maintained and reinforced.

The Songlines are described within the video recording made by Dr Noel Nannup for this project, and users of this document are encouraged to access this material to enhance their understanding of each of the dreaming trails.



aid to memory'.

(Kelly, Lynne. 2016. The memory code : the traditional Aboriginal memory technique that unlocks the secrets of Stonehenge, Easter Island and ancient monuments the world over. Sydney: Allen & Unwin.)

FIGURE 8: THE SONGLINES

······> The 'Kujal Kela' (Twin Dolphin) Songline

····· ··· > 'Djiridji' (Zamia) Songline

Lynne Kelly 2016 described the traditional Aboriginal landscape as a 'memory space on a grand scale' where 'Songlines, or Dreaming Tracks, are pathways through the landscape connecting a large number of significant locations in a fixed order-rocky outcrops, springs, mountains, valleys, caves, waterholes.

When performed, a songline is sung as a long sequence of short verses, which together form a sung chart of the ancestral being's creative journey or origin story. The ritual cycle ensured that sites were visited regularly, the knowledge performed and associated sacred paintings retouched, a further

THE 'KUJAL KELA' TWIN DOLPHIN DREAMING

The 'Kujal Kela' (Twin Dolphin) trail through The 'Kujal Kela' trail runs in an arc across the Curtin University grounds is a complex story of maintaining connections and the continuum of human history across natural climate cycles and change.

The ancestral Swan-Canning Rivers cut a channel into the sediments of the Swan Coastal Plain during the last glacial period when the sea level was about 130 m lower than its current level, and when the coastline was some 12 km west of Rottnest Island around 15-20,000 years ago¹. The specific story of the Dolphin Trail is connected to the inundation of land during formation of the modern Swan-Canning Estuary during the last interglacial period ~5-10,000 years ago.

During this time, the Whadjuk Nyoongar's land contracted significantly, and generations of connection to that now buried land was in The directional flow of underlying water has jeapordy. The Dolphin dreaming story is about an agreement made between the Whadjuk Nyoongar people and the bottlenose dolphins who continue to move between the ocean and the rivers, and who agreed to carry the messages of the ancestors through time in order to maintain Whadjuk Nyoongar connections to their ancestral lands and the 'drowned' river. This agreement was made at Salter Point on the Canning River, which is the origin of the Dolphin Trail.

suburb of South Perth between Salter Point (Triple Dolphin Dreaming) and east of Clontarf (Twin Dolphin Dreaming). Within the Curtin site, the Twin Dolphin trail extends north along the base of the hillslope and is symbolised by two springs and near-surface groundwater within the shallow aquifer; these maintain the water connection to the Canning River.

In the north-west corner of university grounds, the trail traverses the paleochannel, soaks and surface water. It then follows the western base of the lower ridge hill slope, connecting two break-in-slope springs. It exits the site in the south-east corner traversing historic damplands (seasonally moist wetlands) before connecting with the 'Kujal Kela' site.

spiritual significance for the Whadjuk people because it mirrors the energy lines tied to water flows and connections to river; hence it is important that the alignment of the storyline is respected. The trail reads as a relationship between the 'hidden' water, and the plants and animals that interact with and depend on it.

1. Playford, P. E. 1988. Guidebook to the geology of Rottnest Island. Geological Society of Australia, W.A. Division and the Geological Survey of Western Australia Perth, W.A.

FIGURE 9: THE 'KUJAL KELA' (TWIN **DOLPHIN) SONGLINE**



In essence, the 'Kujal Kela' story is about linkage and unbroken connections to ancestral land and the river through cycles of change



'DJIRIDJI' ZAMIA PALM DREAMING

The second trail, which incorporates the main The trail would have been resource rich with the Living Stream conveyance channel, is the 'Djiridji' (Zamia) trail. This trail is associated with surface flow, wetlands and the buried paleochannel. It tells the story of seasonal journeys from river to hills and the abundance of food and water.

The 'Djiridji' (Zamia) trail follows the alignment of a former tributary of the Canning River (now a paleochannel) and connects to a chain of existing and infilled wetlands that once extended between the Canning and Swan Rivers.

This trail was part of the seasonal movement of people from campsite to campsite from the Canning River to the scarp. Along this journey, the Curtin site was the summertime place in the Birak and Bunuru Indigenous seasons.

chain of wetlands acting as points of abundance providing water, fauna and flora (food), and medicine. The trail connects to the Swan River around the Burswood area and then carries on to the Darling Scarp-a winter time place (Makuru Season).

Across Greater Curtin, the 'Djiridji' (Zamia) Trail runs in a general north-east to south-west direction. In the north-east corner of Curtin, the trail traverses the northern edge of the hill slope then follows historic wetlands, connecting to what is now known as Jack Finney Lake. It then follows the paleochannel down to the south-west corner of the site and connects with the wetlands within Waterford to the Canning River.



FIGURE 10: THE 'DJIRIDJI' (ZAMIA) SONGLINE

'Djiridji' Zamia Palm Dreaming tells the story of seasonal journeys from river to hills and the abundance of food and water

THE INTERSECTION

The two trails intersect on site in the present day entry to the Curtin Stadium near the Dome. The point of intersection signifies a change in the directional flow of water, therefore, is a significant water and energy nexus.

This point provides a significant wayfinding point and point of passing and crossing, and an opportunity to interpret the meeting, gathering and exchanges between people arriving and departing within Greater Curtin. As such, this point is essentially social in nature.

Welcoming, knowledge sharing, trade are all key themes that should be explored in this area.



FIGURE 11: THE INTERSECTION

CHARACTER ZONES -THE FIVE EXPRESSIONS OF WATER

Whilst each Songline is rich and expansive in The Character Zones each form a key connector, cultural meaning, the significance of these trails are ultimately linked to the connections between the surface and underground water flows, and their specific micro- and macro-scale plant and animal communities.

Recovering the layers of water types and reinterpreting different characteristics of the water cycle through varied soils, plants, water depth, seasonality and flow, provides a means to express this complex story.

Water flow across the Stream network is described through five distinct Character Zones, each representing a different expression of water in the landscape, most drawn from the palette of natural types of water expression within the Curtin site.

link or node in the Stream network:

CONNECTORS:

- Paleochannel an ancient, subsurface flow ٠ buried water channel
- Groundwater Aquifer the slow moving water stored underground

Nodes:

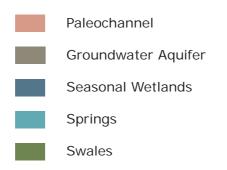
- Seasonal Wetlands expressions of the ٠ groundwater through the seasonal rise and fall of the watertable
- Springs active discharge of groundwater ٠ at the base of the hillslope

LINKS:

Swales – surface water flows from rainfall run-off

Each of the Character Zones are read by markers in the landscape. The flora and fauna markers are referred to as 'Living Indicators' by the Whadjuk Nyoongar people.

FIGURE 12: CHARACTER ZONES





PALEOCHANNEL

The paleochannel is an ancient buried water channel, which was once a tributary to the Canning River, connecting a chain of seasonal wetlands across Curtin.

Historically, the paleochannel would have defined a regional path for Whadjuk Nyoongar people travelling between the Canning and Swan Rivers, along the Zamia trail, with 'Djiridji' or Zamias The distinctive vegetation of the paleochannel (Macrozamia riedlei) and Balgas (Xanthorrhoea *preissii)* occurring in abundance along the upper channel.

The channel is likely underlain by the same river and floodplain sediments that underlie the Canning River and was buried by the deposition of unconsolidated sands during interglacial periods when river flows slowed, allowing these sediments to fill the former channel valley.

characterised by laterite gravels and limonitecemented sand, colloquially called 'coffee rock'. Whilst the channel is now buried, it still acts as a preferential flow path for subsurface flows, and hence still functions as an underground stream.

The interpretation approach for this Character Zone is to reveal and reinterpret this channel at ground level, through the main Living Stream conveyance channel, as well as through plants, material palettes, artwork and programming. The paleochannel is a major water flow path and energy line.

reflects the permanence and abundance of water and defines the linear shape of the channel.

Particular rushes (Leptocarpus (ex Meeboldina) scariosus, Chaetanthus aristatus in the upper channel), a sedge (Baumea vaginalis in the channel bed) and a shrub (Darwinia citriodora for top of channel) are markers of the revealed channel (the new Living Stream WSUD channel) and indicate the laterite and iron-cemented sediments and clay bed. The indicator tree The base of the youngest sediments are within the channel floodway is the Flooded Gum (Eucalyptus rudis).



FIGURE 13: PALEOCHANNEL CHARACTER ZONE

GROUNDWATER AQUIFER

Groundwater aquifers are the hidden layers of water beneath our feet, held in soil pore spaces, rock fractures and permeable rock formations. The superficial (or shallow) aquifer underlying the Swan Coastal Plain is recharged from rainfall, and flows slowly from the Darling Scarp and Gingin Scarp, to the ocean.

Locally within Curtin, this aquifer forms a discreet system that discharges south-west to the Canning River, and this is the aquifer interpreted within the Stream.

Traversing the Academic Heart of the campus, the 'Kujal Kela' (Twin Dolphin) Songline follows this underground movement of water and Living Indicators mark the expression of the nearsurface (1-15 m maximum below ground level) abundant water reservoir, in this setting most notably via larger diameter trees.

Because the aquifer is shallow, the groundwater is within the rooting depth of many plant species and hence the aquifer here is pivotal to the survival and health of Curtin's biodiversity. The indicators of the shallow aquifer include the trees—Sheoaks (*Allocasuarina fraseriana*) and Marris (*Corymbia calophylla*)—the shrubs—Pink Featherflower (*Verticordia densiflora*) and Native Violet (*Hybanthus calycinus*)—and the herb Black-anther Flax-lily (*Dianella revoluta*).

Aside from human interference, the groundwater aquifer maintains a dynamic equilibrium of uptake, evaporation, discharge and rainfall replenishment. It has permanency, longevity and age, and is often referred to as old or fossil water, which has a long journey to the river – an individual water drop may take thousands of years to find its way to the river.

Responding to the water underneath our feet provides opportunities to express the water story along the 'Kujal Kela' trail through mediums such as art, sound, lighting and planting rather than through a direct physical presence of water.



FIGURE 14: GROUNDWATER AQUIFER CHARACTER ZONE

SEASONAL WETLANDS

The third water expression within the Curtin The Living Indicators of the wetlands include site are the seasonal wetlands, which are low lying basins (sumplands) that intersect the groundwater table in winter. The wetlands are therefore seasonally inundated, drying down in summer as groundwater levels falls. They are often referred to as windows to the water table.

Historically, there was a chain of seasonal wetlands that ran north-south along the western side of the Curtin University grounds, most of which have been infilled. Jack Finney Lake and two basins-one to the north and one to the south—are the only wetlands remaining within Greater Curtin. Jack Finney Lake is a significant local asset to Curtin, and is a registered Aboriginal Heritage site.

The 'Djiridji' (Zamia) Songline follows and connects with these surface water expressions, which would have provided resource-rich resting and gathering nodes on the seasonal journey. The chain of wetlands would have created a diverse mosaic of habitats supporting a range of flora and fauna and created a trail for Whadjuk Nyoongar people following food sources between the Canning and Swan River systems.

the paperbark trees (Melaleuca rhaphiophylla and Melaleuca preissiana), the common astartea shrub (Astartea scoparia) and the sedges (Baumea rubiginosa, Baumea articulata).

Points of recovery and restoration of the seasonal wetlands form key cultural and ecological nodes of varying intensity and function. Each wetland node is a unique attraction and point of particular activity that is informed and characterised by a particular story. Each node also performs a particular water treatment and storage function as part of the wider stream network.

These nodes are intended to reflect the character of wetlands as places of abundance and places of gathering, whilst also being points of rest and moments of pause along a journey.

They are places of intensity and focus where features of the natural landscape intersect with important community, educational, and ecological experiences-where memories and systems interact.

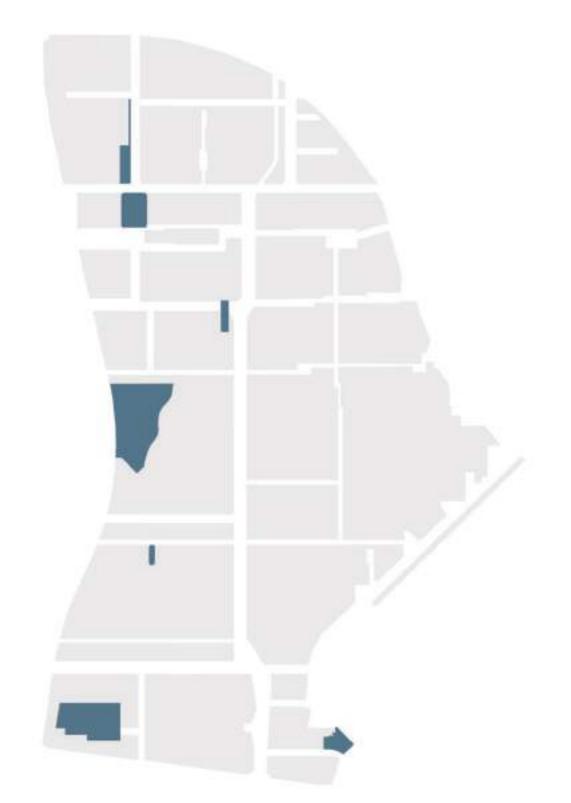


FIGURE 15: WETLAND CHARACTER ZONE

SPRINGS

groundwater resulting from upward pressure or occuring along a break-of-slope. Two key springs are located on the site. Both springs exist as break-in-slope groundwater expressions and are located at the base of the ridge surrounding the Academic Heart.

The springs and their surrounds are key nodes along the 'Kujal Kela' (Twin Dolphin) Songline. The springs are traditionally a place of teaching (teaching the young ones about the 'Kujal Kela' trail) and knowledge sharing. The springs are traditionally a place of 'sweet water'. Only the Elders can drink directly from the spring and campsites are not permitted in proximity to the spring.

One spring is located at the north-western end of The Forum near the Chancellery building. Traditionally a place of teaching and ceremony, in present day it still forms a significant open space on university grounds with views across to Jack Finney Lake and is often used for formal, civic functions and gatherings.

Springs are an active surface expression of The second spring is located at the base of slope in the Sir Charles Court promenade above the Creative Quarter. It is an important location connected to Rob Riley Walk and offers opportunities to become a key outdoor knowledge sharing node adjacent to the Centre for Aboriginal Studies (CAS) to reveal and share the cultural stories associated with the springs.

> The springs are marked by Bull Banksia (Banksia grandis - dry areas), Centella (Centella asiatica - damp areas) and Jointed Twig Sedge (Baumea articulata - wet areas).

> These nodes are intended to reflect the character of springs as places to celebrate abundance and as places of knowledge sharing, teaching and learning. Like the wetlands, the springs provide pause points along a journey.

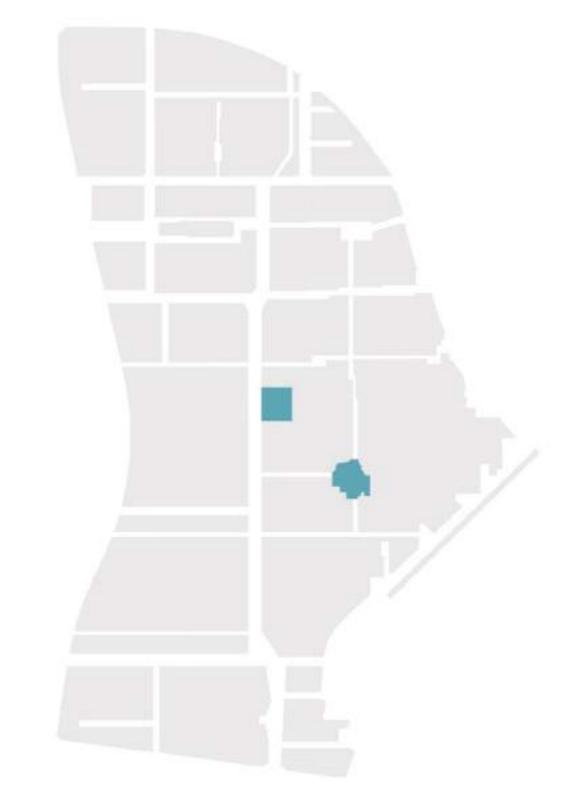


FIGURE 16: SPRING CHARACTER ZONE

Surface water flows ephemerally in response to rainfall run-off, infiltrating along its way and discharging to the wetlands and eventually the river. This water supports shallow-rooted rushes and sedges that can respond quickly to the wet conditions, and can tolerate temporary inundation and rapid water flows. A distinctive band of trees and shrubs follows the line of the watercourses within the floodway, supplementing their water needs. The creeks and swales are important habitat for birds, frogs and other fauna, and provide important biodiversity linkages.



FIGURE 17: SWALE CHARACTER ZONE

SWALES

water after rainfall, which runs to the Stream and wetlands, and seeps back into the soil to replenish the groundwater. They capture and convey water flow as it moves across the surface of the land.

The swales run predominately east-west, linking the existing hilltop in the Academic Heart to the recreational spaces and mixed developments on the western side of the site.

The swales are part of the wider biophilic, green infrastructure links that connect the movement of water, biota and people across the Stream network. The north-south swales are predominantly biodiversity corridors linking vegetation and creating habitat beyond the boundary of the Curtin site.

The swales follow the seasonal overland flow of The swales provide a wayfinding network, providing sensory cues in the landscape, responding to seasonal water flow and infiltration, and telling stories of restoration and strengthening of biodiversity corridors.

> The swales are marked by two key species, depending on whether they are infiltration swales, which carry ephemeral flows only, or conveyance swales or biofilters, which have semi-pervious bases and may also have submerged zones.

> Infiltration swales are marked by Eremaea pauciflora, which can access groundwater in summer to reduce irrigation requirements, and conveyance swales and biofilters are marked by Twig Sedge (Baumea juncea).

PART 4.0 DEFINING THE PALETTES



4.1 INFORMING THE PALETTES

Part 4 provides the palettes from which to draw The palettes informed by these layers are the materials, planting and stories, and identifies intended to create distinct and tangible changes where to apply these palettes to reinforce the uniqueness and richness of each Character Zone and Songlines.

The environmental and cultural layers from which the palettes are derived are discussed in Part 3. These layers include the following:

ENVIRONMENTAL LAYERS

• This is the historic, pre-existing landscape character of the vegetation, soils and geology that define the hard and soft material palette. It is the surface layer that the new stream landscape seeks to restore, recover and reveal. From an interpretive and landscape response, this historic environmental layer 'morphs and twists' in response to the modern urban form.

CULTURAL LAYERS

• This is the story of Curtin, the stories of the Songlines and the Character Zones which come together to tell the story of a modern Curtin that has reconnected with its past, its people and the trajectory of knowledge. From an interpretive and landscape response perspective these stories provide the cues and inspiration for planting, artworks, installations and materiality.

in the landscape fabric across the Stream network. These palettes include the following:

PLANTING PALETTES

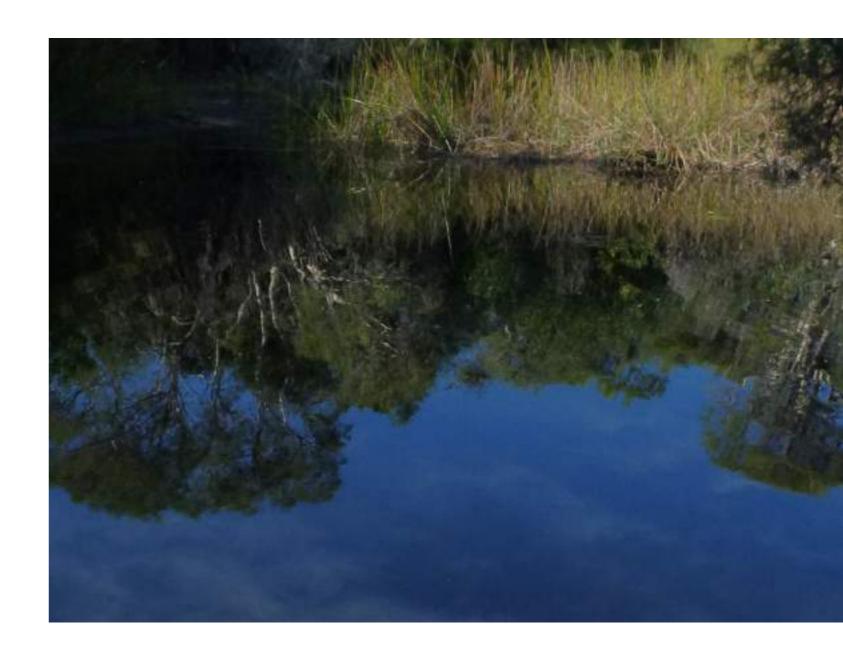
- Vegetation Association Palettes •
- Songline Wayfinding Palette
- Seasonal Indicator Palette
- Character Zone Indicator Palettes •

MATERIAL PALETTES

• Character Zone Palettes

CULTURAL PALETTES

- Overarching Themes
- Story Topics



4.2 PLANTING PALETTES

The planting palettes respond to:

- Historic vegetation associations.
- Plants with Indigenous cultural significance.
- Present and proposed hydrological conditions across the Stream network.

The species included in the palettes are a selection from the full species composition of the vegetation assemblages. The use of these particular plants is an abstraction of what would naturally occur, and is intended to strengthen the readability of each Character Zone and the cultural stories across the Stream network.

The identified species have all been selected for distinctive habit, foliage, and colour to celebrate the diversity of the individual Character Zones and to address varying hydrological conditions. It is anticipated that designers use modern horticultural knowledge to creatively interpret and apply these palettes in a contemporary landscape setting.

All plants need to be pre-ordered at least 12 months prior to planting, as some species may require longer lead times to collect seed/cuttings and propagate to a suitable size. Requirements for mature plants will require longer pre-order periods. It is important that this forward planning is undertaken so as to avoid any dilution of the intent of the Stream through delays or substitutions to this list.



VEGETATION ASSOCIATION PALETTES

All proposed species throughout the Stream network are drawn from the four endemic vegetation associations historically present across Curtin. These associations have been mapped and indicate the intended wider plant response for each section of the Stream.

These palettes form the base list that all Character Zone and Seasonal Indicator Palettes are drawn from but are not, themselves, Character Zone specific.

The species included in the following palettes are a selection from the full species composition of the vegetation assemblages and are intended to cover varying hydrological conditions and strengthen the readability of the Character Zonesand cultural stories across the Stream network.

The four palettes are to be used to supplement the specific Character Zone Indicator Palettes. Supplementary species should not visually dominate each Character Zone.

In order to achieve this, the following criteria should be applied to the use of these palettes:

- Maximum 50% of any planting mix is to be comprised of supplementary species.
- Supplementary species added to any planting mix are to comprise of at least 3 species.
- No individual supplementary species is to form more than 20% of the total planting mix an any area.



FIGURE 18: VEGETATION ASSOCIATIONS ACROSS CURTIN

- Banksia-Jarrah Woodland
- Banksia Woodland
- Marri-Sheoak Forest
- Melaleuca Woodland



FIGURE 19: VEGETATION ASSOCIATION PALETTES



BANKSIA-JARRAH WOODLAND PALETTE

Species Name	Nyoongar / Common Name		
Trees			
Banksia attenuata	Biara / Candle Banksia		
Eucalyptus marginata	Jarrah		
Shrubs	I		
Acacia lasiocarpa	Panjang		
Babingtonia camphorosmae	Kurren / Camphor Myrtle		
Banksia dallanneyi	Bullgalla / Couch Honeypot		
Hemiandra pungens	Snakebush		
Hibbertia hypericoides	Yellow Buttercups		
Hovea trisperma	Puyenak / Common Hovea		
Melaleuca seriata	-		
Petrophile linearis	Pixie Mops		
Philotheca spicata	Pepper and Salt		
Herbs			
Hybanthus calycinus	Wild Violet		

Hybanthus calycinus Conostylis aculeata Burchardia congesta Sowerbaea laxiflora Wild Violet Prickly Conostylis Kara / Milkmaids Purple Tassels



TREES



SHRUBS



HERBS



BANKSIA WOODLAND PALETTE

Species Name	Nyoongar / Common Name
Trees	
Allocasuarina fraseriana	Kondil / Sheoak
Banksia attenuata	Biara / Candle Banksia
Banksia grandis	Mungitch / Bull Banksia
Banksia menziesii	Bulgalla / Firewood Banksia
Eucalyptus todtiana	Dwutta / Coastal Blackbutt
Nuytsia floribunda	Mooja / Christmas Tree
Shrubs	
Adenanthos cygnorum	Common Woollybush
Allocasuarina humilis	Dwarf Sheoak
Bossiaea eriocarpa	Common Brown Pea
Daviesia triflora	-
Eremaea pauciflora	-
Gompholobium tomentosum	Hairy Yellow Pea
Scholtzia involucrata	Spiked Scholtzia
Verticordia densiflora	Compacted Featherflower

Herbs / Grasses

Anigozanthos humilis Catspaw Anigozanthos manglesii Kurulbrang / Mangles Kangaroo Paw Conostylis setigera Bristly Cottonhead Dampiera linearis Common Dampiera Mardja / Bloodroot Haemodorum spictum Lomandra hermaphrodita Lomandra preissii Komma / Purple Flag Patersonia occidentalis Wallaby Grass Rytidosperma occidentale



TREES



SHRUBS



HERBS | GRASSES



MARRI-SHEOAK FOREST PALETTE

Species Name	Nyoongar / Common Name
Trees	
Allocasuarina fraseriana	Kondil / Sheoak
Banksia menziesii	Bulgalla / Firewood Banksia
Bankisia ilicifolia	Holly-leaved Banksia
Corymbia calophylla	Marri
Shrubs	
Acacia willdenowiana	Grass Wattle
Adenanthos obovatus	Basket Flower
Daviesia decurrens	Prickly Bitter-pea
Darwinia citriodora	Lemon-scented Darwinia
Gastrolobium capitatum	Eggs and Bacon
Hardenbergia comptoniana	Native Wisteria
Hibbertia racemosa	Stalked Guinea Flower
Lechenaultia floribunda	Free-flowering Leschenaultia
Melaleuca thymoides	-
Herbs / Grasses	
Conostylis juncea	-
Dasypogon bromeliifolius	Pineapple Bush
Dianella revoluta	Mangard / Blueberry Lily
Kennedia prostrata	Wollung / Scarlet Runner
Phlebocarya ciliata	-
Themeda triandra	Kangaroo Grass







HERBS | GRASSES



MELALEUCA WOODLAND PALETTE

Species Name	Nyoongar / Common Name		
Trees			
Melaleuca rhaphiophylla	Bibool / Swamp Paperbark		
Melaleuca preissiana	Moonah		
Eucalyptus rudis	Moich, Gooloorda / Flooded Gum		
Banksia littoralis	Pungura / Swamp Banksia		
Shrubs			
Astartea scoparia	Common Astartea		
Calytrix flavescens	Summer Starflower		
Calytrix fraseri	Pink Summer Calytrix		
Euchilopsis linearis	Swamp Pea		
Eutaxia virgata	-		
Hibbertia subvaginata	-		
Hypocalymma angustifolium	Koodgeed / White Myrtle		
Hypocalymma robustum	Koodgeed / Swan River Myrtle		
Melaleuca lateritia	Robin Redbreast Bush		
Melaleuca teretifolia	-		
Pericalymma ellipticum	Swamp Teatree		
Rushes / Sedges			
Baumea articulata	Wuargle (Ngarnak, Kuiarch) / Jointed Twig		
Baumea rubiginosa	Sedge		
Baumea juncea	-		
Baumea vaginalis	Bare Twig Sedge		
Chaetanthus aristatus	Pale Twig Sedge		
Lepidosperma effusum	-		
Lepidosperma longitudinale	Spreading Sword Sedge		
Leptocarpus scariosus (prev. Meeboldina scariosa)	Pithy Sword Sedge		
Schoenus subfascicularis	-		
	-		
Herbs			
Centella asiatica	Centella		
Lobelia anceps	Angled Lobelia		









HERBS

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Patersonia occidentalis Thysanotus multiflorus Purple Flag

Tjunguri / Many-flowered Fringe Lily

SONGLINE (WAYFINDING) PALETTE

Each Songline is defined by a signifying species; these are as follows:

The 'Kujal Kela' (Twin Dolphin) Songline

• Balga (Xanthorrhoea preissii)

The 'Djiridji' (Zamia) Songline

• Zamia Palm (*Macrozamia riedlei*)

These species are intended to act as clear wayfinders in the landscape, leading people visually and physically along the trail.

It is important that the continuity of the Songline trils are maintained and, hence, any obstructing buildings, roads or other infrastructure must maintain connectivity via vertical facades and roof gardens, or via artwork, patterns or other artistic responses. Where there are significant gaps in the plant connection, there may need to be a larger cluster planting response at each end of the break in trail.

Songline wayfinding species are to be group planted following a linear arrangement along the length of the Songline, crossing all Character Zones. Planting density is to increase approaching nodes.





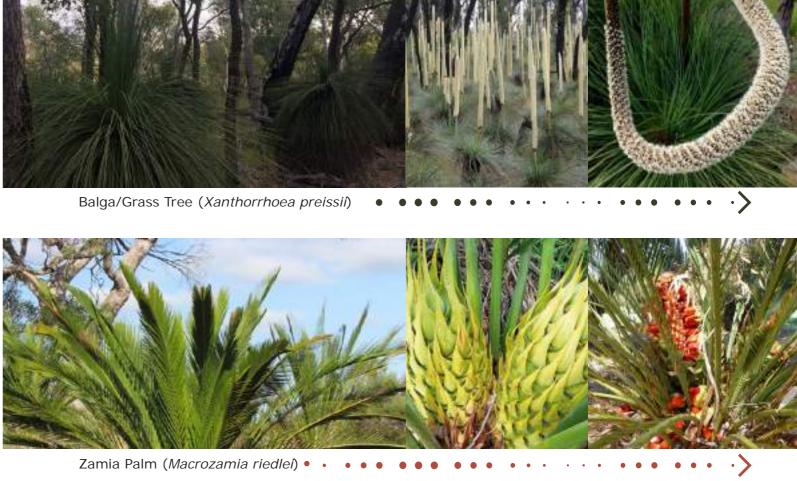


FIGURE 20: SONGLINE WAYFINDING SPECIES

- ••••• Balga/Grass Tree (*Xanthorrhoea preissii*)
- Zamia Palm (Macrozamia riedlei) · · · · · >

SEASONAL INDICATOR PALETTE

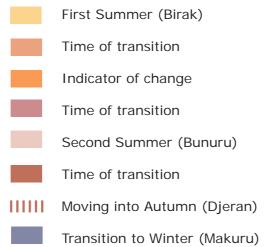
Seasonal indicator species have been selected to respond to and represent seasonal change within the landscape.

Specific species are chosen for their flowering colour to provide intense bursts of that colour at particular locations and times of the year. These reference the Nyoongar six seasons and specifically how they influence interactions with landscape.

These seasonal indicators follow the Zamia Songline, with locations and species responding to Curtin as a summertime place as part of a seasonal transition along this Songline.

The seasons provide opportunity for programme responses, such as food festivals linked with abundant food reserves (honey nectar), designers and maker events associated with summertime camping and resting etc.







FIRST SUMMER (BIRAK) Yellow Flowers Banksia ilicifolia Banksia attenuata

INDICATOR OF CHANGE Nuytsia floribunda

TIME OF TRANSITION Banksia menziesii

> SECOND SUMMER (BUNURU) White Flowers Melaleuca preissiana Corymbia calophylla

TIME OF TRANSITION | MOVING INTO Allocasuarina fraseriana

> TRANSITION TO WINTER (MAKURU) **Blue Flowers** Dianella revoluta

CHARACTER ZONE INDICATOR PALETTES

Each Character Zone is represented by a small, distinct group of plants covering each strata (tree, shrub, herb), which are appropriate to the varying hydrological conditions (wet / dry / damp).

These indicator species are representative of what would naturally be the dominant plants associated with each of the Character Zones.

Within each Character Zone, indicator species are to be used as the dominant plants to define and strengthen the unique character.

These species should visually dominate each Character Zone. In order to achieve this, the following criteria are to be applied to this palette:

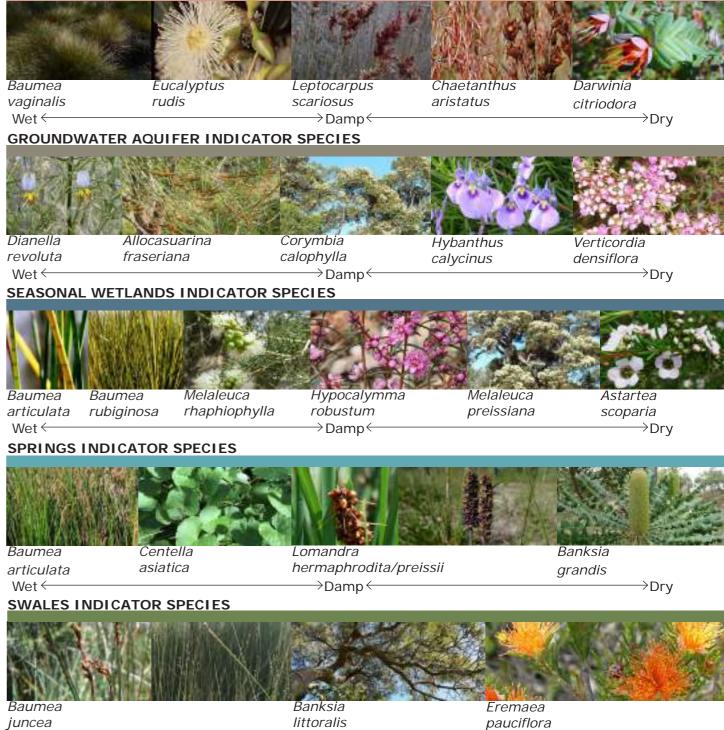
• Minimum 50% -70% of Character Zone planting mix is to be comprised of its Indicator Species.



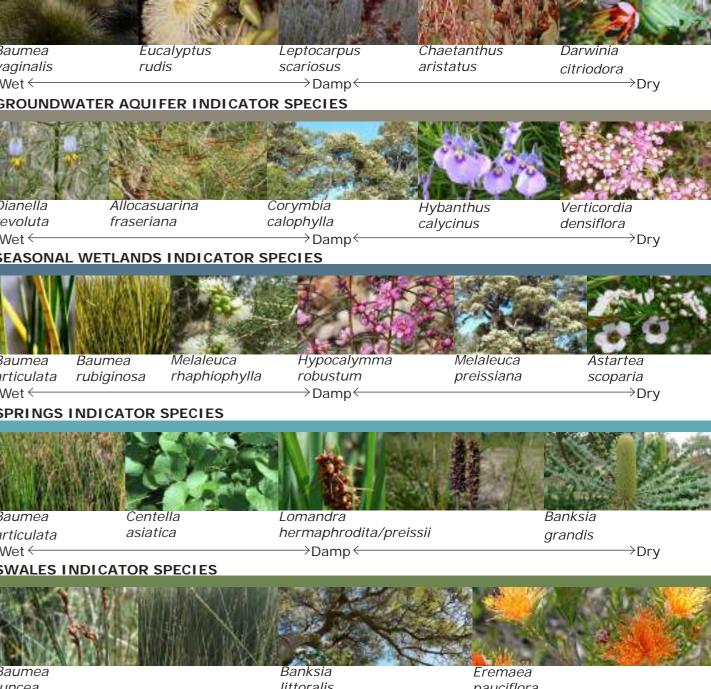
FIGURE 22: CHARACTER ZONE INDICATOR PALETTES

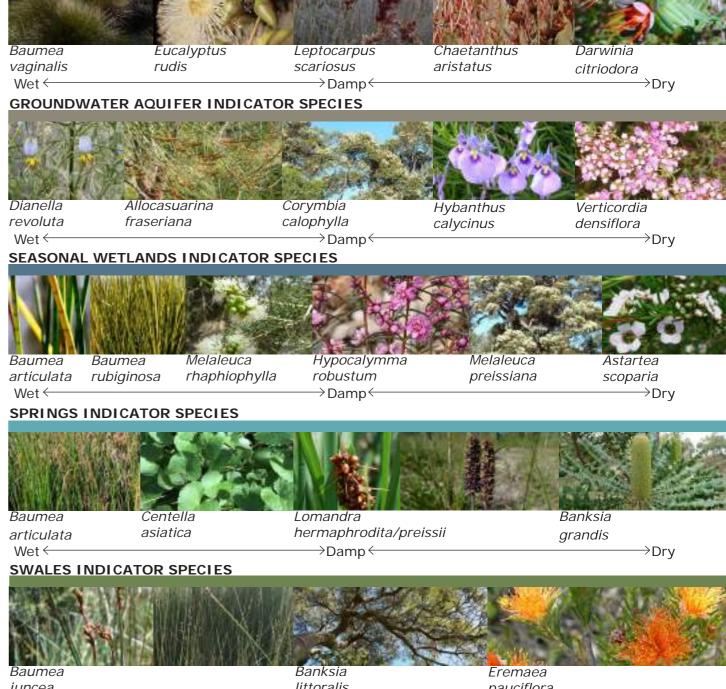


PALEOCHANNEL INDICATOR SPECIES



Dianella	Allocasuarina	Corymbia
revoluta Wet ←		calophylla →Da





我,我们没想 出	AN Z PRO	
Baumea	Centella	Lomano
articulata	asiatica	hermap
Wet←		>Da
SWALES IND	ICATOR SPECIES	
		In I start
State and state	TAKEN WITH THE AVENUE	

Baumea	Banksia
juncea	littoralis
Wet <	>Damp←

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→Dry

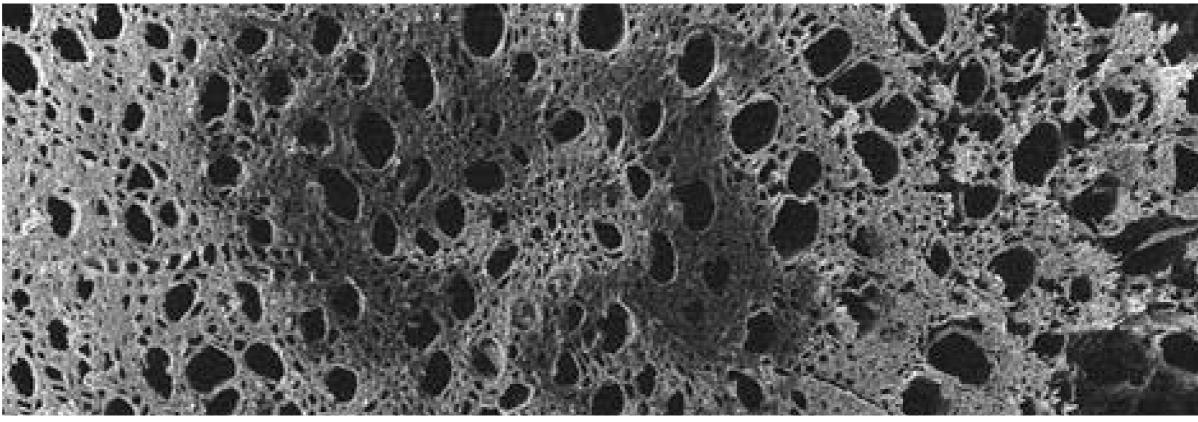
4.3 MATERIAL PALETTES

These palettes refer to the materiality, colour and texture to be applied to each distinct Character Zone within the Stream network.

The material palettes reference both the underlying soils and geology, as well as the colours and textures of the timbers and barks of the Character Zone Indicator species.

The following descriptions are to be used to guide all hard material responses for surfacing, furniture, artworks and building interfaces. The visual and sensory intent to be achieved is most important, rather than the use of specific materials (which are not prescribed).

Material responses are to explore the interrelationships between soils, water and plants at the macro- through to the micro-scale, and the interesting patterns and textures in the world below the surface as well as above.



CELL - MELALEUCA PREISSIANA

PALEOCHANNEL

The paleochannel is a former tributary of the Canning River and is comprised of clay floodplain deposits (alluvial sediments), and gravel and other sediments washed down from the Darling Scarp (fluvial sediments).

The intent is to interpret the material types of the buried channel, rather than the sands that have covered it over time.

Soils are predominantly orange to dark redbrown laterites and yellow cemented sands (pavements). The colour of these materials comes from iron. The base of the channel would be dark grey clays.

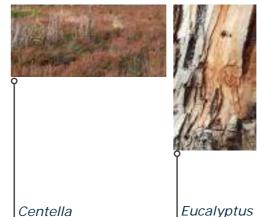
Responses should recognise the layered colours and textures of the revealed channel stratigraphy.



FIGURE 23: PALEOCHANNEL CHARACTER ZONE

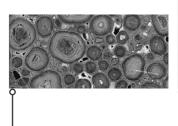
MATERIALS | COLOURS | TEXTURES





aristatus

Eucalyptus rudis bark



Laterite patterns



Leptocarpus scariosus

GROUNDWATER AQUIFER

The shallow aquifer at Curtin occurs within the Bassendean sands, which are coastal sands deposited by wind.

These are predominantly bleached grey quartz sands. The hill at Curtin is a dune formed from these sands.

Vertically down the profile, these sands have distinctive patterns at different scales due to the transformation of sediments and water chemistry from interactions between roots and biota accessing the groundwater table.

These interactions create distinctive patterns driven by the architecture of root systems the remnants of fossilised roots that create mini-pipelines to the water table for other species. These small-scale patterns reinforce the message of connections, relationships and interdependencies.

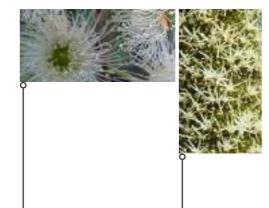
Responses should explore patterns, perforations or arrangements of materials that reference these processes at different scales.



FIGURE 24: GROUNDWATER AQUIFER CHARACTER ZONE

MATERIALS | COLOURS | TEXTURES





Corymbia calophylla Xanthorrhoea preissii





Allocasuarina fraseriana

SEASONAL WETLANDS

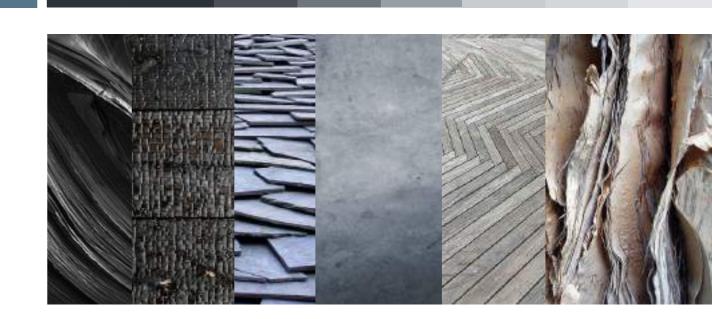
The wetlands are formed within the interdunal swales of the Bassendean sands, and are characterized by dark-grey sands, fine organic silts and black peats, which form from decomposing wetland vegetation.

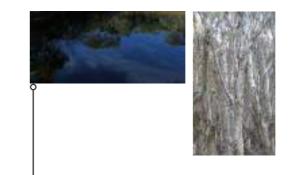
Responses should be rich and explore the ephemeral nature of the wetlands, the covering and revealing of the darker, richer black peats of the wetter and deeper soils then transitioning to finer, dry grey sands at the surface layers. The changing colours, the process of drying out and inundation, the changing barks of the trees, and the very distinctive texture of the paperbarks. offer a diverse palette. The use of timber is an appropriate material response.

At a small scale, exploring the air cells within wetland plant roots and other adaptive responses to tolerating abundant water, may contrast with the story of acquiring water that is common to the groundwater aquifer Character Zone.

FIGURE 25: SEASONAL WETLANDS CHARACTER ZONE

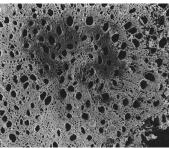
MATERIALS | COLOURS | TEXTURES





Melaleuca rhaphiophylla





Cell -*Melaleuca preissiana*

SPRINGS

The springs are characterised by pure white sands which have become bleached by the constant flow of water.

They too, are made of quartz. The spring produces an upward discharge expression forming soaks and horizontal water flow.

Materials should explore the shape of the spring, and the subtle textural and colour responses grey to white and coarse to medium-grained sands.



FIGURE 26: SPRINGS CHARACTER ZONE

MATERIALS | COLOURS | TEXTURES





grandis

articulata



SWALES

The swales reference the geology and soils of the surrounding regional landscape, extending from the Darling Scarp to the Swan and Canning Rivers through a compressed sequence. They link Curtin to the stories, connections and wider journey beyond.

The swales' materiality, patterns and textures respond to the flow of water eroding the soils and revealing the parent and weathered rocks.

The surface material picks up on the granite parent rock of the scarp, transitioning to the laterite gravels of the slopes, through to the sands of the plains.

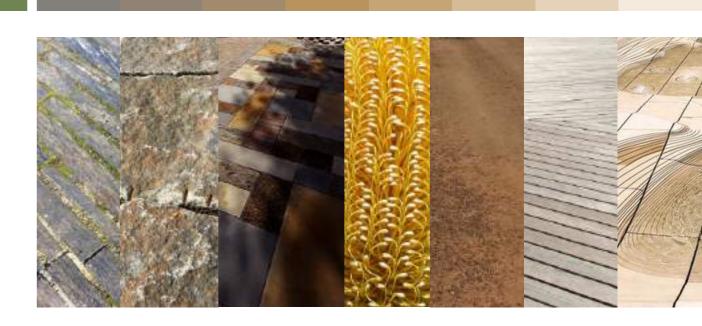
The swales connect the movement of water, biota and people across Curtin and the materiality is to respond to this idea of linkage and connection, and pick up on common colours and textures as they intersect with other Character Zones.

The swale indicator species—Bare Twig Sedge (Baumea juncea), found naturally occurring across this topographic gradient and its range of soils-acts as a wayfinder and a symbol of continuity, a unifying element as the swales move across Curtin.



FIGURE 27: SWALES CHARACTER ZONE

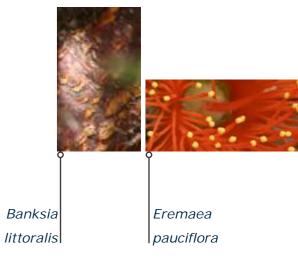
MATERIALS | COLOURS | TEXTURES





Baumea juncea





The Curtin Living Knowledge Stream Design Guidance

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4.4 CULTURAL PALETTES

OVERARCHING THEMATICS

Songlines and the Character Zones in the context of a wider regional story that comes together to tell the narrative of a new Curtin that has reconnected with its past, its people, and the trajectory of knowledge.

These palettes are intended to provide the user with inspiration and thematic guidance through the detailed design process, and are about communicating the stories.

Overarching themes are outlined across the Curtin site (indicated below); these are then broken down into example story topics (subthemes that sit under each overarching theme). These are to be further drawn on at specific locations and should be viewed as prompts.

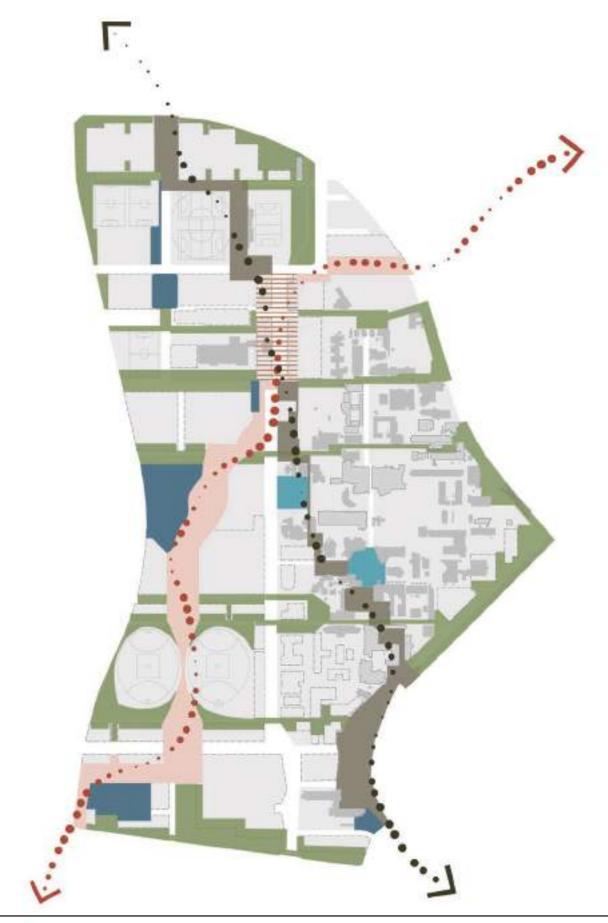
The cultural palettes distil and reimagine the Individual design responses to example story topics at specific locations are to be considered as part of the Curtin-wide story (recovery, connection, knowledge), and therefore must reference and consider the overarching themes to ensure this message is reinforced and consistently communicated.

> These stories are to be told through the Songline, planting and hard material palettes described above, as well as in richer layers of visual, artistic and programming responses that explore specific topics.

> Development of these stories, responses and content are intended to be further developed in collaboration with the reference group to ensure cultural appropriateness.

FIGURE 28: OVERARCHING THEMES

· ••• · > Groundwater Flow · · · · · › Surface Water Flow Diversity Journey Knowledge Recharge Celebration Reconnect



SUB-THEMES | EXAMPLE STORY TOPICS

JOURNEY

1. Seasonal Migration *Seasonal Abundance*

2. The Zamia Palm *Cyclical Resources*

3. The Banksia Nourishment

4. The Wetland Chain Connection to Canning, Past and Present

RECHARGE

5. Windows to the Water Table *Rise and Fall of the Aquifer*

6. Summertime Place *Kooyar Dreaming*

DIVERSITY

7. Duality and Difference *Respect and Learn*

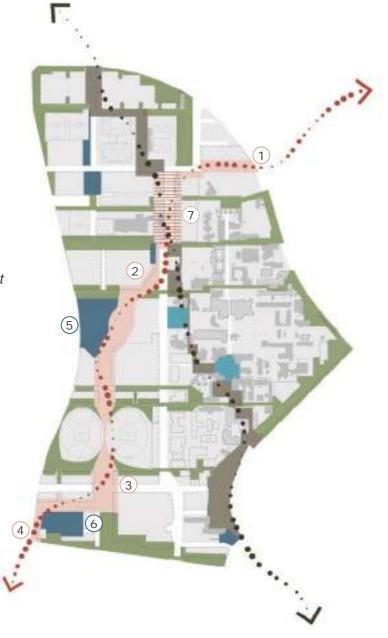


FIGURE 29: SUB-THEMES (DJIRIDJI SONGLINE)

KNOWLEDGE

8. Interconnectedness *Water Under Our Feet*

9. Energy Flow Water Health and Caring for Country

10. Reading the Landscape *Living Indicators*

11. Nuturing Connection Through Change

CELEBRATION

12. Bounty and Wealth *Protection of Resources*

13. Family Sharing

RECONNECT

14. Growth *Generate and Innovate*



FIGURE 30: SUB-THEMES (KUJAL KELA SONGLINE AND SWALES)

PART 5.0 DESIGN GUIDANCE

5.1 DESIGN GUIDANCE OVERVIEW

This Part provides design guidance for the Stream **Note:** typologies. The typologies are subsets of the Character Zones (as described in Part 3), further defined and characterised at a more specific, local scale.

The typologies are informed by, and respond to, construction to ensure all functional design the layers of human influence including functional water management and the expression of water (e.g visible/below ground etc), adjacent built form, land use, programming, spatial influences and constraints.

- Firstly, this section describes the water management influences that need to be integrated into the design of the Stream.
- Secondly, this section defines each typology; its general location, character, potential activities and programme, materiality, and functional role in water management.
- Thirdly, each typology is graphically represented with guidance outlining the application of the material, planting and cultural palettes (described in Part 4).

Design guidance is limited to spatial and material guidance on the intended landscape character for the Stream. The Local Water Management Strategy (LWMS) and LWMS Implementation Plan are to be referenced during design and criteria are addressed within the Stream.

Similarly, this document does not provide specific land use or built form criteria and thus should be read in conjunction with the Greater Curtin Master Plan and specific Development Guidelines for the campus.



5.2 WATER MANAGEMENT

The Stream network is the major stormwater infrastructure system for flood management, conveyance, water quality improvements, storage, and groundwater recharge.

The open green channel network consisting of a primary north-south *vegetated channel* and interconnecting secondary vegetated swales, will capture run-off from the hard surfaces of the buildings, paving, car parks and road side swales.

Rooftop gardens are proposed for buildings located adjacent to the Stream. Along with achieving other benefits, rooftop gardens assist to dampen peak velocity and run-off volumes during storm events and will contribute to the biodiversity connectivity and function of the FIGURE 31: WATER MANAGEMENT Stream network.

Developments are, as a minimum, required to cater for first flush rainfall events and will be required to connect directly to the main conveyance channel and swale network. This network is designed to convey the critical 10 year average recurrence interval (ARI) rainfall event. Larger events (up to the critical 100 year ARI) will be detained and infiltrated within ephemeral vegetated basins dispersed throughout the network.

As it is a 'living' biological system, the Stream enables progressive treatment of conveyed stormwater using physical and biological processes

1. Monash University 2014. Vegetation guidelines for Stormwater biofilters in the south-west of Western Australia. Water for Liveability Centre, Monash University. Within the Stream network planting palettes described in Part 4 are to be supplemented by locally native rush and sedge species (only-not shrubs, trees or herbs) drawn from the Vegetation guidelines for stormwater biofilters in the south-west of Western Australia¹, appropriately matched to the position within the channel so as to facilitate flows and water quality improvement.

Note: The LWMS and LWMS Implementation Plan are to be referenced during design and construction to ensure all functional design criteria are addressed within the Stream.

Main North-South Vegetated Conveyance Channel

Vegetated Conveyance Swales -Treatment and storage of stormwater run-off (<1:10 ARI) with flows directed towards ephemeral basins

Vegetated Infiltration Swales - Treatment and infiltration of stormwater run-off (<1:10 ARI)

Ephemeral Basins - stormwater detention (<1:100 ARI) and recharge of groundwater via infiltration

- Connecting road side treatment swales (<1:10 ARI)
- **Piped Connections**



5.3 STREAM TYPOLOGIES

This section provides a brief description of each **FIGURE 32: THE STREAM TYPOLOGIES** Character Zone Typology within the Stream network, followed by a graphic representation demonstrating indicative spatial configurations and application of planting and material palettes (defined in Part 4).

The typologies (for all of the Character Zones) have been categorised into the following three main types.

Urban

Urban links, connectors and nodes are formal in character, with larger areas and ratio of hardscape and hard edge treatments to the Stream. These spaces allow greater human interaction and access to the stream/water bodies and are generally located in tighter urban spaces adjacent to and defined by built form and/or roads.

GREEN/RESTORATIVE

Green links, connectors, restoration nodes and restorative links are more naturalistic typologies that are purposefully designed and maintained in a state that emulates a softer, more native habitat whilst still being adapted to the functional human requirements and programming across Curtin. These landscapes offer a natural, softer alternative to the more formalized harder urban landscapes.

BUILT FORM INTERFACE

These typologies require a response integrated within the building facade, forecourts or pavement areas fronting the stream. This may be through integrated public art commissions, surface treatment, facade treatments or green walls.

PALEOCHANNEL

- Urban Connector
- Green Connector
- Built Form Interface

GROUNDWATER AQUIFER

- Urban Core Connector
- Green Core Connector
- • Built Form Interface

SEASONAL WETLANDS

- Urban Nature Node
- Restoration Node
- • Built Form Interface

SPRINGS

• Water Feature Node

SWALES

- Urban Link
- Green link
- **Restorative Nature Link**
- Built Form Interface

THE INTERSECTION





PALEOCHANNEL TYPOLOGIES



BAN CONNECTOR

Urban Connectors provide spaces for outdoor labs, seating, socialising and studying along the Stream.

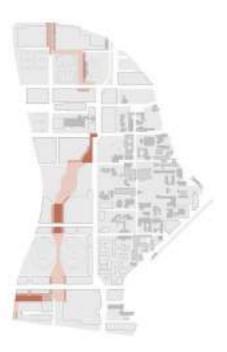
Their urban character is defined by built form edge to both or one side of the Stream. They are defined by a formal, predominately hardscape edge to the main conveyance channel that allows interaction and engagement with the Stream. Hard terracing is to reference the stratigraphy of the paleochannel. Pedestrian corridors to either side are to allow generous walking zones that seamlessly transition in materiality to the conveyance channel.

Planting is formal in arrangement, creating a defined high canopy of shade and a linear arrangement to emphasise the Songline and journey across Curtin.

GREEN CONNECTOR

Green Connectors provide open space for informal gathering, picnicking, passive recreation and study. They are defined by a predominately softscape treatment and varying formal to informal edges to the main conveyance channel. The channel is defined by a gentler grade and wider spaces that allow gradual transition between typologies. They are typified by bordering the wide open sports fields, wetlands or lawn areas across Curtin.

Planting is more naturalistic in arrangement, however maintains a strong linear pattern.





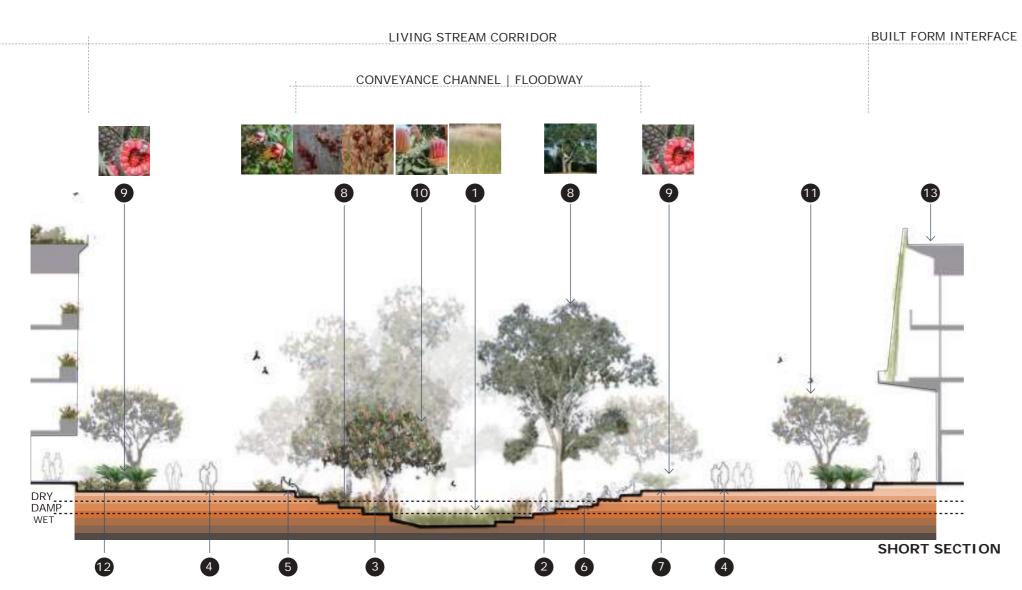
BUILT FORM INTERFACE

Developments abutting and fronting the Stream should integrate artworks, either permanent or ephemeral, within the building facade, forecourts or pavement areas. This may be through mediums such as:

- Integrated public art commissions, such as sculpture, lighting, sound, or video within the forecourts or on the building facades.
- Architectural detailing of the facade and/ or surface treatments responding to the Character Zone material palette.
- Integrated green walls to the building facades.







DESIGN CRITERIA

- 1 Vegetated treatment zone with discrete areas of hardstand treatment (eg. pavement rock) to facilitate for informal crossing:
 - Semi-pervious base to promote conveyance.
 - Minimum base width of • 1.2 m.

2 Hard terraced edge channel treatment:

- Colour and texture to reflect relevant stratigraphy.
- Terrace height no more than 0.5 m.
- Min. overall grade of 1:6 • across.
- Consider relevant safety • regulations with respect to water depth.

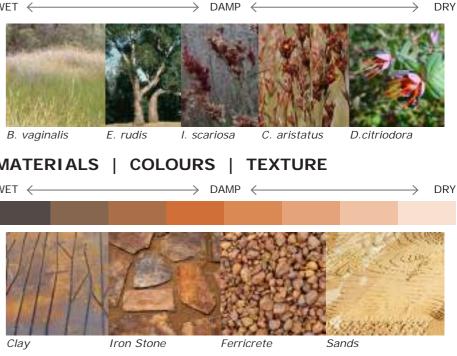
- 3 Intermittent vegetated terraces:
 - Densely planted (lower strata) terraces to have a min. width of
 - 1.5 m with un-compacted • soils to promote infiltration.
- 4 Promenade Surface colour and texture to provide linear contuinity. Interpretation to be incorporated into surface treatments.
- 5 Shaded rest areas adjacent promenade.
- 6 Shaded outdoor teaching spaces.

- Linear vegetated areas to intercept and infiltrate stormwater run-off (first 15 mm rainfall event) to conveyance channel from adjacent hardstand.
- 8 Character Zone upper storey tree. Trees to be planted in linear planting pattern.*** Character Zone lower storey planting in linear pattern.***
- 9 Songline Wayfinding* in linear planting pattern to reinforce wayfinding along the Songline.
- (10) Seasonal Indicator species** to be planted on mass in groupings.

- Shade trees within Dry (11) Zone to be selected from Vegetation Association Palette.***
- Flow > first 15 mm rainfall event within adjacent development to be directed into conveyance channel.
- Integrated built form including potential green roof.







PROGRAM

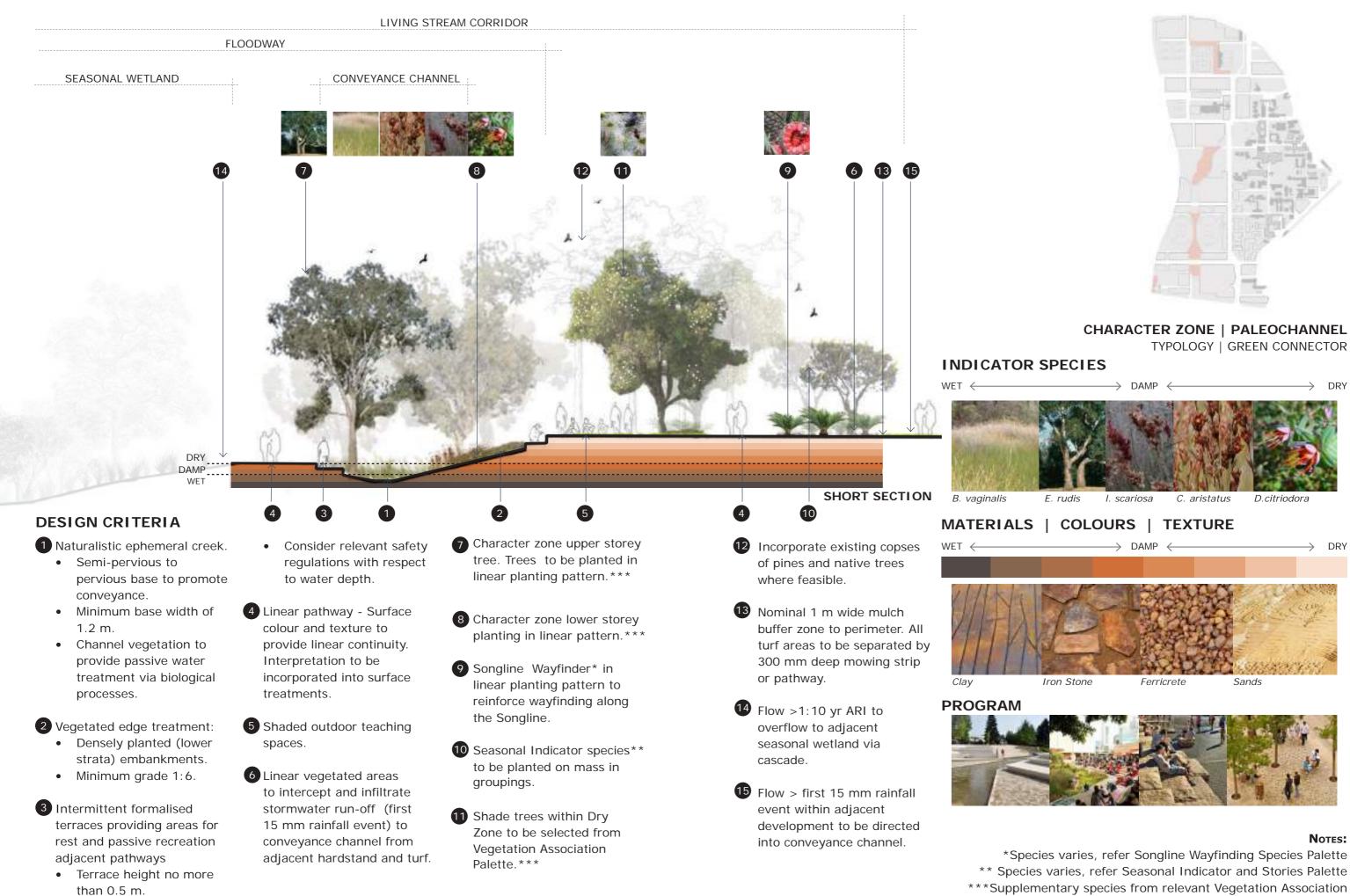


*Species varies, refer Songline Wayfinding Species Palette ** Species varies, refer Seasonal Indicator and Stories Palette ***Supplementary species from relevant Vegetation Association Palette



CHARACTER ZONE | PALEOCHANNEL TYPOLOGY | URBAN CONNECTOR

Notes:





***Supplementary species from relevant Vegetation Association Palette

GROUNDWATER AQUIFER TYPOLOGIES

URBAN CORE CONNECTOR

Urban Core Connectors are located predominately through the established Academic Core. They are defined as an intervention into a pre-existing landscape, generally surrounded by existing built form on all sides. Size, location and adjacent land use and services will largely influence the ratio of hard to soft landscaping.

Responses may include planting, retrofitting of pavement, integrating public artworks, facade modifications/integration of artworks or addition of surface features.

Planting is to include the Marri and Sheoak trees in a linear arrangement where feasible and focus on the strong linear planting of the Balga and mass plantings of the lower strata vegetation.

GREEN CORE CONNECTOR

Green Core Connectors provide strong, linear, soft landscaped edges to the site. They provide strong visual and physical continuity between the campus and adjacent areas through use of pavement, in-ground and standalone artworks and large diameter trees.

Planting is to include Marri trees, Balga and mass plantings of the lower strata vegetation through the roadside plantings in a strong linear arrangement to reinforce Songline connection.



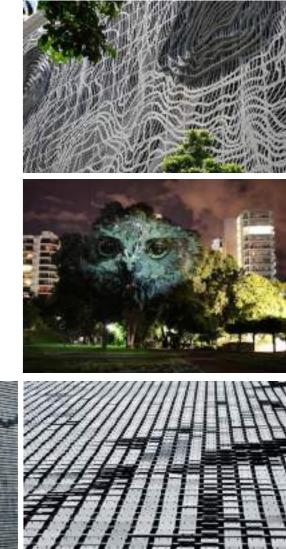


||||||||| BUILT FORM INTERFACE

This typology refers to both new developments and retrofitting of existing buildings in the Academic Core. Buildings should integrate artworks, either permanent or ephemeral, within the building facade, forecourts or pavement areas. This may be through mediums such as:

- Integrated public art commissions, such as sculpture, lighting, sound, or video within the forecourts or on the building facades.
- Architectural detailing of the facade and/ or surface treatments responding to the Character Zone material palette.
- Integrated green walls to the building facades.







DESIGN CRITERIA

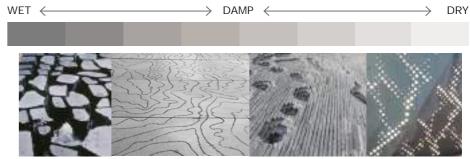
- 1 Character Zone upper storey tree. Trees to be planted in linear planting pattern.**
- 2 Character Zone lower storey planting in linear pattern.**
- 3 Surface colour and texture of pathways to provide linear continuity. Retrofit of existing paving where required. Interpretation to be incorporated into surface treatments.
- 4 Shaded spaces for rest, social interaction and outdoor teaching.
- 5 Public art and urban furniture to interpret Character Zone themes.

- 6 Songline Wayfinding* in linear planting pattern to reinforce wayfinding along the Songline.
- 7 Incorporate existing copses of pines and native trees where feasible.

Wet \leftarrow



D. revoluta



PROGRAM



*Species varies, refer Songline Wayfinding Species Palette **Supplementary species from relevant Vegetation Association Palette



CHARACTER ZONE | AQUIFER TYPOLOGY | URBAN CORE CONNECTOR



MATERIALS | COLOURS | TEXTURE

Perforations, Patterns, Bleached Grey Quartz Sands



Notes:



DESIGN CRITERIA

- 1 Character Zone upper storey tree. Trees to be planted in linear planting pattern.**
- 2 Character zone lower storey planting in linear pattern. **
- 3 Surface colour and texture of pathways and roads to provide linear continuity. Retrofit of existing paving where required. Interpretation to be incorporated into surface treatments.
- 4 Shaded spaces for rest, social interaction and outdoor teaching.

- **5** Public art and urban furniture to interpret Character Zone themes.
- 6 Songline Wayfinding* in linear planting pattern to reinforce wayfinding along the Songline.
- 7 Incorporate existing copses of pines and native trees where feasible.
- 8 Continuation of Living Knowledge Stream (beyond).



Wet \leftarrow



D. revoluta

Wet \leftarrow



PROGRAM



*Species varies, refer Songline Wayfinding Species Palette **Supplementary species from relevant Vegetation Association Palette



CHARACTER ZONE | AQUIFER TYPOLOGY | GREEN CORE CONNECTOR

INDICATOR SPECIES



A.fraseriana C. calophylla H. calycinus V. densiflora

MATERIALS | COLOURS | TEXTURE

\longrightarrow	DAMP <		\longrightarrow	DRY
		-		
	123	Statis -	3.	and a
	ST I		1	2

Perforations, Patterns, Bleached Grey Quartz Sands



Notes:

SEASONAL WETLANDS TYPOLOGIES

Urban Nature Node

Urban Nature Nodes are ephemeral wetlands that are defined by their contemporary, urban interpretation of a natural wetland system.

They are outdoor hubs that provide spaces for outdoor labs, informal seating, socialising and studying. Their urban character is defined by the built form surrounding the wetland on one or more sides. They are defined by a mix of both hard and soft edge treatments that allow varying degrees of interaction with the water body.

Planting contains a semi-naturalistic arrangement with good shade coverage for seating while allowing areas of clear open views. Some areas of turf are to be included to allow passive recreation.

RESTORATION NODE

The restorative wetland (specifically, Jack Finney Lake) involves restoration of a historic wetland. This is predominately an informal landscape, naturalistic in character, informed by the natural remnant vegetation and wetland structure, however, managed to accommodate more intense use and enjoyment by the Curtin community.

The space is defined by soft landscape edges and gentle transitions in grades and planting between the more formal soft landscaping of adjacent typologies. Planting contains a diverse native species palette planted in a naturalistic manner.





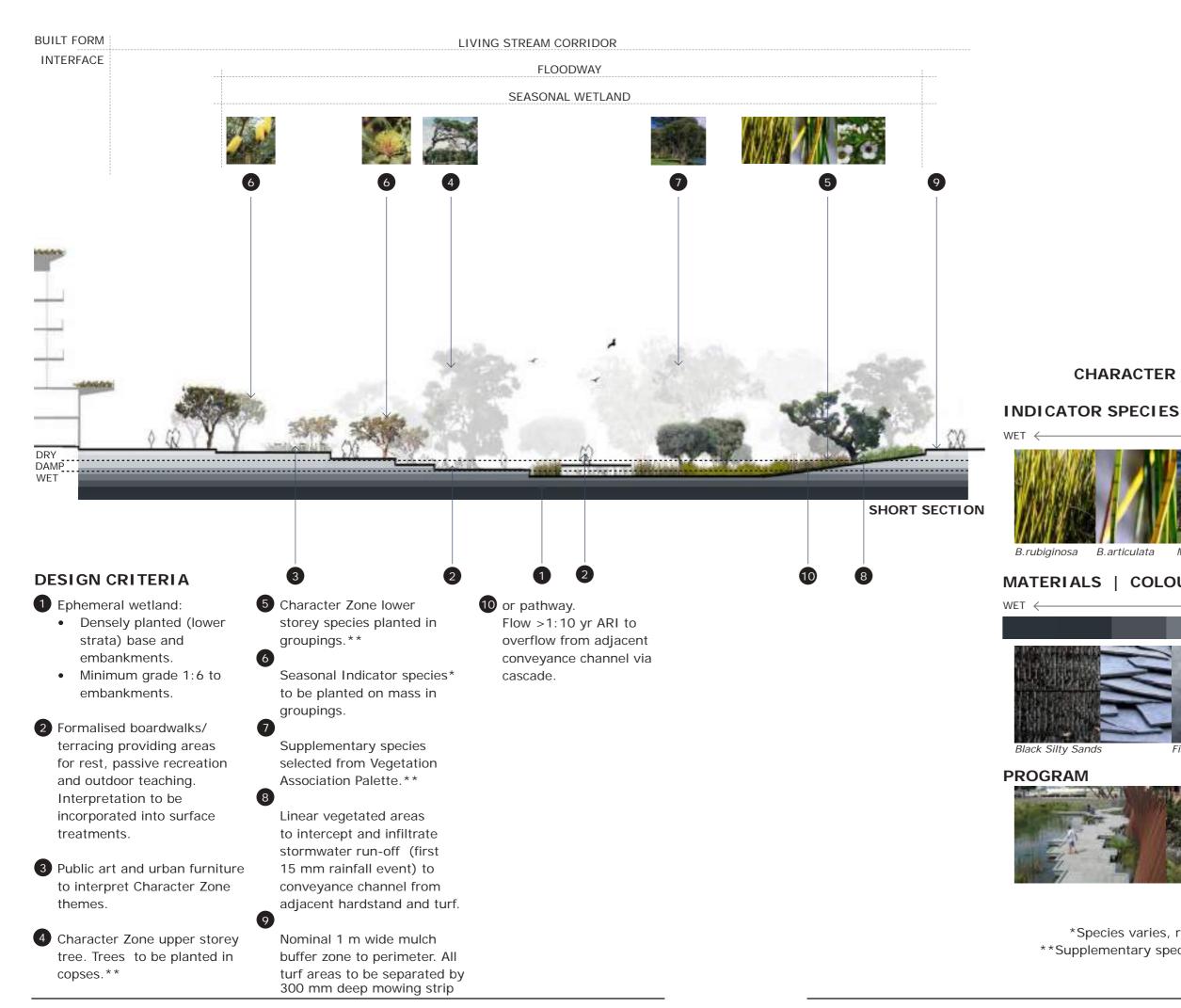
BUILT FORM INTERFACE

Developments abutting and fronting the Stream should integrate artworks, either permanent or ephemeral, within the building facade, forecourts or pavement areas. This may be through mediums such as:

- Integrated public art commissions, such as sculpture, lighting, sound, or video within the forecourts or on the building facades.
- Architectural detailing of the facade and/ or surface treatments responding to the Character Zone material palette.
- Integrated green walls to the building facades.

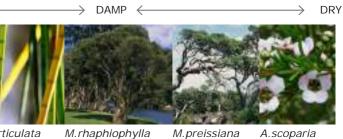




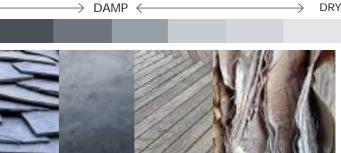




CHARACTER ZONE | SEASONAL WETLANDS TYPOLOGY | URBAN NATURE NODE



MATERIALS | COLOURS | TEXTURE



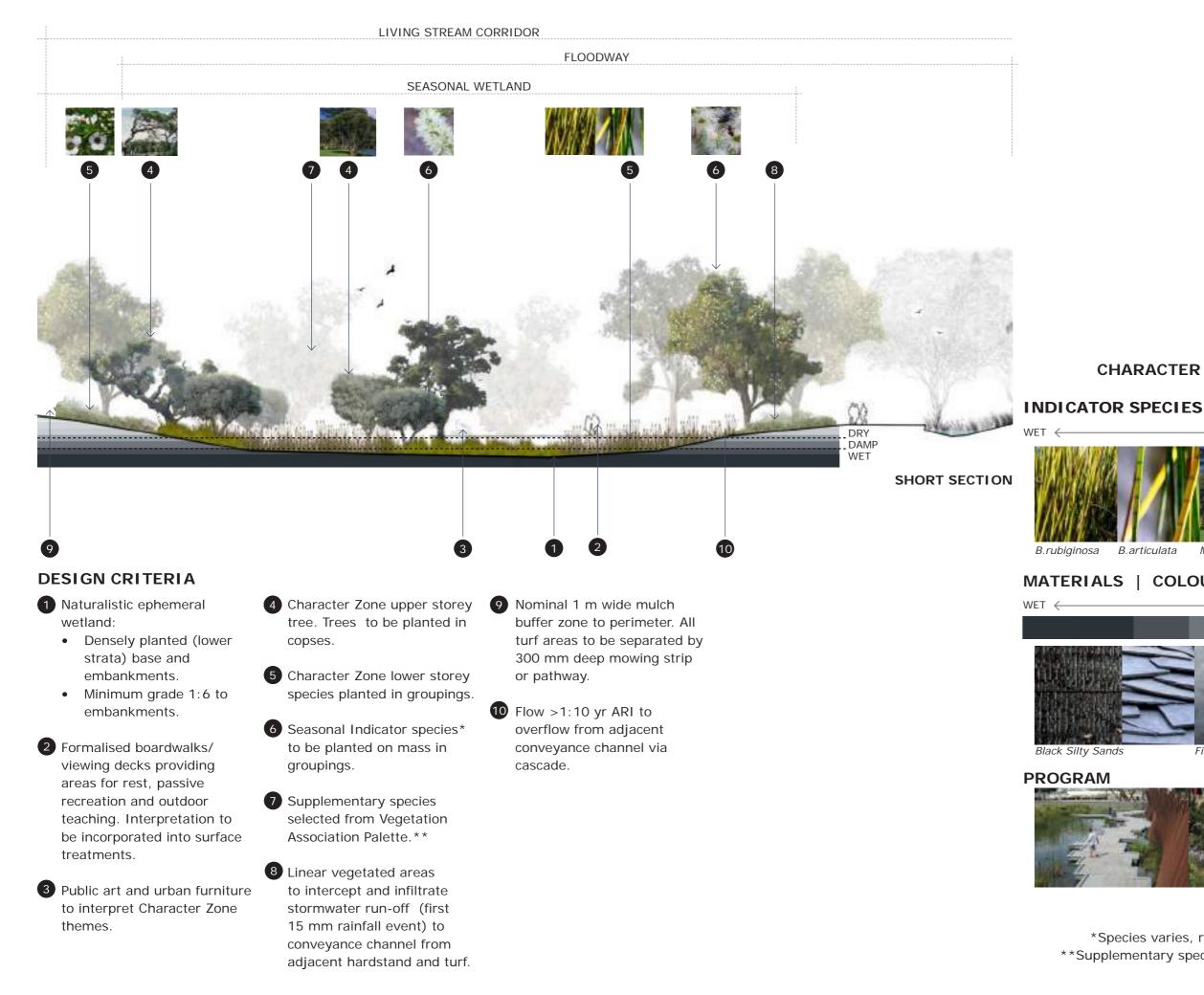
Fine Grey Sands

Timbers and Bark



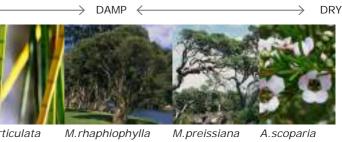
Notes:

*Species varies, refer Songline Wayfinding Species Palette **Supplementary species from relevant Vegetation Association Palette

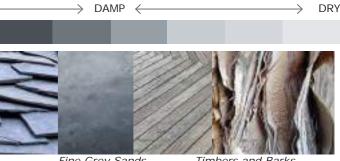




CHARACTER ZONE | SEASONAL WETLANDS TYPOLOGY | RESTORATION NODE



MATERIALS | COLOURS | TEXTURE



Fine Grey Sands

Timbers and Barks



Notes:

*Species varies, refer Songline Wayfinding Species Palette **Supplementary species from relevant Vegetation Association Palette

SPRINGS TYPOLOGIES



WATER FEATURE NODE

The spring typology occurs at two locations within the pre-existing, developed Academic Core.

This typology is to be expressed as an urban water feature, around which people can meet, connect and interact.

The character of the spring is to be interpreted as contemporary abstracted expression of a spring, with water as a permanent feature. The water feature is to incorporate both planting and hard materials in its design.

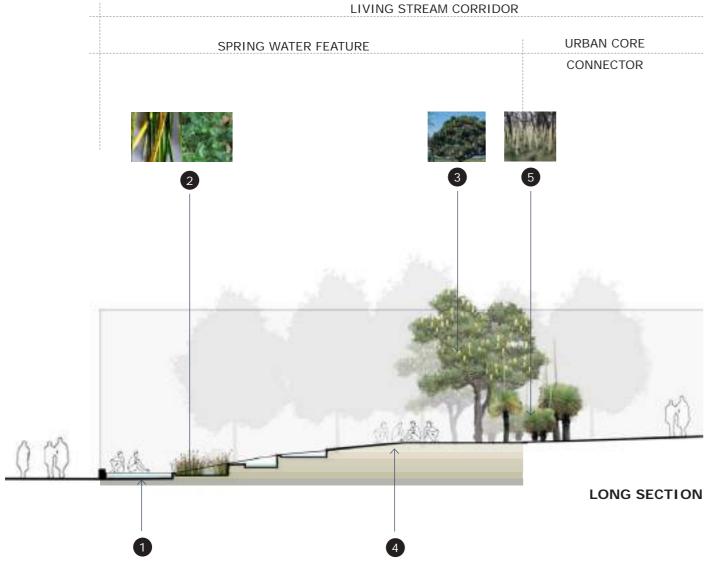
The Songline indicator—*Xanthorrhoea preissii* is to be group planted, with planting density increasing incrementally on approach to the spring typologies.









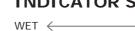


DESIGN CRITERIA

1 Permanent water feature with feature paving inlay.

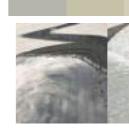
- 2 Intermittent Character Zone (lower strata) planting within water feature.**
- 3 Character Zone upper storey tree. Trees to be planted in copses upslope from permanent water feature.**
- 4 Surface colour and texture of pathways to provide definition of node. Retrofit of existing paving where required. Interpretation to be incorporated into surface treatments.

5 Songline Wayfinding* in linear planting pattern to reinforce wayfinding along the Songline.



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B. articulata
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Wet \leftarrow



Grey Sands

PROGRAM



*Species varies, refer Songline Wayfinding Species Palette **Supplementary species from relevant Vegetation Association Palette



CHARACTER ZONE | SPRING TYPOLOGY | WATER FEATURE NODE

INDICATOR SPECIES



C. asiatica

B. grandis

MATERIALS | COLOURS | TEXTURE

\rightarrow DAN	1P <		\rightarrow	DRY
XiiX	No.			
3	SI	ant i	12	ee.

→ Bleached White Quartz Sands



Notes:

SWALES TYPOLOGIES



Urban Links are stormwater infiltration swales following important pedestrian routes through the Academic Core connecting to the Green Links.

These are defined by a tighter urban condition and presented as formal landscapes in narrower roadside swales and bioretention pits. They are defined by a strong shade canopy and mass plantings of Eremea pauciflora.



GREEN LINK

Green Links are important pedestrian and stormwater conveyance corridors defined by a soft landscape character with a strong shade canopy and an abundant understorey.

These are wide vegetated corridors running adjacent to open green spaces or wide forecourts to public buildings. They are to be designed with generous walking zones, regular rest points for gathering and interaction, and fluid crossing of the swales.

Planting is more naturalistic in arrangement to the Urban Links, however maintains a strong linear pattern with mass plantings of Baumea juncea.







RESTORATIVE NATURE LINK

The Restorative nature links are to strengthen biodiversity across site and provide ecological corridors linking vegetation and creating habitat beyond the boundary of the Curtin site.

These nature links are located to enhance existing areas of native remnant vegetation. They are typically wider buffers and verges to the site boundary, and are defined by a diverse native species palette planted in a naturalistic manner. Although designed as a naturalistic biodiverse corridor the planting mix needs to account for safety and security requirements.

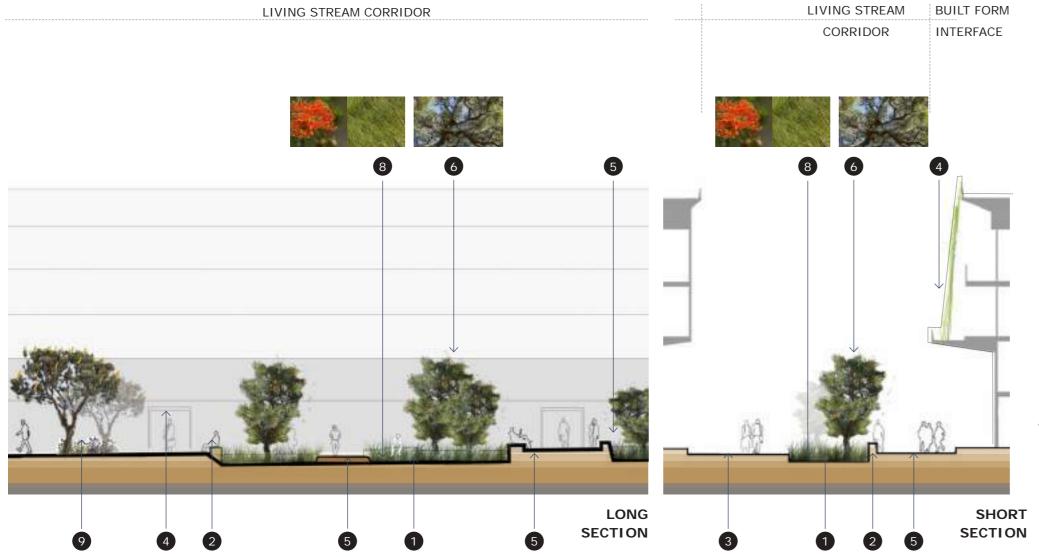
BUILT FORM INTERFACE

Developments abutting and fronting the Stream should integrate artworks, either permanent or ephemeral, within the building facade, forecourts or pavement areas. This may be through mediums such as:

- Integrated public art commissions, such as sculpture, lighting, sound, or video within the forecourts or on the building facades.
- Architectural detailing of the facade and/ or surface treatments responding to the Character Zone material palette.
- Integrated green walls to the building facades.







DESIGN CRITERIA

1 Ephemeral vegetated treatment swale:

- Densely planted (lower strata) base.
- Pervious base to promote **5** Intermittent informal • infiltration.
- Minimum base width of ٠ 1.2 m.

2 Urban edge treatment integrating rest nodes and interpretation/public art.

- 3 Pedestrian prioritised eastwest link. Surface colour and texture of pathways to provide linear continuity.
- 4 Arbours and/or green facades on adjacent buildings providing continuity of vegetation linkages and

Character Zone themes. Permeable pavements to promote infiltration.

- crossings. Enhance and promote the visual and acoustic qualities of surface water movement through landscape design and public art.
- 6 Character Zone upper storey tree. Trees to be planted in linear planting pattern.*
- species 7 Character Zone planted in linear pattern supplemented by locally native rush and sedge species only, vegetation to

- be appropriately matched 8 to the position within the channel, so as to facilitate flows and water quality improvement.**
- 9 Lower strata within dry zone to be selected from Vegetation Association Palette.*

INDICATOR SPECIES









*Supplementary species from relevant Vegetation Association Palette ** Supp. species from the Vegetation Guidelines for Stormwater Biofilters in the South-West of WA



CHARACTER ZONE | SWALES TYPOLOGY | URBAN LINK



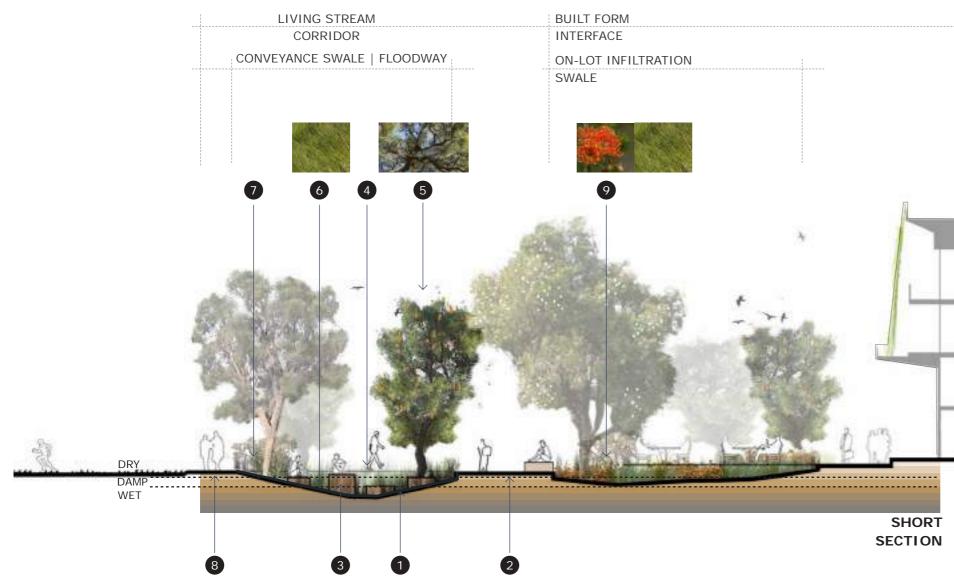
B. littoralis

E. pauciflora

MATERIALS | COLOURS | TEXTURE



Notes:



DESIGN CRITERIA

1 Naturalistic ephemeral vegetated treatment swale:

- Densely planted (lower strata) base and embankments.
- Semi-pervious base to • promote conveyance promote conveyance and maintain moist conditions, or biofilters with submerged zone.
- Minimum base width of • 0.6 m and embankment grade of 1:6.
- 2 Pedestrian prioritised eastwest link. Surface colour and texture of pathways to provide linear continuity.



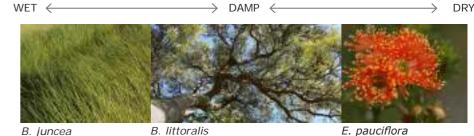
3 Intermittent informal crossings. Enhance and

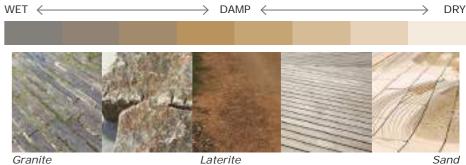
- promote the visual and acoustic qualities of surface water movement through landscape design and public art.
- 4 Formalised crossings (raised walkway). Interpretation to be incorporated into surface treatments.
- 5 Character Zone upper storey tree. Trees to be planted in linear planting pattern.*
- 6 Character Zone species planted in linear pattern supplemented by locally native rush and sedge species only, vegetation to be appropriately matched to the position within the

channel, so as to facilitate flows and water quality improvement.**

- 7 Lower strata within dry zone to be selected from Vegetation Association Palette.*
- 8 Nominal 1 m wide mulch buffer zone to perimeter. All turf areas to be separated by 300 mm deep mowing strip or pathway.
- 9 Character Zone species for infiltration swales. Flow > first 15 mm rainfall event within adjacent development to overflow to conveyance swale.

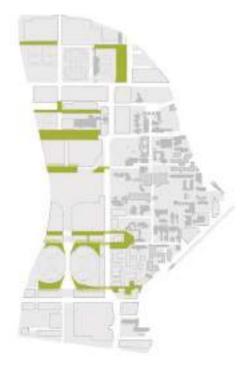
INDICATOR SPECIES







*Supplementary species from relevant Vegetation Association Palette ** Supp. species from Vegetation Guidelines for Stormwater Biofilters in the South-West of WA



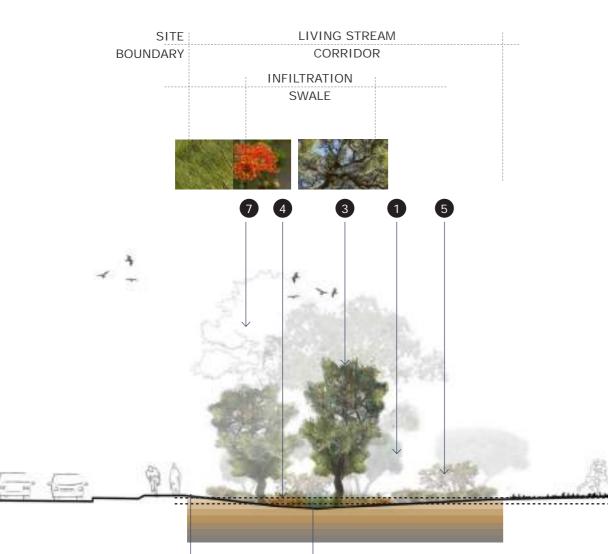
CHARACTER ZONE | SWALES TYPOLOGY | GREEN LINK

B. littoralis

E. pauciflora

MATERIALS | COLOURS | TEXTURE

Notes:



SHORT

DAMP WET

SECTION

DESIGN CRITERIA

- 1 Linear "Open Woodland" biodiversity connector. Densely planted base (lower strata) to deter/ restrict public access and informal crossing. Habitat creation where feasible.
- 2 Intermittent ephemeral vegetated treatment swales providing either infiltration or conveyance:
 - Minimum base width of 0.6 m.
 - Minimum grade of 1:4. •
- 3 Character Zone upper storey tree. Trees to be planted in linear planting pattern. *

4 Character Zone species planted in linear pattern supplemented by locally native rush and sedge species only, vegetation to be appropriately matched to the position within the channel, so as to facilitate flows and water quality

5 Lower strata within dry zone to be selected from Vegetation Association Palette.*

improvement.**

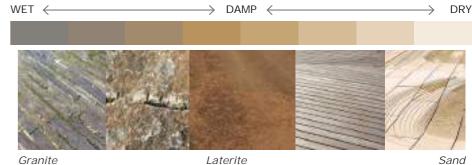
6 Nominal 1 m wide mulch buffer zone to perimeter. All turf areas to be separated by 300 mm deep mowing strip or pathway.

7 Incorporate existing copses of pines and native trees where feasible.

INDICATOR SPECIES



B. juncea



PROGRAM





CHARACTER ZONE | SWALES TYPOLOGY | RESTORATIVE NATURE LINK



B. littoralis

E. pauciflora

MATERIALS | COLOURS | TEXTURE



Notes: *Supplementary species from relevant Vegetation Association Palette ** Supp. species from Vegetation Guidelines for Stormwater Biofilters in the South-West of WA

THE INTERSECTION

This is where the Songlines meet and water flow changes direction.

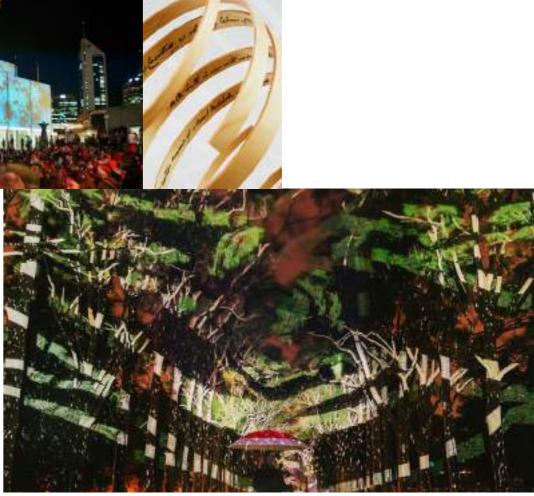
The location forms a key junction, arrival and departure point in modern Curtin University.

Interpretive responses should celebrate Curtin's diversity and explore knowledge sharing and connection through both oral and visual means.

This could include audio-visual media, art installations, interactive sculpture, building facades and surfacing treatments.







PART 6.0 DELIVERY

6.1 DELIVERY PROCESS

The role of this document is to provide design guidance to future designers working within the Living Stream Corridor and adjacent development lots to ensure the design intent of the Stream is implemented.

The custodian of this document is Curtin University Properties Facilities and Development and this document provides a reference for the assessment of design proposals submitted. This document is part of a suite of guidance documents which will be referenced in the review of designs and approvals for projects within the Stream Corridor and adjacent development lots.

This document does not provide guidance in relation to the construction, maintenance or monitoring of specific elements nor does it provide specific guidance to individual development lots.

The preparation of this document has been undertaken in parallel with a series of active planning studies led by Curtin which propose alternative development to that outlined within the 2013 Greater Curtin Master Plan.

Given this, minor shifts in the overall extent of the Living Stream Corridor and arrangement of Stream typologies may alter over time in response to changes in planning.

Curtin Properties Facilities and Development will be responsible for alignment of the Living Stream Corridor and typologies with any adjustments to proposed planning of the University over time and for the provision of any easement(s) to protect the integrity of the Stream into the future.

Detailed below is a high-level summary of the approval pathway developed to protect the integrity of the Stream network. This process facilitates communication of planning changes over time and designers should seek clarity from Curtin to confirm the obligations of their project with respect to implementation of the Stream within their specific project.

Further details relating to approvals will be specified by Curtin on a project by project basis.

6.2 APPLICABLE PROJECTS

This document will be referenced in the design, review and approval of the following projects:

- Curtin led new works/upgrades to the Public Realm within the Stream Corridor.
- Curtin led new construction or refurbishment of existing buildings adjacent to the Stream Corridor.
- Developer led new designs or refurbishment of buildings within development lots adjacent to the Stream Corridor.
- Curtin updates to landscape and environmental management/maintenance plans and strategies within Greater Curtin and the academic core.
- Curtin specific educational curriculum programming, tools and or any other projects which directly or indirectly influence the form, function, interpretation or purpose of the Stream.

Public realm works include roads, hard and soft landscaping, urban furniture and signage, minor structures, public art and associated servicing infrastructure.



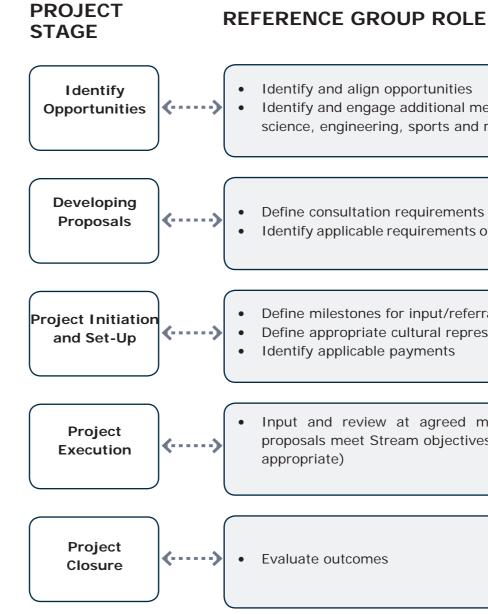
FIGURE 33: SPATIAL EXTENT OF STREAM NETWORK

	Public Realm Easement (the Stream Corridor)						
шш	Development Interface						
	Proposed Development Lots						
	Existing Buildings to be Retained						
	Existing Buildings to be Refurbished						
	Public Realm						
	Green Space Sports Fields						

6.3 CONSULTATION AND REVIEW

6.4 DESIGN REVIEW AND APPROVAL

REVIEW AND APPROVAL FRAMEWORK



Prior to progression of design proposals, the designer is to consult with the Curtin University Cultural Reference Group (CUCRG) and execute a consultation agreement prepared for the project.

This agreement would define (including, but not limited to) the terms of reference, vetting of artists, who the appropriate person(s) to provide guidance are, consultation framework/review milestones, intellectual property and royalties.

design team comprising either Curtin staff or external consultants) or by developers. Where design is led by Curtin, a Curtin representative for the project will execute the agreement with the CUCRG.

Where design is undertaken by a developer, the approval process will be in line with the relevant Curtin University Development Guidelines. The developer will be required to execute the consultation agreement prior to any formal development agreement with Curtin.

Design for public realm works within the Stream Corridor are to be approved by Curtin. The approval process may vary depending on the nature of the project. Curtin may utilise a design review panel as part of its project specific review and approval process.

At each review and/or approval milestone, Curtin will refer proposals to the CUCRG in accordance with the consultation agreement and facilitate review commentary back to the Design Team from Design may be undertaken by Curtin (with the the CUCRG. Curtin will refer proposals to other relevant stakeholder groups where appropriate .

• Identify and engage additional members of reference group (i.e. science, engineering, sports and recreation)

• Identify applicable requirements of the Stream Design Guidelines

• Define milestones for input/referral • Define appropriate cultural representatives

Input and review at agreed milestones (to ensure design proposals meet Stream objectives and responses are culturally

PART 7.0 APPLICATION OF GUIDELINES

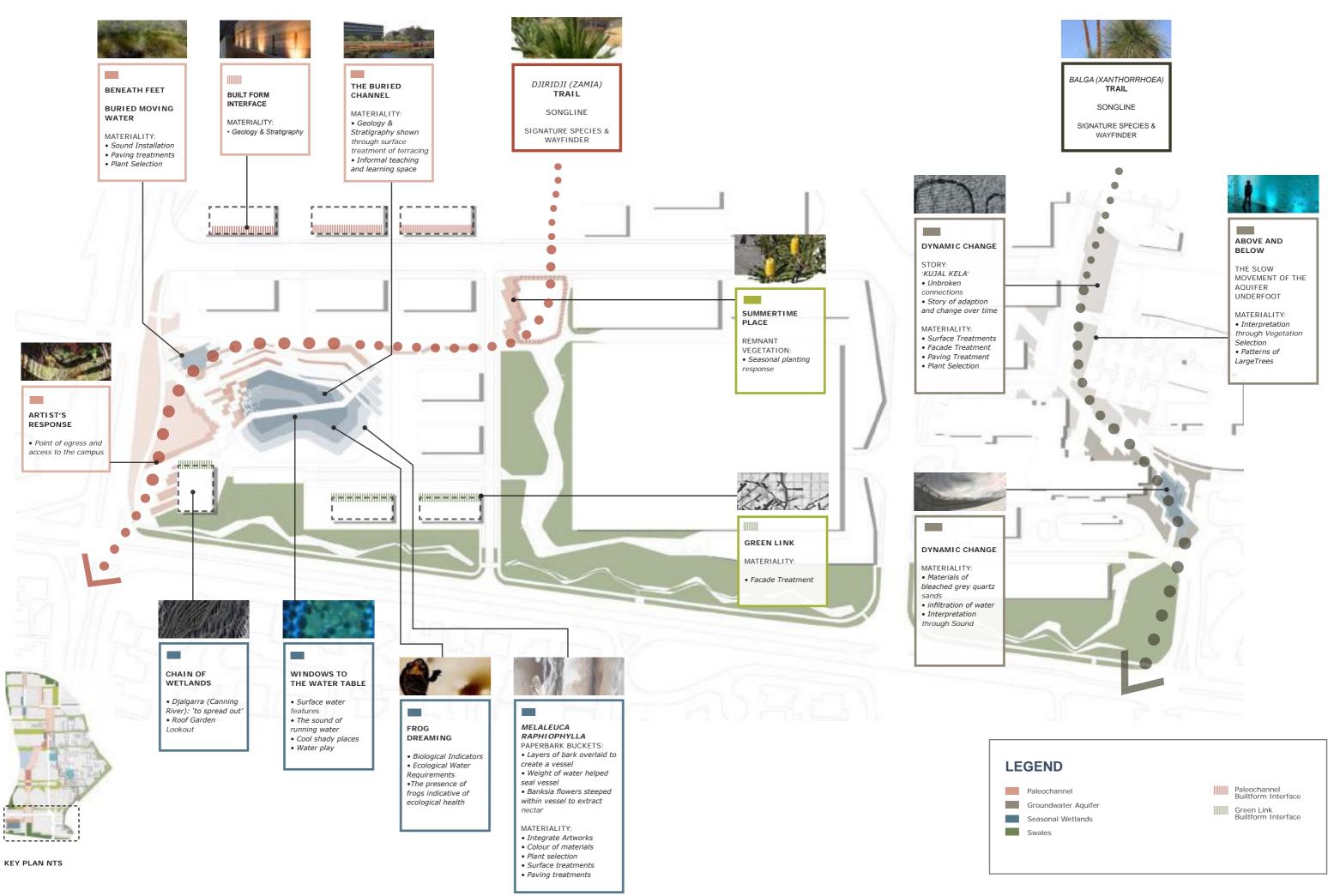
7.1 URBAN NATURE NODE EPHEMERAL WETLAND

A design for the Southern Basin area of Curtin University is presented here as a practical example of applying the Living Knowledge Stream design guidelines. This design was developed in accordance with both the values and design specifications outlined in Parts 1–6 of this document.

The Southern Basin is an ephemeral wetland in the south-west corner of Curtin, located at the point where the Stream exits the Curtin campus. It is an important seasonal wetland that lies on the cultural Journey towards the Canning River (as per Page 100). It acts as an Urban Nature Node, a point of confluence between surrounding Urban Connector (built form), Green Connector (Stream Corridor) and Restorative Nature Link (conveyance swale) zones, as defined on Page 110.

The Southern Basin design documentation includes plans of the site as well as Character Zone mapping, and corresponding material and planting palettes. The palette detail reflects the comprehensive guidance outlined in Part 4 of this document.





LEGEND

- New south-west entrance to site. Public art location to signify 'Djiridji' Zamia Palm Dreaming Trail and connection to Canning River
- Pedestrian promenade following 'Djiridji' Zamia Palm Dreaming Trail
- 3 New south-east entrance to site. Public art location to signify 'Kujal Kela' Dreaming Trail and connection to Canning River
- Pedestrian promenade following 'Kujal Kela' Dreaming Trail
- Existing stand of mature *Eucalyptus* grandis to retain. Trees to be selectively thinned to improve views and safety
- 6 Existing mature *Eucalyptus rudis* to retain
- Existing mature Corymbia calophylla to retain
- B Enhanced and integrated verge treatment to Kent Street
- Restoration swales, and enhanced verge treatment to Manning Road
- Vegetated ephemeral wetland
- 1 Landscaped terraces
- Recreational grass banks
- Remnant Banksia woodland to be protected and enhanced
- Informal trails and seating through meandering swales
- Pedestrian prioritised crossings linking Living Knowledge Stream network
- Key wayfinding marker 'Living Indicator'/Potential public artwork location/Existing Marri
- Xanthorrhea preissii planted in linear strips to follow Dreaming Trail and act as wayfinding marker
- Corymbia calophylla and Allocasuarina fraseriana planted in linear strips to form open forest
- Shared surface, high amenity, slow traffic zone
- Sheltered seating along main promenade
- Active/permeable frontages to stream network/Potential alfresco spaces







CONCEPT PLAN 1:1000 @ A1



ILLUSTRATIVE VIEW LOOKING NORTH-EAST ACROSS WETLAND

LEGEND

1 New south-west entrance to site. Public art location to signify 'Djiridji' Zamia Palm Dreaming Trail and connection to Canning River

U)

- 2 Pedestrian promenade following 'Djiridji' Zamia Palm Dreaming Trail. Embedded art/interpretation through paving
- main promenade act as wayfinding markers along the 'Djiridji' Zamia Palm Dreaming Trail

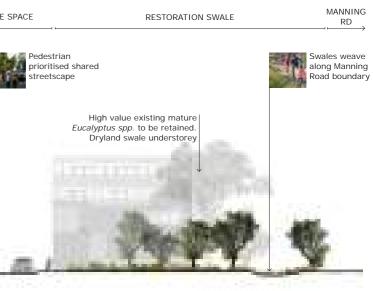
3 Zamia palms planted on mass in linear arrangement along

- 4 Generous landscaped terraces lead to wetland edge
- 5 Planted terraces alternate with hard surfaced terraces, providing sheltered shady outdoor labs/gathering spaces
- 6 Informal art and play stepping stones cascade to wetland edge
- Timber boardwalk with integrated seating areas
- 8 Sheltered seating along main promenade
- 9 Raised planters with integrated seating
- Vegetated ephemeral wetland. Densely planted with swathes of Baumea spp. and scattered Melaleuca spp.
- Daylighting of existing pipes in form of overland swales
- Vegetated water feature to accommodate overland flows prior to entering wetland
- B Densely vegetated banks with groups of seasonal flowering and shade trees

- Gently undulating grass bank
- Existing stand of mature Eucalyptus grandis to retain/ Trees to be selectively thinned to improve views and safety
- Existing mature Eucalyptus rudis to retain
- The Enhanced and integrated verge treatment to Kent Street
- Restoration swales, and enhanced verge treatment to Manning Road
- Informal trails of varying sands and rock meander through swales
- Gently undulating mounding and swale vegetation to wrap around built form
- Pedestrian prioritised crossings linking Living Knowledge Stream network
- 22 Shared surface, high amenity, slow traffic zone
- Active/permeable frontages to stream network/ Large, open terrace allows potential alfresco spaces, with bespoke shade shelters incorporated
- Semi-private areas fronting Living Knowledge Stream/ Stream materiality and planting to be carried through into semi-private areas
- 2 Integrated built form facade to stream potential green walls

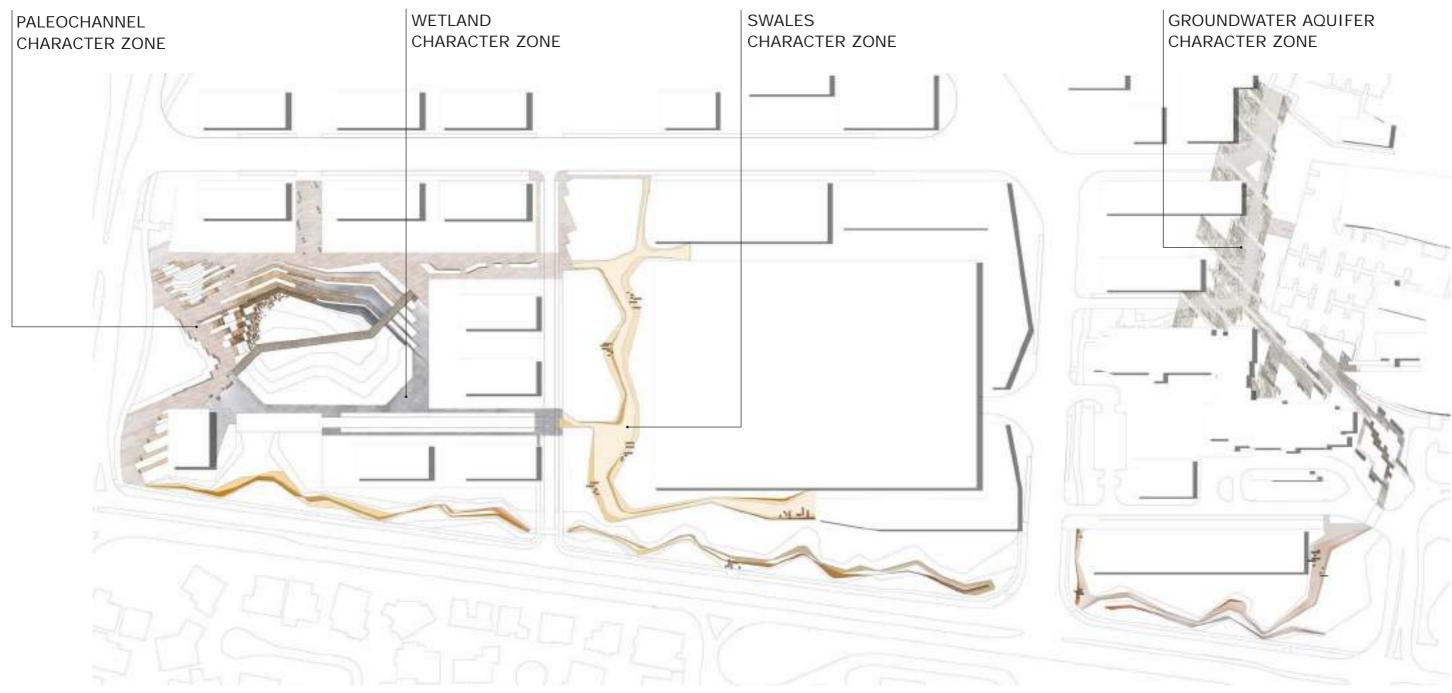


	SEMI-PRI	VATE ZONE	PUBLIC PROMENADE	PALEOCHANNEL TERRACING	EPHEMERAL VEGE	TATED WETLAND	GRASS EMBANKMENT	SHARED SURFACE S
	Paleochannel built form interface - variegated/textural material treatment to facade	Surface treatment, nodal seating and Banksias to continue through public access way	Wide pedestriar promenade to accommodate shared use	Wide seating terraces. Alternating hard and planted.Max.500 mm level change Min.1500 mm wide		Timber deck traversing wetland, width to accommodate seating and study groups at key locations	Gently sloping grassed bank to wetland edge - max. 1:6 slope	
		Banksia spp. to provide seasonal colour	Zamia to mark dreaming trail	Occasional <i>Eucalyptus</i> <i>rudis</i> planted along terraces to provide shade	Groupings of <i>Melaleuca</i> <i>spp.</i> scattered across ephemeral wetland	Swathes of <i>Baumea spp.</i> creating dense open sedgeland	Eucalyptus	existing mature a <i>rudis</i> to be ong grass bank
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KEY PLAN NTS	SECTION BB 1:250 @A1			A Contraction	和任何	and the second second	the state	¥



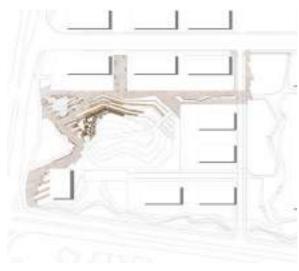
The Curtin Living Knowledge Stream Design Guidance

Page 159 of 185





MATERIAL PALETTE **CHARACTER ZONE: PALEOCHANNEL**



SURFACE TREATMENTS Walkways, terracing, edging, retaining walls



Element: main promenade Indicative Material: exposed aggregate concrete or stone segmental pavers Colour: pale sands, pinks to light beige

paleochannel connects The and reveals, forming a link, and providing an experiential journey between places of pause and reflection.

Spatially expanding and contracting, a path is defined that cascades into a tiered landscape, to reveal the stratigraphy of a buried geology and history.

Materially, the landscape references pale sands at the surface through to the rich oxides and greys of an iron cemented clay bed closer to the water table.

FURNITURE **ELEMENTS**

Seating, informal play elements, stepping stones etc



Element: seating blocks Indicative Material: coloured concrete, stone, rammed earth

INTERPRETIVE

ELEMENTS Specific signage, embedded stories, artwork etc



Element: stand alone signage/ sculpture Indicative Material: weathered steel



Element: main promenade and terracing Indicative Material: in situ concrete/exposed aggregate concrete Colour: light beige to ochre

Element: retaining walling to terraces Indicative Material: coloured concrete, stone or steel Colour: oxidised iron/deep brown





Element: Seating blocks Indicative Material: Coloured concrete, stone, rammed earth

Element: bench seating Indicative Material: timber seating on stone/concrete/steel base



Element: pavement inlays Indicative Material: etched concrete walling/pavement/building facade /steel inlays



Element: integrated artworks to





Element: lower terraces/stepping stones

Indicative Material: oxidised iron/ deep ochre coloured concrete or stone

Finish: exposed aggregate/rough hewn



Element: stepping stones to lower terraces

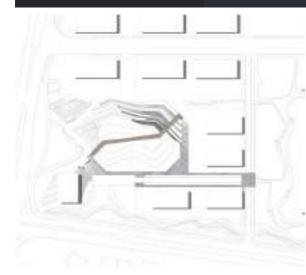
Indicative Material: oxidised iron/ deep ochre coloured concrete or stone

Finish: exposed aggregate/rough hewn



Element: building fenestration/ facade Indicative Material/Colour: variegated/terracotta/ochres

MATERIAL PALETTE **CHARACTER ZONE: WETLANDS**



TREATMENTS Decking, walkways, terracing, edging, retaining walls

SURFACE



Element: main promenade Indicative Material: exposed aggregate concrete or stone segmental pavers Colour: varying shades of light washed grey

The urban wetland is a place of celebration and gathering, a place to pause and reflect.

Spatially, a series of terraces gradually expand from the paleochannel stratigraphy into looser, wider spaces that encourage people to pause, gather and enjoy. Large, shaded terraces and an undulating grassy bank accommodate community and student recreation, relaxing, picnicking and outdoor labs.

Materials reference smooth, dark grey-blues, fine silts and the peat of wetter times, transitioning to lighter, rougher, flaky textures of dryer times, cracked, exposed finishes, flaky paperbark and greying of weathered timbers.

FURNITURE ELEMENTS

Shelter, seating, informal play elements, stepping stones etc



Element: Bespoke shade /picnic shelters

Element: Embedded interpretive

Indicative Material: Acid etched /

sandblasted concrete

text/art

INTERPRETIVE ELEMENTS

Specific signage,

embedded stories, ephemeral water play, artwork etc





Indicative Material: routed timber/ steel inlays



Element: timber decking Indicative Material: hardwood Element: intermediate terraces/ steps Indicative Material: in situ concrete, light grey to charcoal grey, textured finishes



Element: bench seating to deck Indicative Material: timber



Indicative Material: light grey to charcoal grey concrete, varying finishes



Element: integrated art/water play insets to lower terraces Indicative Material: rough hewn stone/charcoal grey to light grey textured concrete

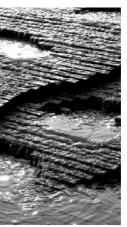


Element: larger terraces Indicative Material: in situ concrete, smooth, washed finished

Element: seating blocks/terracing



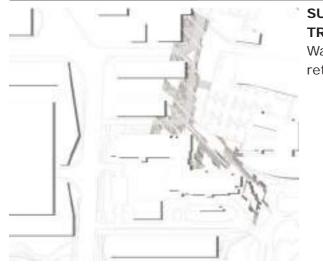
Element: stepping stones/seating blocks to lower terraces Indicative Material: exposed aggregate concrete/ rough hewn stone



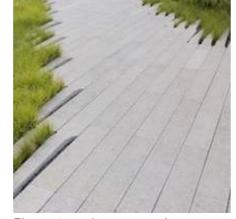


Element: integrated art/water play to upper terraces Indicative Material: rough hewn stone/charcoal grey to light grey textured concrete

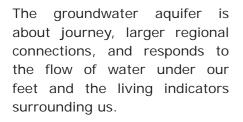
MATERIAL PALETTE CHARACTER ZONE: GROUNDWATER AQUIFER



SURFACE TREATMENTS Walkways, edging, retaining walls etc



Element: main promenade Indicative Material: large format concrete paving slabs



Spatially, linear arrangements following the Songline, represent movement and flow, using living indicators (Marris, Sheoaks and Balga) above us, and large scale interpretive surface treatments under our feet as storytelling, directional and wayfinding cues.

Materials reference bleached quartz sands and draw on the architectural heritage of Curtin to form a continuous in situ concrete carpet of varying textural and patterned finishes. Surface treatments move to deeper charcoal colours and timbers around the wetland, before transitioning to the granites of the swales.

FURNITURE **ELEMENTS** Shelter, seating,

informal play elements etc



Element: shelter, seating, raised planters walling Indicative Material: perforated steel with integrated lighting

INTERPRETIVE ELEMENTS

Specific signage, embedded stories, artwork etc

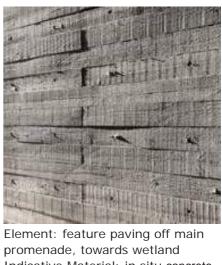
steps and through



Element: embedded interpretive text/art Indicative Material: acid etched/ sandblasted concrete



Element: feature paving off main promenade Indicative Material: exposed aggregate concrete/granite strip



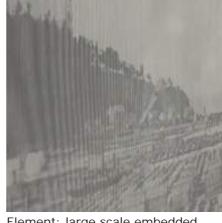
pavers

light grey, timber board finish

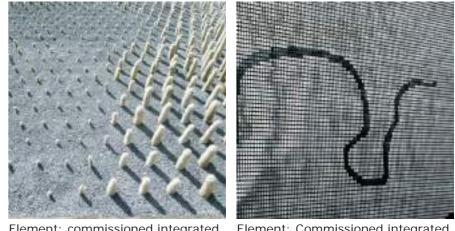


Element: bespoke shade shelters

Element: seating blocks/play elements Indicative Material: light grey, smooth concrete

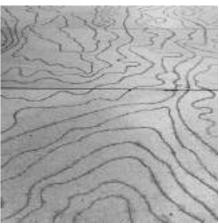


Element: large scale embedded interpretive text/art in facades/ walling Indicative Material: acid etched/ sandblasted concrete



Element: commissioned integrated public artworks through promenade area

Indicative Material: in situ concrete,



Element: Main promenade Indicative Material: Integrated art/ patterning to large scale in situ concrete areas

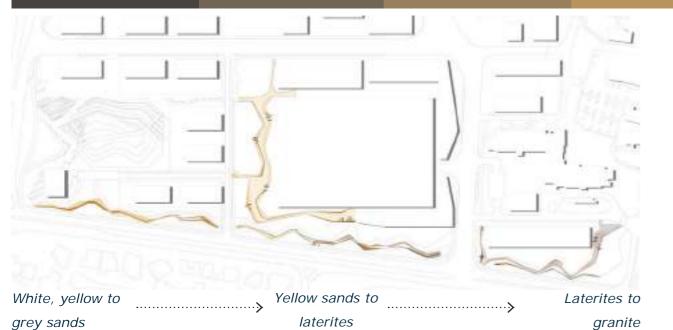




Element: Integrated pavement art

Element: Commissioned integrated public artworks as part of building fenestration/facade

MATERIAL PALETTE CHARACTER ZONE: SWALES



SURFACE TREATMENTS

Walkways, informal trails, edging, garden beds, swale base etc.



Indicative Material: limestone individual large rocks, rock rip rap, compacted crushed limestone to trails



Indicative Material: grey gravels, bluemetal of varying diameter- trail edging, mulch

The swales respond to movement and flow, and provide restorative connections and linkage across the wider campus.

Spatially, the swale is a meandering rivulet, ephemeral in nature, weaving in and out, wrapping around and up built form, expanding and contracting and creating 'breathing' spaces in the landscape. The restorative swale is loose and informal in its surface finish and planting arrangement

Materials reference a dry creek bed, revealing threads of varying loose and compacted sands, gravels and rocks representing the wider profile of the granites of the scarp, to lateritic gravels, to fine grey sands and gravels to crushed limestone.



Indicative Material: laterite peagravel to path edges, garden beds, rock rip rap, crushed compacted laterite to trails



Indicative Material: feature surfacing - large scale laterite, granite slabs to footpath connections/building frontages

FURNITURE AND INTERPRETIVE ELEMENTS Seating, play elements, stepping stones. Specific

stepping stones, Specific signage, embedded stories, artwork etc.



Element: stepping/play features Indicative Material: timber/stone with routed timber/steel inlays



Element: seating blocks Indicative Material: Stone/recycled timber sleepers



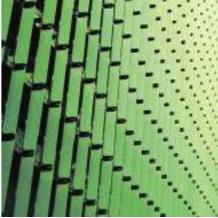
Element: individual nodal seats Indicative Material: white/coloured concrete



Element: feature elements

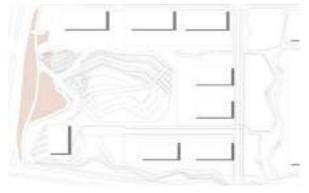
Indicative Material: granite individual large rocks, rock rip rap, compacted crushed granite to trails

Element: feature rocks as seating

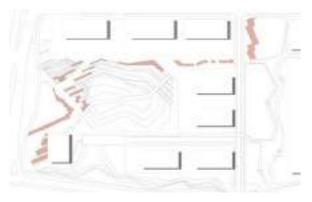


Element: commissioned integrated public artworks as part of building fenestration/facade

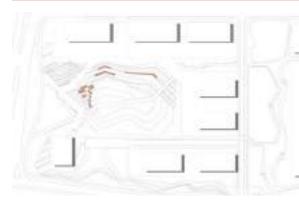
PLANTING PALETTE **CHARACTER ZONE: PALEOCHANNEL**



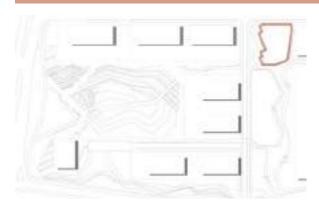
Mix 1P: Buffer Planting



Mix 2P: Songline



Mix 3P: Seasonal



Mix 4P: Remnant Banksia

Woodland of Banksia attenuata and Eucalyptus rudis with low flowering understorey

Low open woodland of Banksia spp., with linear arrangement of Macrozamia riedlei, interspersed with occasional Eucalyptus rudis

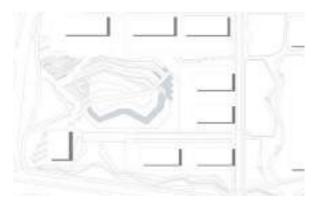
Open woodland of Banksia spp. characterised by yellow flowers and swathes of rushes and sedges. Dryland to ephemeral on lower terraces

> Banksia spp. and low understorey to buffer and complement the remnant Banksia woodland

> > *Melalueca Woodland vegetation association **Banksia woodland vegetation association ***Marri-Sheoak vegetation association ****Banksia-Jarrah Woodland vegetation association

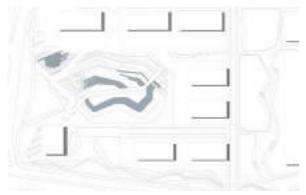
Species Name	Nyoongar / Common Name	Indicative Percentage (%) within each planting mix			
		Mix 1P:	Mix 2P:	Mix 3P:	Mix 4P
		Buffer	Songline	Seasonal	Banksi
Trees					
Banksia attenuata** (Seasonal Indicator)	Biara / Candle Banksia	5	3	4	
Bankisia ilicifolia*** (Seasonal Indicator)	Holly-leaved Banksia		1	4	
Banksia menziesii*** (Seasonal Indicator)	Bulgalla / Firewood Banksia				
Eucalyptus rudis* (Indicator species)	Moitch / Flooded Gum	5	1		
Macrozamia riedlei (Songline Wayfinding)	Djiridji / Zamia	5	25	10	
Nuytsia floribunda (Seasonal Indicator)	Mooja / Christmas Tree				C
Shrubs			1		
Astartea scoparia*	Common Astartea			1	
Adenanthos cygnorum**	Common Woolybush				
Allocasuarina humilis**	Dwarf Sheoak				C
Bossiaea eriocarpa**	Common Brown Pea				
Calytrix flavescens*	Summer Starflower	5	1	2	
Calytrix fraseri*	Pink Summer Calytrix	5	· ·	2	
Darwinia citriodora *** (Indicator species)	Lemon-scented Darwinia	20	15	10	
Daviesia triflora**	-	20	10	10	
Eremaea pauciflora**		5	2		
Hibbertia hypericoides****	Yellow Buttercups		2	1	
Hibbertia subvaginata*	-	4			
Hypocalymma angustifolium*	White Myrtle		1	2	
Hypocalymma robustum*	Swan River Myrtle	4	3	1	
Gompholobium tomentosum**	Hairy Yellow Pea	2	1	1	
Melaleuca lateritia*	Robin Redbreast Bush	2	I	0.5	
Melaleuca seriata****		1	0.5	0.5	
Pericalymma ellipticum*	Swamp Teatree	3	0.5	1	
Scholtzia involucrata**	Spiked Scholtzia	1	0.5	0.5	
Verticordia densiflora**	Compacted Featherflower	1		0.5	
Rushes / Sedges	compacted reachernower			0.5	
•	Para Turia Sadaa	4	5	0	
Baumea yaginglic* (Indicator species)	Bare Twig Sedge	4	5	8	
Baumea vaginalis* (Indicator species)	Pale Twig Sedge	10	15	5	
Chaetanthus aristatus* (Indicator species)	-	10	15	15	
Lepidosperma effusum*	Spreading Sword Sedge			2	
	Pithy Sword Sedge	10	20	2	
Leptocarpus scariosus* (Indicator species)	-	10	20	25	
Herbs					
Anigozanthos humilis**	Catspaw				
Anigozanthos manglesii**	Kurulbrang / Mangles		2		
	Kangaroo Paw			-	
Conostylis setigera**	Bristly Cottonhead	1	1	2	
Dampiera linearis**	Common Dampiera				
Dianella revoluta***	Blueberry Lily	1			
Haemodorum spictum**	Mardja / Bloodroot				
Patersonia occidentalis*	Komma / Purple Flag	5	2		
Rytidosperma occidentale**	Wallaby Grass				
Thysanotus multiflorus*	Many-flowered Fringe Lily	3	1		
		100	100	100	1(

PLANTING PALETTE CHARACTER ZONE: WETLAND



Mix 1W: Upper Embankment (Dryland)

Melaleuca open woodland, with low flowering understorey, interspersed with occasional *Eucalyptus rudis* and groupings of *Banksia spp.*



Mix 2W: Lower Embankment (Ephemeral)

Melaleuca open woodland, over sedgeland of *Baumea spp.* and groupings of *Melaleuca spp.* Dryland on upper banks transitioning to ephemeral basin



Mix 3W: Wetland Basin (Ephemeral)

Scattered *Melaleuca rhaphiophylla* over open sedgeland of *Baumea spp.*

*Melalueca Woodland vegetation association **Banksia woodland vegetation association ***Marri-Sheoak vegetation association

Species Name	Nyoongar / Common Name	Indicative Percentage (%) within each planting mix			
		MIX 1W: UPPER EMBANKMENT	MIX 2W: LOWER EBANKMENT	MIX 3W: WETLAND BASIN	
Trees					
Banksia attenuata ** (Seasonal Indicator)	Biara / Candle Banksia	0.5	0.5		
Bankisia ilicifolia * * * (Seasonal Indicator)	Holly-leaved Banksia	1.5	0.5		
Banksia littoralis*	Pungura / Swamp Banksia	0.5	1		
Eucalyptus rudis*	Moitch / Flooded Gum	0.5			
M. rhaphiophylla* (Indicator species)	Bibool / Swamp Paperbark		2	5	
Melaleuca preissiana* (Indicator species)	Moonah	2	2		
Shrubs					
Astartea scoparia* (Indicator species)	Common Astartea		10	1	
Calytrix flavescens*	Summer Starflower	5	3		
Calytrix fraseri*	Pink Summer Calytrix	5	3		
Darwinia citriodora***	Lemon-scented Darwinia				
Eremaea pauciflora**	-	5			
Euchilopsis linearis*	Swamp Pea	2	3		
Eutaxia virgata*	-	2	3		
Hibbertia subvaginata*	-	6	3		
Hypocalymma angustifolium*	Koodgeed / White Myrtle	5	10	2	
Hypocalymma robustum* (Indicator species)	Koodgeed / Swan River Myrtle	15	5		
Melaleuca lateritia*	Robin Redbreast Bush	0.5	1		
Melaleuca teretifolia*	-	0.5	2		
Lechenaultia floribunda	Free-flowering Leschenaultia	5	3		
Pericalymma ellipticum*	Swamp Teatree	2	2		
Verticordia densiflora**	Compacted Featherflower	2			
Rushes / Sedges					
Baumea articulata* (Indicator species)	/ Wuargul Jointed Twig Sedge		10	40	
Baumea juncea*	Bare Twig Sedge	10	4	5	
Baumea rubiginosa* (Indicator species)	-		20	30	
Baumea vaginalis*	Pale Twig Sedge		1	15	
Chaetanthus aristatus*	-	2	1		
Lepidosperma effusum*	Spreading Sword Sedge		1		
Lepidosperma longitudinale*	Pithy Sword Sedge		1		
Leptocarpus scariosus*	-	5			
Schoenus subfascicularis*	-		2		

Herbs

Centella asiatica*	Centella		2	2
Lobelia anceps*	Angled Lobelia	6	2	
Patersonia occidentalis*	Purple Flag	7		
Thysanotus multiflorus*	Tjungeri / Many-flowered Fringe Lily	6		
		100	100	100

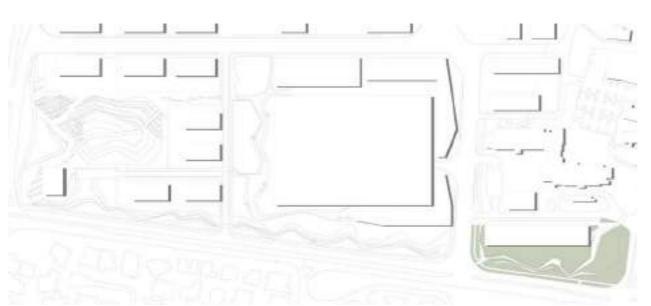
PLANTING PALETTE CHARACTER ZONE: SWALES



Woodland of Banksia littoralis transitioning to low open

Mix 1S: Transitional Melaleuca to shrubland dominated by Eremaea pauciflora bordering Banksia Woodland

mass planting of Baumea juncea



Marri open forest transitioning to low open shrubland dominated by Eremaea pauciflora interspersed with swathes of Banksia littoralis bordering mass planting of Baumea juncea

Mix 2S: Transitional Marri to Banksia Woodland

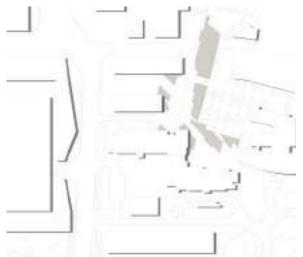
*Melalueca Woodland vegetation association **Banksia woodland vegetation association ***Marri-Sheoak vegetation association

Species Name	Nyoongar/Common Name	Indicative P (%) within ea miz	ach planting
		MIX 1S: MELALEUCA WOODLAND	MIX 2S: MARRI- SHEOAK FOREST
Trees			
Bankisia ilicifolia *** (Seasonal Indicator)	Holly-leaved Banksia		
Banksia littoralis* (Indicator species)	Pungura / Swamp Banksia	2	
Banksia menziesii * ** (Seasonal Indicator)	Bulgalla / Firewood Banksia		1.
Eucalyptus rudis*	Moitch / Flooded Gum	0.5	0.
Shrubs			
Acacia willdenowiana***	Grass Wattle		
Adenanthos obovatus***	Basket Flower		
Calytrix flavescens*	Summer Starflower	4	
Calytrix fraseri*	Pink Summer Calytrix	4	
Darwinia citriodora***	Lemon-scented Darwinia	-7	
Daviesia decurrens**	Prickly Bitter-pea		
Eremaea pauciflora** (Indicator species)		25	2
Euchilopsis linearis*	- Swamp Pea	4	2
Eutaxia virgata*	Swarrip rea	3	
Gastrolobium capitatum***		5	
Hardenbergia comptoniana***	Native Wisteria		0
Hibbertia racemosa***	Stalked Ginea Flower		0
Hibbertia subvaginata*		3	
Hypocalymma angustifolium*	Koodgeed / White Myrtle	4	
Lechenaultia floribunda***	Free-flowering Lechenaultia		
Melaleuca lateritia*	Robin Redbreast Bush	0.5	
Melaleuca teretifolia*		0.5	
Melaleuca thymoides***	-		
Pericalymma ellipticum*	Swamp Teatree	0.5	
Verticordia densiflora**	Compacted Featherflower		0
Rushes / Sedges	- p		
Baumea juncea* (Indicator species)	Bare Twig Sedge	25	2
Lepidosperma effusum*	Spreading Sword Sedge	0.5	2
Lepidosperma longitudinale*	Pithy Sword Sedge	10	
Schoenus subfascicularis*		5	
Herbs			
Conostylis juncea***	_		
Dasypogon bromeliifolius***	- Pineapple Bush		
Dasypogon bromennonas Dianella revoluta***	Mangard / Blueberry Lily		
Kennedia prostrata***	Wollung / Scarlett Runner		
Lobelia anceps*	Angled Lobelia	2	
		3	
Patersonia occidentalis*	Purple Flag	3	
Phlebocarya ciliata*** Themeda triandra***	-		
	Many flowered Fringe Like	2	
Thysanotus multiflorus*	Many-flowered Fringe Lily	3	

PLANTING PALETTE CHARACTER ZONE: GROUNDWATER AQUIFER

		Species Name	Nyoongar/Common Name	Indicative Percentage (%) within each planting mix	
1				MIX 1A: MELALEUCA WOODLAND	MIX 2A: MARRI- SHEOAK FOREST
		Trees			
r.		Allocasuarina fraseriana *** (Indicator species)	Kondil / Sheoak	0.5	0.5
		Corymbia calophylla*** (Indicator species)	Marri	2	1.5
		Xanthorrhea preissii (Songline Indicator)	Balga / Grass tree	15	15
		Shrubs			
		Acacia willdenowiana***	Grass Wattle		2
		Adenanthos obovatus***	Basket Flower		1
	Grasstree shrubland with scattered Marri and low	Astartea scoparia*	Common Astartea	0.5	
	flowering understorey of herbs and shrubs	Calytrix flavescens*	Summer Starflower	2	
		Daviesia decurrens***	Prickly Bitter-pea		1
		Gastrolobium capitatum***	-		2
		Hardenbergia comptoniana***	Native Wisteria		1
		Hibbertia racemosa***	Stalked Ginea Flower		2
		Hibbertia subvaginata*	-	2	
		Hypocalymma angustifolium*	Koodgeed / White Myrtle	3	
		Hypocalymma robustum*	Koodgeed / Swan River Myrtle	2	
		Lechenaultia floribunda***	Free-flowering Leschenaultia		2
		Melaleuca thymoides***	-	1	2
		Pericalymma ellipticum*	Swamp Teatree	2	
		Verticordia densiflora** (Indicator species)	Compacted Featherflower	15	20
		Rushes / Sedges			
		Baumea juncea*	Bare Twig Sedge	5	
		Lepidosperma longitudinale*	Pthy Sword Sedge	3	
		Herbs			
		Conostylis juncea***	-		2
-		Dasypogon bromeliifolius***	Pineapple Bush	10	15
*		Dianella revoluta*** (Indicator species)	Mangard / Blueberry Lily	15	15
		Hybanthus calycinus **** (Indicator species)	Wild Violet	10	10
- 10		Kennedia prostrata***	Wollung / Scarlett Runner		2
-		Lobelia anceps*	Angled Lobelia	4	
		Patersonia occidentalis*	Purple Flag	4	
		Phlebocarya ciliata***	-		4
	Marri open forest with low flowering understorey	Themeda triandra***	-		2
	interspersed with regular linear strips of Xanthorrhea	Thysanotus multiflorus*	Many-flowered Fringe Lily	4	
st	preissii and linear groupings of Allocasuarina fraseriana	,		100	100

Mix 1A: Grasstree Shrubland



Mix 2A: Marri Woodland Open Forest

*Melalueca Woodland vegetation association **Banksia woodland vegetation association ***Marri-Sheoak vegetation association ****Banksia-Jarrah Woodland vegetation association

IMAGE REFERENCES

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Page 09 Figure 1: Sketch courtesy of Dr Noel Nannup, 2012.

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Page 31: Photo, Banksia woodland, RT, Syrinx Environmental

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