2017

city of Rockingham

where the coast comes to life

Created by: Planning and Development Services

Contents

1 Introduction

The City of Rockingham encompasses an approximate area of 260 km^2 and currently has a population of over 140,000, which is expected to grow beyond 175,000 in the next ten years. Given the context of a rapidly urbanising Strategic Metropolitan Center, the City aspires to develop strong communities, recognizing that green space is a key element contributing to our City's liveability, amenity and character.

The City's green space includes all trees, shrubs, grass and other vegetation on public and private land. Collectively, these various forms of green space play their part to positively influence community well-being, local economy and biodiversity.

The Greening Plan (the Plan) is a systematic and long term approach to management of green space, with a particular focus on trees in streetscapes and public open space (POS). These trees are an invaluable part of the City's green capital and the Plan provides a framework to protect, enhance and effectively manage these assets.

The Plan also acknowledges the challenges associated with establishing and managing a resilient, healthy and diverse urban forest, together with the need to ensure the benefits of urban greening are complimentary to community safety objectives and the provision of services.

The Plan considers the current extent of all green cover across the City, while also identifying potential losses, key threats, challenges and opportunities, to establish ambitious yet pragmatic Green Goals for the City's urban forest over the next five years and beyond.

1.1 Vision

This Plan endeavours to deliver the following aspiration contained in the City's Strategic Community Plan 2015-2025:

Planning for population growth and guiding development and land use to ensure that future generations enjoy a sustainable city and genuinely desirable lifestyle.

Aspiration D: Sustainable Environment
Strategic objective: Land Use and Development Control

1.2 Purpose

To provide a framework for the establishment of a resilient, diverse and expanding urban forest through greening in public open space and streetscapes.

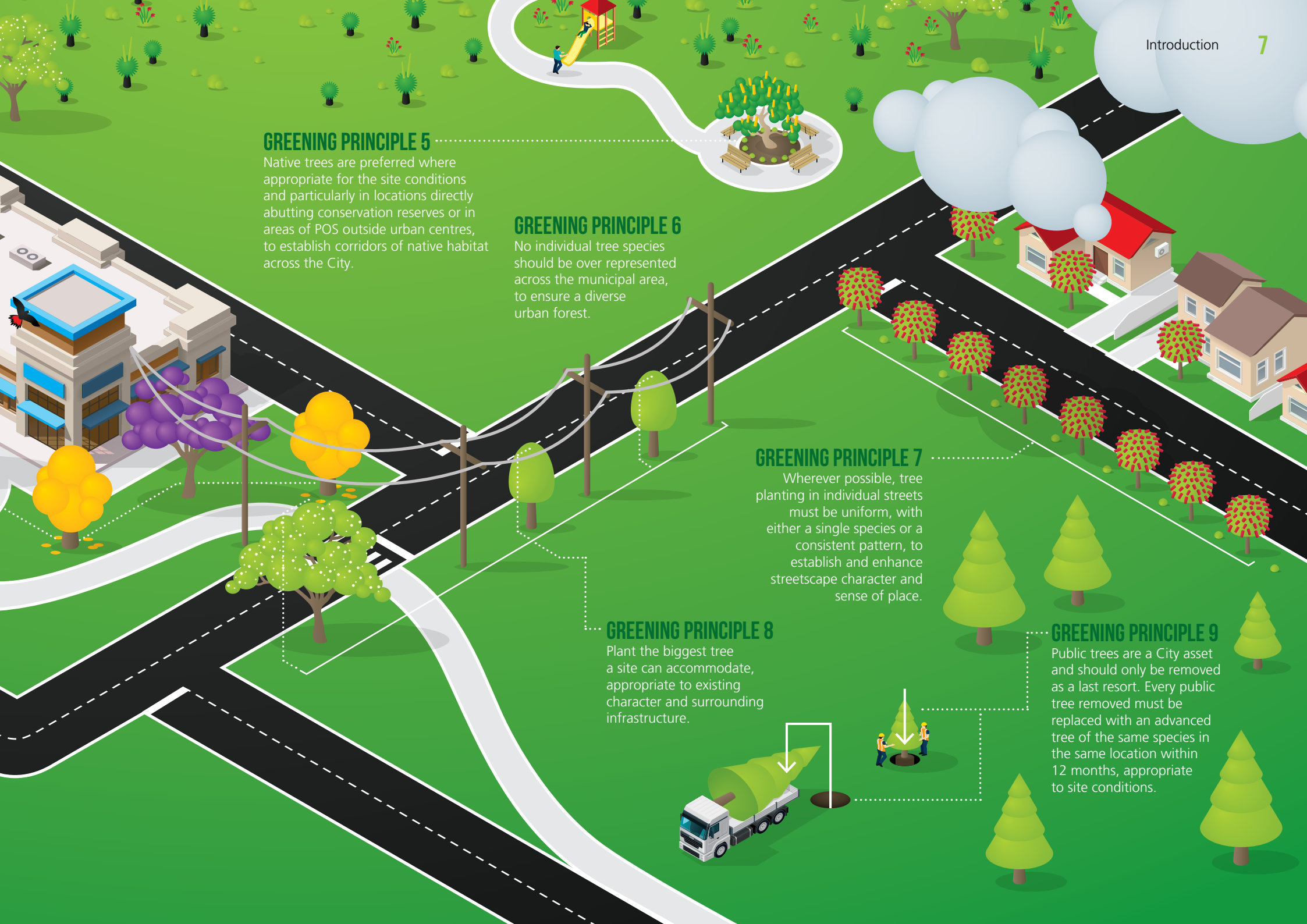
1.3 Green Goals

The delivery of the Greening Plan is driven by the following Green Goals:

- Improve the trajectory of the City's green cover
- Encourage community involvement in urban greening
- Protect and maintain the City's green assets
- Plant the right tree in the right place
- Ensure a diverse urban forest

Actions required to achieve these Green Goals are identified in Section 6 of this Plan and must be undertaken with consideration for the following Greening Principles.

1.4 Greening Principles



GREENING PRINCIPLE 5

Native trees are preferred where appropriate for the site conditions and particularly in locations directly abutting conservation reserves or in areas of POS outside urban centres, to establish corridors of native habitat across the City.

GREENING PRINCIPLE 6

No individual tree species should be over represented across the municipal area, to ensure a diverse urban forest.

GREENING PRINCIPLE 7

Wherever possible, tree planting in individual streets must be uniform, with either a single species or a consistent pattern, to establish and enhance streetscape character and sense of place.

GREENING PRINCIPLE 8

Plant the biggest tree a site can accommodate, appropriate to existing character and surrounding infrastructure.

GREENING PRINCIPLE 9

Public trees are a City asset and should only be removed as a last resort. Every public tree removed must be replaced with an advanced tree of the same species in the same location within 12 months, appropriate to site conditions.

1.5 Strategic context

1.6 Relevant documentation

Effective management of the City's green space is reliant on the successful integration of a suite of documents that bear relevance to tree planting within road reserves and POS. The following documents were given particular consideration during the development of this Plan and should be referred to during implementation as required:

- Bushfire Risk Mitigation Strategy, City of Rockingham (2017) (draft)
- Environmental Management Strategy, City of Rockingham (2017) (draft)
- Public Open Space Strategy, City of Rockingham (2017) (draft)
- Reserve Prioritisation Report, City of Rockingham (2015)
- Design WA, Department of Planning (2016) (draft)
- State Planning Policy 3.7: Planning in Bush Fire Prone Areas, Department of Planning (2015)
- Guidelines for Planning in Bushfire Prone Areas, Department of Planning (2017)
- Liveable Neighbourhoods, Department of Planning (2009)
- Draft Liveable Neighbourhoods, Department of Planning (2015)
- Utility Providers Code of Practice, Main Roads WA (2015)
- Rockingham Lakes Regional Park Management Plan, Department of Parks and Wildlife (2010)
- Vegetation Placement within the Road Reserve, Main Roads WA 2013
- Revegetation Planning and Techniques, Main Roads WA 2013
- City of Rockingham Verge Treatment Policy (draft)

2 What is Green space?

Green space refers to all trees and vegetation that grows within the City on both public and private land. This includes street trees, parks and gardens, nature reserves, shrubs, green walls, green roofs and turf planted, which together provide a range of benefits that enrich the quality of life and make for a healthier, more prosperous community.

Under the umbrella term of green space is urban forest or urban green space which encompasses all trees outside of the City's natural areas and conservation reserves. As such, urban greening refers to the establishment of trees and other vegetation in an urban setting.

2.1 What are the benefits of greening?

The retention, protection and enhancement of green space has a multitude of environmental, social and economic benefits for the City.

Street trees provide shade to buildings, outdoor recreational spaces, pavements and parking areas. Trees also lower ambient temperatures and assist in reducing adverse Urban Heat Island (UHI) effects and electricity use.

Furthermore, trees perform a range of important environmental and ecological functions. They are effective at intercepting rainfall, resulting in reduced stormwater runoff and soil erosion, with the scale and intensity of interception increasing with the size and amount of canopy cover (Liveable Neighbourhoods, 2015).

Reduce temperatures

Trees can directly decrease the surrounding air temperature by

5°C

(McPherson et al. 2006)

Oxygen production

Two medium sized, healthy trees can produce enough oxygen required for

ONE PERSON FOR ONE YEAR

(McPherson et al. 2006)

Energy saving

Air conditioners alone use nearly

ONE THIRD

OF THE

power consumed on the hottest days in January, February and March *(Western Power 2016)*

A mature tree can transpire up to

150 L OF WATER

PER DAY

which, in hot dry locations such as the City, can produce a cooling effect similar to that of

TWO AIR CONDITIONERS RUNNING FOR 20 HOURS

(Akbari 2009)

Shade from trees can

MINIMISE ENERGY USAGE

in buildings by reducing heat absorption and storage *(McPherson et al. 2006)*, cooling the surrounding air and lowering the building temperature. *(Akbari 2009)*

Trees can reduce air conditioner usage by

UP TO

10%

(McPherson and Simpson 2003)
(McPherson et al. 2006)

COOLING NEIGHBOURHOODS WITH TREES

provides benefits to the whole community, as not all households may be able to afford air conditioning.

Air quality and carbon storage

PM

Trees remove air pollution through interception of particulate matter and absorption of gases *(McPherson et al. 1994)*

Trees reduce atmospheric CO^2 by sequestering carbon in stems and leaves *(Akbari et al. 2001; Nowak and Crane 2002)*

Stormwater

TREES REDUCE STORMWATER impacts through all parts of the plant.

Leaves and branches intercept rainfall and reduce urban runoff

(Xiao and McPherson 2002)

Roots increase rainfall infiltration rate into soil, absorb water from soil and increase soil water holding capacity

(Xiao and McPherson 2002; McPherson et al. 2006)

TREES REDUCE EROSION

BY

decreasing the impact of rain on surfaces

(McPherson et al. 2006)

STORMWATER FLOWS into and out of some of the City's wetlands. High volumes and polluted storm water can negatively affect these ecosystems.

Research by the Cooperative Research Centres Programme for Water Sensitive Cities (CRCWSC) suggests that trees can reduce maintenance costs of understory vegetation within stormwater biofilters by up to

80%

The Department of Water's *Decision Process for Stormwater Management in WA: Draft for Consultation (July, 2016)* recognises the importance of incorporating trees in stormwater management as a part of achieving good urban amenity. Trees can significantly improve water quality as well as reduce stormwater volumes and peak flow rates.

Economic value

Street trees are known to increase property prices. Research undertaken in Perth indicates that:

1 STREET TREE can increase property price by up to **$16,889**

(Pandit et al. 2013)

Increasing urban green space around retail areas

CAN

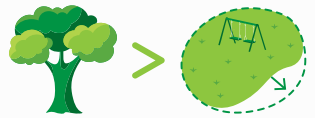
IMPROVE SALES by making shopping districts more attractive.

Appropriately located trees can reduce the City's costs associated with road and footpath maintenance, as the shade reduces pavement fatigue.

(McPherson and Muchnick 2005)

Research also suggests that an increase in street tree planting increases property value more than increasing the total area of urban parks.

(Ishikawa and Fukushige 2012)



Conservation, biodiversity and urban ecology

Planting street and parkland trees can positively influence

BIODIVERSITY

AND

ECOLOGICAL

OUTCOMES

by establishing corridors of habitat across the landscape.

Street and parkland trees can provide important foraging, roosting and nesting habitat for endangered

CARNABY'S BLACK COCKATOOS

and threatened

RED-TAILED BLACK COCKATOOS

Green corridors provide stepping stones of habitat enabling the movement of fauna between conservation reserves,

SAFEGUARDING AGAINST

POPULATIONS BECOMING ISOLATED

Health and wellbeing

Extreme air temperatures can impact on elderly, young and sick people. In Perth, two consecutive days with an average temperature of 44°C can increase heat related mortality by:

30%

(Tapper 2014)

Trees also increase people's:

- **SATISFACTION**
- **EXPERIENCES**
- **PERCEPTIONS** of the quality of their everyday environments

(Chiesura 2004)

Tree lined streets can

REDUCE STRESS WHILE DRIVING

AND

DISCOURAGE HIGH SPEEDS

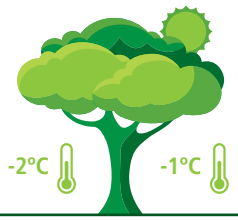
(Parsons et al. 1998)

Heat related mortality rates on days with extreme temperatures can be reduced from

30% – 20%

through a reduction in air temperature of just 1-2°C, which can be achieved using trees.

(Tapper 2014)



Urban greening improves the City's

- **LIVEABILITY**
- **CHARACTER**
- **SENSE OF PLACE**

High levels of health, wellbeing and involvement within a community makes a more desirable place to live in and visit.

IN 2014/15, THE CITY RECEIVED AN AVERAGE OF:

115,000 DOMESTIC **VISITORS** + **19,000** INTERNATIONAL **VISITORS**

WITH

56% VISITING FRIENDS **AND RELATIVES** + **23%** VISITING FOR **HOLIDAY OR LEISURE**

Tourism West Australia (TWA 2016b) found that elements influencing holiday experience included good weather, landscape/scenery and lifestyle, all of which are influenced by public trees.

Public trees encourage the use of:

OUTDOOR SPACES

WHICH:

- **INCREASES SOCIAL INTEGRATION**

AND

- **INTERACTION AMONG NEIGHBOURS**

(Coley et al. 1997)

2.2 Predicted climate trends

There is a consensus amongst scientists dealing with climate hypotheses and observations that increasing levels of greenhouse gases attributable to human activities are likely to be contributing to global warming. Over the 20th century, increases in global average air and ocean temperature have been observed. The extra heat in the climate system also has other impacts such as affecting atmospheric and ocean circulation, which influence rainfall and wind patterns (DotE 2015).

Records show that the decade of 2001 - 2010 was the world's warmest decade on record and in Australia, each decade has been warmer than the previous decade since the 1950s (DotE 2015). Furthermore, since 1950, the average number of heat wave days per year has increased across Australia. The number of heatwave events and their duration and intensity is also on the rise, with heatwaves resulting in more deaths over the last 100 years than any other natural hazard (Steffan et al. 2014)

CHANGES IN CLIMATE ARE THEREFORE CONSIDERED TO PRESENT A SIGNIFICANT RISK TO QUALITY OF LIFE AND COMMUNITY HEALTH AND WELL-BEING INTO THE FUTURE, PARTICULARLY IN URBAN AREAS, WITH THE ELDERLY AND VERY YOUNG BEING MOST VULNERABLE.

INCREASING TREE CANOPY COVER AND GREEN SPACE IS RECOGNISED AS ONE OF THE MOST COST EFFECTIVE STRATEGIES TO MITIGATE THESE POTENTIAL CLIMATE IMPACTS.

3 What is the City's green cover?

3.1 Historical roots

The City has experienced an evolution of land uses and varying levels of associated clearing. Originally inhabited by the Nyungar people, European settlement began in the area now known as the City of Rockingham in the early 1850s as pioneering families began clearing the land for agriculture.

In 1870, the Rockingham Jetty and associated railway was constructed to export timber harvested from the region. This operated as a significant port until the Fremantle Inner Harbour was opened in 1897. Despite this, Rockingham continued to grow as a popular holiday destination with development along the coast.

While this resulted in clearing of native coastal shrubland, it also resulted in the establishment of some of the City's iconic street and parkland trees, such as the Tuarts and Peppermints in Churchill and Bell Parks and the Norfolk Island Pines along Arcadia Drive.

Inland, agricultural and rural activities continued throughout Baldivis and Karnup, with land being used for market gardens, orchards and vineyards.

Over the last decade, the City has been the fourth fastest growing municipality in Perth and is now home to more than 140,000 residents. Located in one of the nation's fastest growth corridors, the City is one of Western Australia's Strategic Metropolitan Centres and our population is expected to grow to approximately 200,000 in the next 20 years. This growth has come with significant urban development to cater for the needs of a growing population.

It is therefore important to recognise that clearing land to support growth and prosperity is not a recent occurrence, nor is the creation of leafy green spaces for the community.

In this way, the actions undertaken by the City over the next 5 years and beyond will play an important role in providing a green, liveable City for current and future generations.

3.2 Comparison to previous plan

3.2.1 Canopy cover

The City's previous Greening Plan was adopted by Council in 2012. The overarching objective was to increase the aggregate extent of vegetation within the municipality. The achieve this, the Greening Plan (2012) set canopy cover targets for specified 'suburban residential', 'urban/residential' and 'rural' areas.

As part of the development of this Plan, an analysis of existing canopy cover was undertaken to determine how close the City came to realising the previous targets. The results are shown in Table 1 below.

Table 1: Comparison to 2030 canopy cover targets set in Greening Plan (2012).

Specified area	Target percent canopy cover increase	Change in canopy cover measured	Target met
Suburban residential	30%	-0.2%	No
Urban/residential	20%	-2.9%	No
Rural	15%	-1.0%	No

A relatively small decrease in green cover has occurred for all three specified areas (<3%), indicating that changes in green cover are not currently on a trajectory that would result in the City's previous targets being met by 2030.

While the City planted thousands of trees over the last five years, the loss of canopy cover associated with urban expansion was much greater.

CHANGES IN GREEN COVER ARE NOT CURRENTLY ON A TRAJECTORY THAT WOULD RESULT IN THE CITY'S PREVIOUS TARGETS BEING MET BY 2030.

3.2.2 Green cover

As part of the analysis for the Greening Plan (2012), a 2010 near infrared aerial image of the City was used. This has been analysed relative to the latest 2016 infrared imagery to detect a change in NDVI (Normalised Difference Vegetation Index), which essentially indicates where there is change in greenness or vegetation rigour as well as changes in overall green cover. The change in NDVI, or greenness, is shown in Figure 1 and has been calibrated such that a significant decrease primarily indicates that a loss of green cover has occurred due to clearing, but may also indicate changes in vigour due to a lack of irrigation on private property or large scale weed control in conservation areas.

Many areas are also shown as having experienced a moderate increase or decrease in greenness which is likely due to annual variations in moisture availability and does not necessarily indicate that a change in cover has occurred. Areas of significant increase in green cover are also identified and include areas such as irrigated market gardens, irrigated turf and the growth of vegetation (particularly within bushland areas and wetland areas).

Moving forward, the available technology to analyse green cover and tree canopy has improved markedly since the previous plan was developed, meaning we are better placed to estimate potential changes and set realistic targets for the future.

HOW DID WE GO OVER THE LAST 5 YEARS?

2010 – 2015

Figure 1:
Change in NDVI 2010 to 2015 (derived from Landsat 7 and Landsat 8 Imagery)

Legend

Suburb boundary

NDVI change

- Significant increase
- Moderate increase
- Negligible
- Moderate decrease
- Significant decrease

1. Baldivis
2. Cooloongup
3. East Rockingham
4. Golden Bay
5. Hillman
6. Karnup
7. Point Peron
8. Port Kennedy
9. Rockingham
10. Safety Bay
11. Secret Harbour
12. Shoalwater
13. Singleton
14. Waikiki
15. Warnbro

3.3 Existing green cover

An analysis of the City's existing green cover has been undertaken using iTree software, where random point data is classified according to the following terrain classes:

- Canopy (height >3m)
- Shrubs (height <3m)
- Grass
- Bare soil
- Hardstand
- Built form
- Water

There need to assess not only canopy cover, but also shrubs and grassland, to provide an accurate picture of collective green space, as the City encompasses a range of coastal, wetland and bushland environments which naturally have different levels of vegetated cover.

On the basis of canopy, Karnup is the performing best at a suburb level with 29% cover across both public and private realms, followed closely by Waikiki with 27%. Port Kennedy has the lowest level, with just 5% canopy cover (Figure 2).

This is unsurprising given Karnup encompasses large areas of bushland in conservation reserves, together with rural landholdings which contain significant canopy. Similarly, the suburb of Waikiki includes the bushland within Lake Cooloongup Reserve.

The built up industrial character in Port Kennedy results in lower canopy levels and importantly, Scientific Park forms a large part of the suburb where the natural vegetation is predominantly coastal shrubland rather than canopy.

While trees are recognised as the most cost effective tool for achieving urban greening benefits, turf and shrubland also play a role. Turf assists with carbon sequestration and native shrubland provides important habitat for native fauna. The combined tree, shrub and grassland cover at a suburb level can be seen in Figure 3.

On this basis, Port Kennedy actually has 76% total green cover, comprised of 38% shrubland, 33% turf and 5% canopy. The relative percentages of cover for each suburb can be seen in the Suburb Snapshots in section 7.

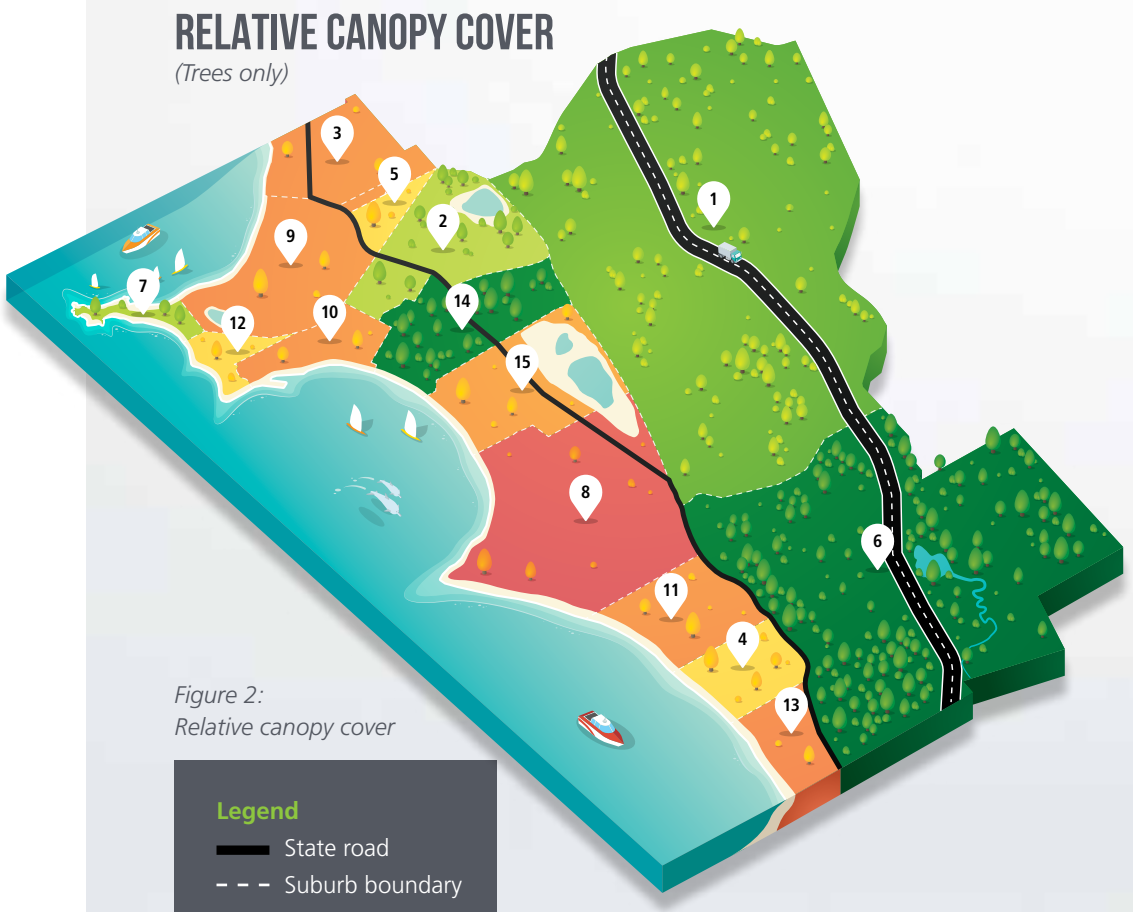


Figure 2:
Relative canopy cover

RELATIVE GREEN COVER

(Trees, shrubs and turf)

Figure 3:
Relative green cover
(trees, shrubs and turf)

Legend

State road

Suburb boundary

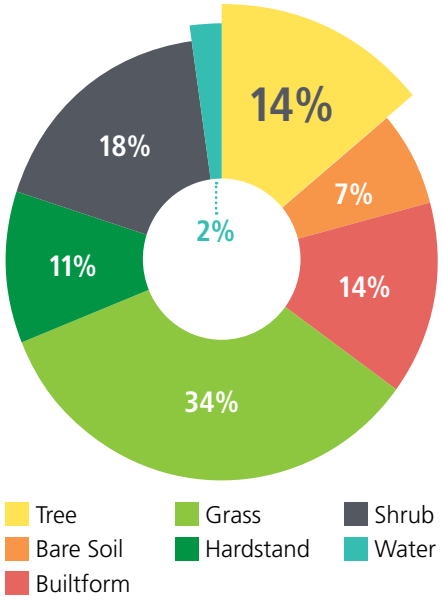
Percentage green cover

- > 90%
- 80% – 90%
- 70% – 80%
- 60% – 70%
- 50% – 60%
- < 50%

1. Baldivis
2. Cooloongup
3. East Rockingham
4. Golden Bay
5. Hillman
6. Karnup
7. Point Peron
8. Port Kennedy
9. Rockingham
10. Safety Bay
11. Secret Harbour
12. Shoalwater
13. Singleton
14. Waikiki
15. Warnbro

The analysis revealed that 14% of the City's municipal area is covered by trees (Figure 4), of which only 2% is located in the public realm, within streets or parkland. This plan is primarily concerned with the protection and enhancement of these public trees. The remaining canopy cover occurs on private land or in conservation reserves.

Figure 4: Terrain cover in the City



14% OF THE CITY'S MUNICIPAL AREA IS COVERED BY TREES

ONLY 2% IS LOCATED IN THE PUBLIC REALM, WITHIN STREETS OR PARKLAND

3.4 Street and parkland trees at a glance

3.4.1 Number

A total of 46,474 trees were recorded on public land, of which 14,696 occurred in POS and 31,778 occurred in road reserves. The number of public trees in each suburb can be seen on the Suburb Snapshot sheets in Section 8 of this Plan.

46,474 TREES WERE RECORDED ON PUBLIC LAND

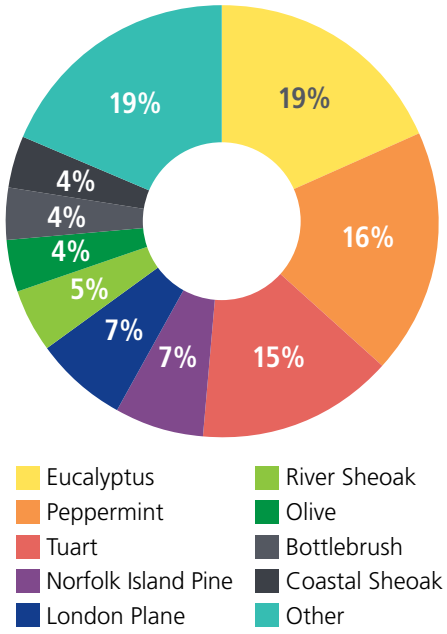
POS:14,696
ROAD RESERVES: 31,778

This analysis is expected to be an underestimation of the total number of public trees, as not all street and parkland trees would have been manually identified due to the sheer size of the City. However, this information still provides an excellent foundation upon which the City can deliver good outcomes for urban greening, with the expectation that these figures will continue to be refined over time.

3.4.2 Species composition

Species identification was undertaken for a random sample of 27,988 public trees and the percentage composition of the City's nine most common tree species (Figure 5). Species not included in the top ten list are grouped as 'Other'.

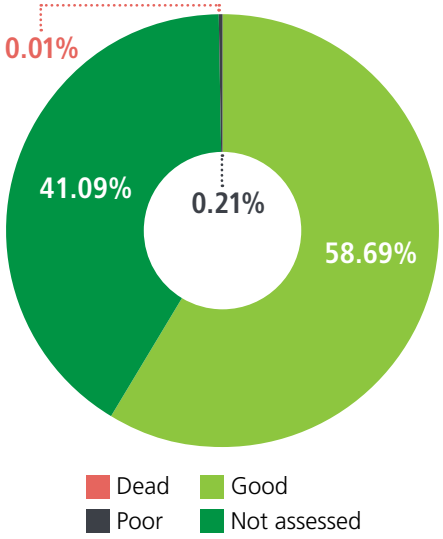
Figure 5: Urban forest species composition



3.4.3 Condition

Of the 27,988 trees assessed, only 100 were assigned a health score of poor and three were recorded as dead, which is equates to 0.22% of total recorded public trees (Figure 6).

Figure 6: Urban forest condition



TREES WITH A POOR HEALTH SCORE: 0.22%

3.4.4 Economic value

The City encompasses over 257 km² and the total area of canopy cover on public land is approximately 7.19 km². The total monetary value in terms of pollution and carbon removal benefits for all trees on public land in the City is estimated to be $584,487 per year, which includes the removal of:

- Carbon monoxide
- Nitrogen dioxide
- Sulphur dioxide
- Carbon dioxide; and
- Particulate matter

The monetary value for the sum of carbon dioxide stored in these trees was estimated using iTree Canopy software to be over $10,829,900.

While an economic value can be estimated on the basis of carbon sequestration and the removal of gases, trees enable us to breathe cleaner air and live healthier lives. As such, it is difficult to place a dollar value on the range of positive flow on effects for the economy and public health system.

CITY OF ROCKINGHAM: 257 KM²

CANOPY COVER ON PUBLIC LAND: 7.19 KM²

3.4.5 Existing urban forest management

Currently, the City's Parks Services plants over 1,200 trees per year, in addition to 16,000 shrubs, in streetscapes and POS. Last year, 500 of those trees were planted as part of the Winter Street Tree Planting Program, where residents place a request with the City for a free street tree to be planted on their verge.

TREES PLANTED BY PARKS SERVICES IN POS AND STREETS
1,200 TREES/YEAR

On average, the City removes 120 public trees per year for being dead, diseased or dangerous, particularly following major storm events.

REMOVAL OF DEAD, DISEASED OR DANGEROUS TREES:
120 TREES/YEAR

3.4.6 Character zones

Public tree species vary considerably across the City, as reflected by the key character zones in Figure 7. The species which fall into each character zone is noted in the individual suburb snapshots and Appendix A.

CHARACTER ZONES

Figure 7: Character zones

Legend

- Road
- Suburb boundary
- Bush Forever site
- Rockingham Lakes regional park (DPaW)
- Parks and recreation reserve (MRS 2016)

Proposed character zones

- Inland residential
- Urban centre
- Industrial
- Coastal
- Rural
- Foreshore park*
- Not applicable

*Defined as west of the most seaward coastal road

1. Baldivis
2. Cooloongup
3. East Rockingham
4. Golden Bay
5. Hillman
6. Karnup
7. Point Peron
8. Port Kennedy
9. Rockingham
10. Safety Bay
11. Secret Harbour
12. Shoalwater
13. Singleton
14. Waikiki
15. Warnbro

4 What are the issues surrounding urban green cover?

4.1 Natural decline

Many of the City's trees are of considerable age and size. The trees within Churchill and Bell Parks, Rockingham were planted prior to 1950 and the Norfolk Island Pines along Arcadia Drive in Safety Bay were planted prior to 1965.

With this age comes significant aesthetic and community value, however, the life expectancy of these trees needs to be considered to ensure they are replaced at a rate which accounts for natural decline. A robust urban forest requires public trees with varying life expectancies and growth rates to safeguard against large numbers of public trees being lost at the same time.

4.2 Removal

The City removes trees from public land where they are assessed as being either dead, diseased or dangerous, to ensure community safety, with 120 trees per year removed on average. This number is likely to increase as many of the City's existing trees reach the end of the lifespan.

4.3 Fire hazards

In 2016, the Map of Bush Fire Prone Areas was published by the Department of Fire and Emergency Services which identifies land falling within, or partially within, an area considered prone to bushfires by the Fire and Emergency Services Commissioner. In this regard, the Greening Plan aims to ensure all planting undertaken by the City considers potential bushfire hazard implications and is consistent with best practice in accordance with State Planning Policy 3.7 Planning in Bush Fire Prone Areas and the supporting Guidelines for Planning in Bushfire Prone Areas.Planting must also consider the City's Community Plan Strategy: Bushfire Risk Mitigation.

4.4 Vulnerability

Various levels of environmental change, which could potentially be associated with a warming climate, or the introduction of pathogens and disease, can result in the decline of trees. It is difficult to predict which species are most susceptible to potential environmental threats and which species will successfully respond and adapt. Lack of diversity presents a significant risk to the City's green capital and as such, it is important to ensure our urban forest has a diverse range of species to provide greater resilience and long term viability for the future.

4.5 Infrastructure restrictions

Planting trees in streetscapes represents a significant opportunity to provide an even distribution of urban greening throughout the City's suburbs. Street trees are situated in the verge (the space between the private property line and the road) which is also required to accommodate a range of utilities such as:

- Stormwater drainage
- Street lighting
- Electricity
- Landscaping and furniture i.e. footpaths, benches; and
- Embayments for parking or public transport.

These competing uses for verge space, together with the current trends for increased urban density, mean that the retention and provision of trees within developments can be difficult to achieve. In established suburbs like Shoalwater, verges may be as wide as 13m allowing ample room for the provision of street trees. Conversely, the area remaining in the verge for tree planting in some residential areas of Baldivis can be just 0.6m.

Spatial constraints and surrounding infrastructure for the most part dictate the potential for tree planting in vacant spaces, highlighting the importance of planting the right tree in the right place. Incompatible planting can result in adverse impacts to services and infrastructure, poor tree survival and subsequent tree removal in the future. For any identified vacant space, the existing site conditions and nearby infrastructure must be considered to ensure management resources are effectively utilised.

4.6 Vandalism

Street trees are particularly susceptible to damage, either indirectly through verge parking or intentionally through acts of vandalism. While this inadvertent damage may result in seemingly small losses in tree cover, the collective impact on tree canopy targets across the City can be significant. Often this vandalism occurs where there is a lack of community support for the provision of street trees, due to impingement on views, a desire to increase parking space or to minimize potential maintenance requirements.

In this regard, the City will aim to avoid the obstruction of views by aligning street tree spacing with lot boundaries where appropriate. In locations where the retention of views is an issue, residents should be reminded of the benefits and values of trees and the community's vision to ensure a sustainable City for the future.

4.7 Development

Clearing for development can result in substantial losses of green cover on private land. With competing engineering and drainage requirements at play, the potential to retain remnant trees in greenfield development sites presents a significant challenge.

In these areas, the creation of new POS and streetscapes is accompanied with tree planting and landscaping works, which assists in providing a foundation for the establishment of urban greening and neighbourhood character.

At a smaller scale, infill development in established suburbs can result in a loss of significant trees from private land. In Rockingham, Safety Bay or Hillman for example, there are residential bocks with large remnant trees which are unlikely to be retained if these blocks are subdivided or redeveloped in the future.


The
BALDIVIS
Rivergums

5 What does the City stand to lose?

An evaluation of potential threats to the urban forest was undertaken and on this basis, it is estimated that the City could potentially stand to lose 2% of existing canopy cover over the next five years as a result of anticipated rates of natural decline or development (areas zoned Development or with approved Local Structure Plans) (Figure 8).

POTENTIAL LOSS OF GREEN COVER IN 5 YEARS:

2%

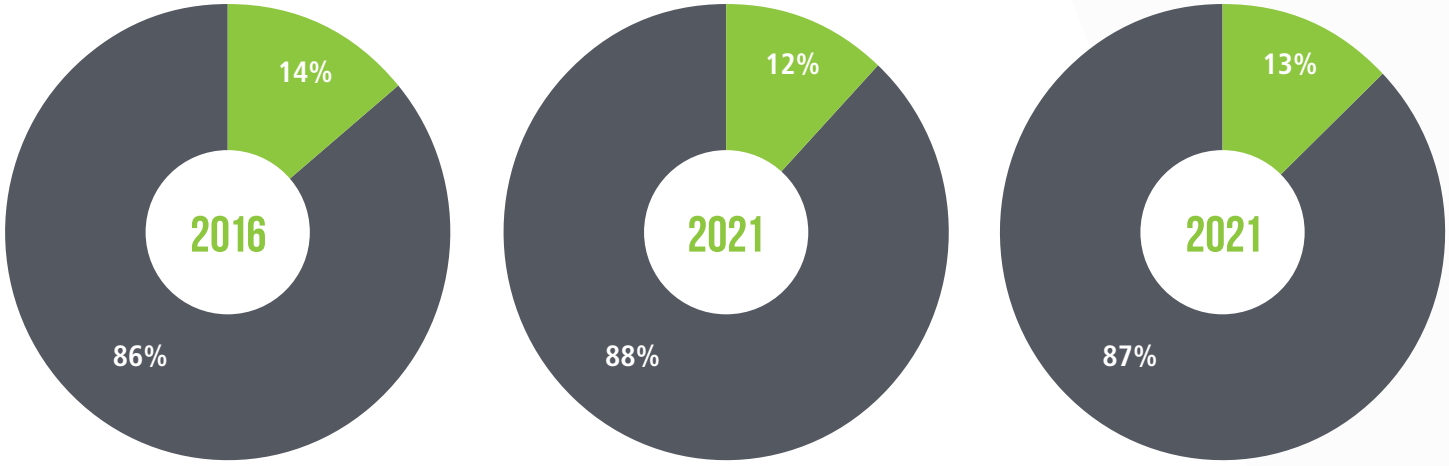


Figure 8: Existing green cover (2016) [left], estimated green cover based on potential losses over next five years [centre] and estimated green cover after five years at our current rate of tree planting [right]

6 What are the opportunities to improve green cover in the public realm?

Land in the public realm under management by the City presents a significant opportunity to improve the trajectory of our green cover, with the greatest opportunity occurring at street level. This is because road verges account for the most vacant planting space by area and are integrated with urban land use where the benefits of greening are most relevant.

2106.39 HA OF VACANT SPACE WAS IDENTIFIED IN STREETS AND POS

74,700
Large trees

Nevertheless, there is typically more room to accommodate large trees within POS compared to street verges. Parkland trees are relatively easy to manage as they are less subject to inadvertent damage and infrastructure restrictions. Planting in POS also ensures the urban forest includes large trees which would not be considered suitable for planting in most streetscapes. As such, this Plan focuses on achieving a balance of POS and street tree planting.

15% OCCURS IN POS AND 85% OCCURS IN ROAD RESERVES

A total of 2106.39 ha of vacant space was identified on public land with potential for planting trees, of which 322.08 ha occurs in POS and 1784.31 ha occurs in road reserves (15% and 85% respectively. It is estimated that this vacant space is sufficient for the City to plant over 74,700 large trees, which at maturity would each have a canopy of approximately 100 m^2, or to plant an even greater number of small and medium trees.

Given the City has an abundance of vacant tree spaces, recommended planting priorities for implementation detailed in Section 9 of this Plan were determined on the basis that integrator and neighbourhood connector roads are often key to the broad character of a suburb and should be planted first, while aiming to plant the many access level residential streets and areas of POS progressively into the future.

Focusing planting in this way will have the advantage of enhancing ecosystem services within urban areas as road networks and POS are essentially corridors that, if planted, may improve ecological connectivity and ensure the positive impacts of urban greening are evenly distributed across the City.

Figure 9 and 10 overleaf illustrate the opportunity to improve the trajectory of green cover with street tree planting, relative to the potential losses observed in new and established neighbourhoods.

Figure 9 illustrates a typical established suburb, with the red hatched area delineating the road reservation from private property. Note that in Plate 1, most of the trees and green cover occurs on private property. Plate 2 shows what the area might look like if all of those lots were subdivided and that vegetation was lost. Plate 3 illustrates how street tree planting can play a significant role in accounting for losses on private property to achieve a balance between green cover and housing density.

Nevertheless, it must be noted that the retention of trees on private property is always of paramount importance, which the City's Environmental Planning Strategy will aim to address, consistent Department of Planning guidance documents, such as the Design WA Guidelines.

Figure 10 depicts the importance of street trees in a typical new suburb, where smaller lots and smaller backyards result in little to no green space on private property.

Figure 9: Typical established suburb [Plate 1], with potential losses of green cover on private property due to subdivision [Plate 2] and how this loss can be potentially offset with street trees [Plate 3]

PLATE 1: TYPICAL ESTABLISHED SUBURB

PLATE 2: POTENTIONAL LOSS OF GREEN COVER ON PRIVATE PROPERTY

PLATE 3: POTENTIAL OFFSET WITH STREET TREES

Figure 10: A typical new suburb with little to no green space on private property [left] and the potential to enhance green cover through street tree planting [right].

PLATE 4: MINIMAL GREEN SPACE

PLATE 5: ENHANCED GREEN COVER

Figure 11: Existing streets in Baldivis [top] and positive impact on streetscape amenity with potential tree planting [bottom]

EXISTING STREETSCAPE



POTENTIAL STREETSCAPE



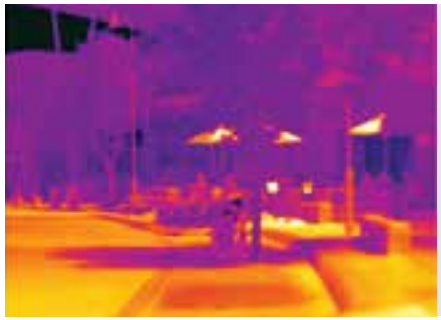
GREENING PRINCIPLE 1

All built-up urban environments within the City must be accompanied with street and parkland trees to reduce potential UHI effects, prioritising areas such as car parks, shopping precincts and industrial areas.

Figure12: Difference in average street temperature, the shaded street is 3.5 degrees cooler.

Shaded street:
Civic Boulevard, Rockingham

Average street temperature:
45.3˚C

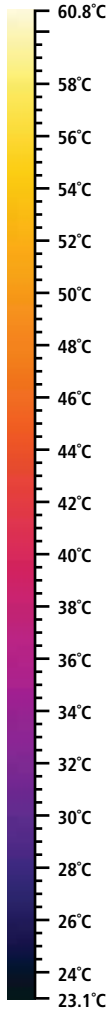


Partly shaded street:
Syren Street, Rockingham

Average street temperature:
46.2˚C

Unshaded street:
Chalgrove Avenue, Rockingham

Average street temperature:
48.8˚C

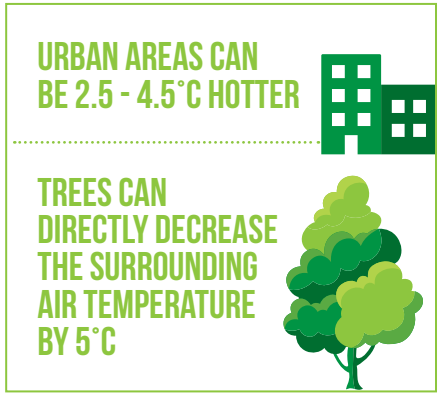


6.1 Urban Heat Island impacts

The Urban Heat Island (UHI) effect is a well understood phenomenon whereby urban areas can be 2.5 - 4.5˚C hotter than surrounding rural environments, as solar radiation is absorbed, stored and reflected by hard built form such as roads and buildings (Akbari et al. 2001; Voogt 2002). Higher temperatures within cities as a result of the UHI effect, together with anticipated increases in temperature due to climate change, are likely to negatively impact liveability and community health and wellbeing (Voogt 2002). This is particularly pertinent given that in Australia, heat waves claim more human lives than any other natural hazard (Nicholls et al. 2008).

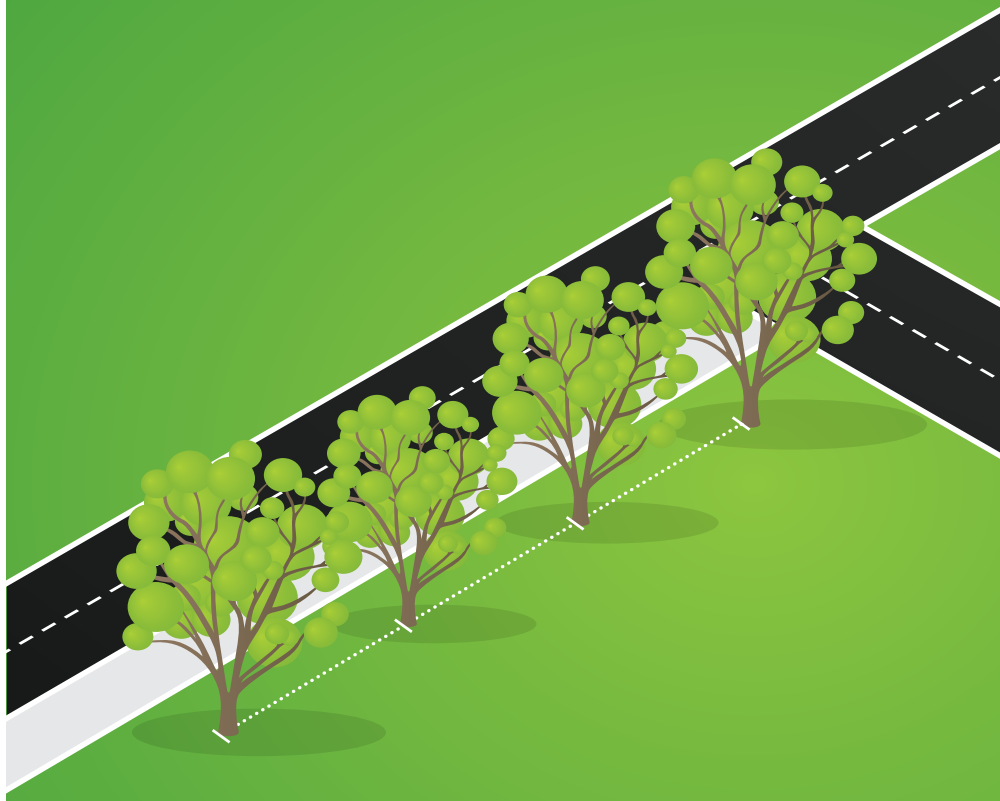
Urban green cover plays a critical role in mitigating the UHI effect, by shading and cooling our urban environments. Trees can directly decrease the surrounding air temperature by 5˚C (McPherson et al. 2006), as well as lowering cooling and energy requirements of surrounding buildings. Indirectly, large scale tree planting can also lower the energy usage of a whole city (Akbari et al. 2001).

Figure 12 left provides an example of observed temperature differences between shaded, partly shaded and unshaded streets in Rockingham. The images were taken using an infrared camera at 1 o'clock on a 32 degree day. The shaded street was 3.5 degrees cooler than the unshaded street.



6.2 Tree spacing

Trees should be spaced according to their expected mature canopy size with the aim of establishing contiguous canopy cover and therefore delivering maximum benefit wherever possible. Appropriate tree spacing is not only important for the provision of shade, but also ensures vigour and longevity as trees have sufficient room to grow.



GREENING PRINCIPLE 2

Spacing must be sufficient to support mature tree size, with continuous and connected canopy cover in streetscapes wherever possible.

GREENING PRINCIPLE 3

Species selection must consider separation requirements, verge widths and surrounding infrastructure restrictions, while acknowledging that the provision of public trees is paramount, irrespective of the challenges.

6.3 Species selection

Urban areas are harsh environments for trees, with compacted soil, restricted root zones, too much heat or too much shade, modified water patterns and exposure to damage. Spatial constraints also limit which trees can be planted.

As such, the establishment of a healthy urban forest cannot be achieved without appropriate species selection. While recommended species are provided in Appendix A according to existing character zones, species selection must be site specific to ensure the right tree is planted in the right place with consideration for the following factors:

Spatial constraints
Spatial constraints are to be assessed site specific basis to determine the suitability of a space for street tree planting, including:

- Verge width,
- Length and shape,
- Building set back,
- Overhead power lines,
- Vehicle and pedestrian access,
- Street lighting; and
- Sightlines.

Tree clear zones
Available verge space for tree planting in urban areas must also meet the minimum clear zone requirements and setbacks from the road relative to vehicle speeds, in accordance with Liveable Neighbourhoods (DoP, 2009) (Table 2).

Table 2: Tree clear zones for urban streets

Street type	Design speed (km/hr)	Frangible tree (trunk <100 mm)	Non frangible tree* (trunk >100 mm)
Integrator A and Integrator B	70	2.5 m	2.75 m
	60	2.0 m	2.5 m
Neighbourhood connectors and 50 km/hr Intregrator Bs	50	0.75 m	1.15 m
Access street	50 or less	0.75 m	0.75 m

Notes:
1. Measurements determined to suit typical tree location in the medians and verge. Located to suit spacings of underground services as per Figure 13.
2. Clear zone dimensions to suit typical median widths and tree species for urban conditions.
3. * Measurements are from edge of vehicle travel lane to the near edge of mature tree trunk. For typical medium-trunk trees of around 500 mm diameter, add 0.25 m to get distance to tree planting line. For large trees of around 1 m diameter, add 0.5 m to get distance to tree planting line.
4. In areas with parking embayments, trees may be placed in kerb nibs and above clearances do not apply.

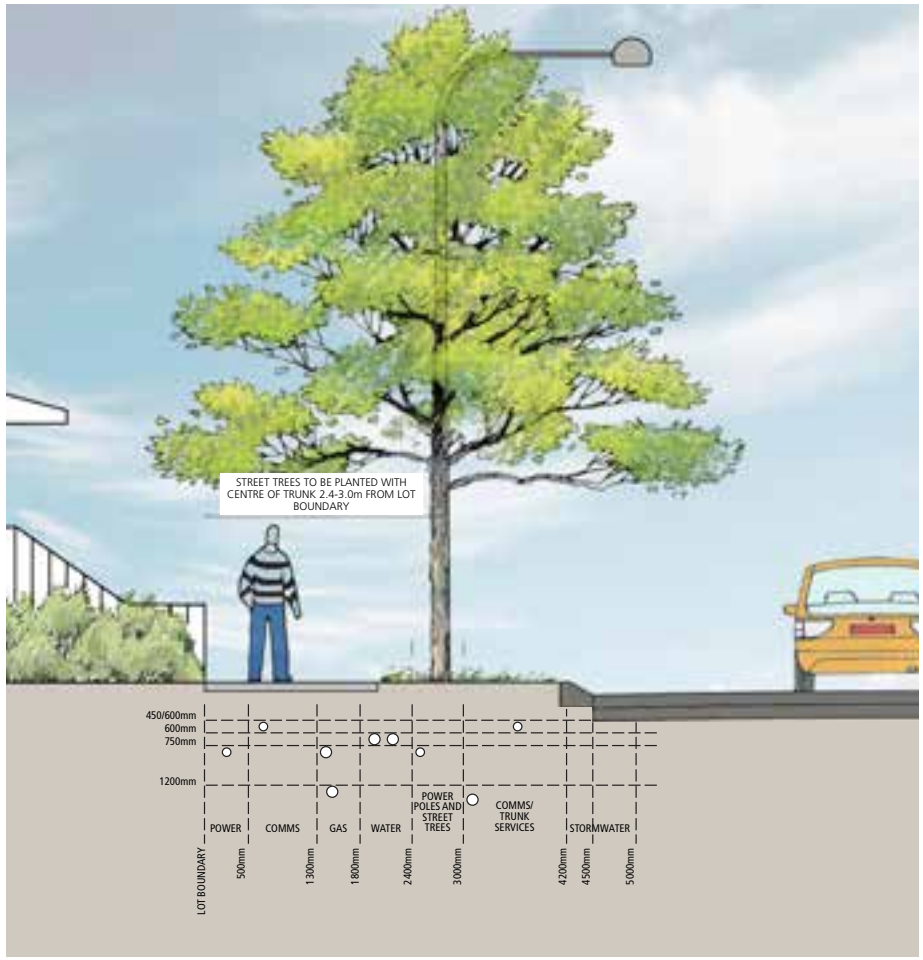
Utilities

The location of a street tree within the verge must also be consistent with the Utility Providers Code of Practice (MRWA, 2010) to minimize potential for conflict with essential services and infrastructure.

Overhead power lines

Western Power stipulated that the minimum clearance for power lines is typically 2.5m to the side and 2 meters below in urban areas, with no vegetation above the power lines. These clear zones are necessary as power lines swing and sag in varying temperatures and weather conditions. Both the City and Western Power are responsible for maintaining clearance from trees on public land, including those within the verge.

Figure 13: Typical verge service locations



GREENING PRINCIPLE 4

Non-native trees are preferred in circumstances where they are considered more likely to thrive and deliver benefits in urban centres, or where they provide known feeding habitat for Black Cockatoos.

6.4 Native vs non native

Tree species vary in their ability to deliver the full range of social, environmental and economic benefits and the argument of native vs non-native species is often at the centre of this debate.

Research has shown than many non-native trees have a much greater cooling effect than native species because of their structure. Non-natives, such as London Planes which perform well in streetscapes and parks, have dense thick foliage, broader leaves and larger canopies compared to native species, such as Tuarts, which have a relatively sparse canopy and narrow leaves.

Furthermore, the deciduous nature of non-natives is often well suited to urban centres as they offer shade in summer but allow sunlight to filter into buildings during winter, although the maintenance effort for deciduous trees is considerably more labour intensive during autumn months when leaves are falling. Deciduous trees should also be avoided in the vicinity of stormwater bioretention basins as detritus can break down and impact infiltration performance.

Native trees are evergreen and drop a small amount of leaf litter throughout the year, while also providing an invaluable contribution to the urban forest by establishing ecological linkages across the landscape.

6.5 Habitat corridors

Urban expansion on the Swan Coastal Plain and associated clearing of native vegetation has led to significant fragmentation and habitat loss for native flora and fauna. As a consequence of this loss, remaining intact habitat on the Swan Coastal Plain is considered regionally significant for conservation. Many small habitat remnants are protected in nature reserves within the City; however, they are much more susceptible to disturbance from episodic natural or anthropogenic events.

This is particularly likely where patches of habitat are bordered by large uninhabitable urban areas. Maintaining continuity in the form of habitat corridors is particularly important so that ecological assemblage and genetic diversity are maintained over a wider area in the event that smaller areas are degraded or destroyed.

Habitat corridors can be established across the landscape by using native species in streetscapes and parkland, as well as in backyards. Collectively, these native species form small stepping stones of habitat which enables the movement and dispersal of native flora and fauna between larger patches of habitat and across the urban environment.

These corridors of native vegetation also offer habitat for birds to forage and nest. Non-native species can also perform this function, for example non-native pine plantations are recognised as an important food source for the endangered Carnaby's Black Cockatoo, in addition to other non-native trees including Jacarandas and Tipuanas.

GREENING PRINCIPLE 5

Native trees are preferred where appropriate for the site conditions and particularly in locations directly abutting conservation reserves or in areas of POS outside urban centres, to establish corridors of native habitat across the City.

GREENING PRINCIPLE 6

No individual tree species should be over represented across the municipal area, to ensure a diverse urban forest.

6.6 Resilience

As discussed in Section 4.4, a lack of diversity presents a significant risk to the City's green capital in the event that certain species become susceptible to the impacts of disease or changes in the environment. Diversification is a basic rule for reducing risk. A greater range of species will provide greater resilience and long term stability for the City's urban forest.

Species diversity needs to be carefully balanced with the need to establish and maintain existing character within streets and parks. At a local scale, trees species within individual streets and parks should be uniform to create and enhance character. At a municipal scale, a variety of tree species are to be planted each year.

6.7 Character

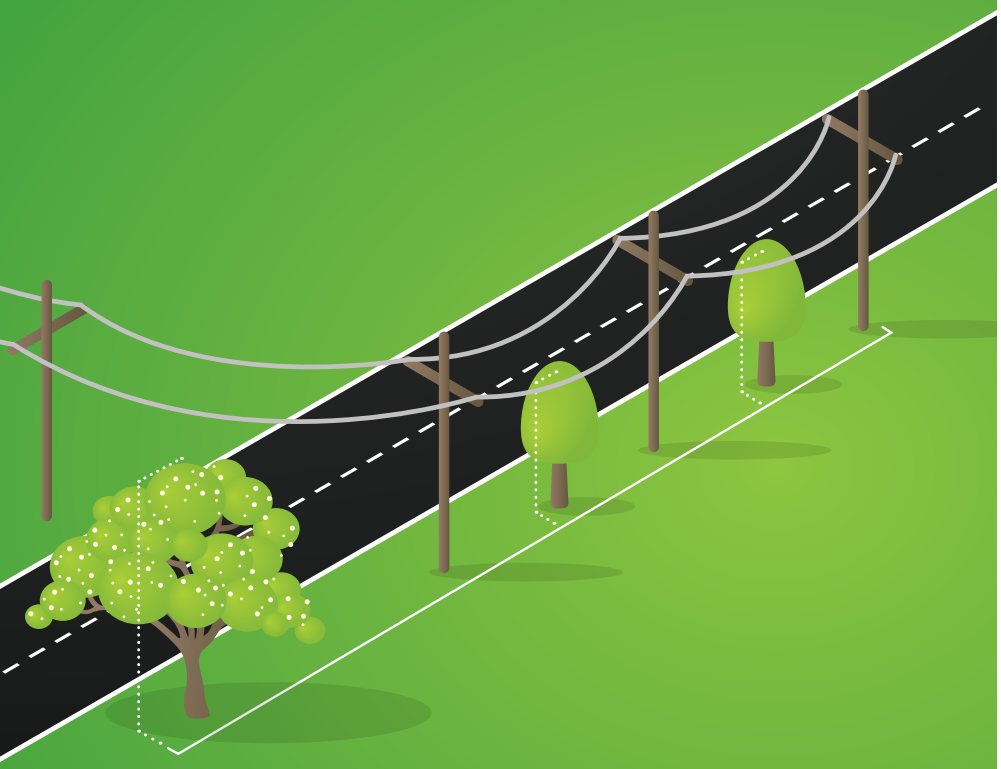
Trees play a critical role creating a unique sense of place. They contribute significantly to neighbourhood character and enhance the amenity of our public spaces. This sense of character and place is predominantly created through uniformity. A lack of uniformity can not only diminish streetscape character, but can also be more difficult to manage as a result of the maintenance requirements of different tree species.

In this way, the City aims to retain character by ensuring tree planting is in keeping with existing tree species, for example Norfolk Island Pines are to be planted along Arcadia Drive, Safety Bay and Tuarts and Peppermints are to be planted in Churchill and Bell Parks, Rockingham.

Street tree planting should also aim to create character where there isn't any, by continually working to ensure that over time, all streets are lined with uniform tree planting. As such, it is the City's preference for a street tree to be provided for every lot, to the satisfaction of the City, in new developments.

GREENING PRINCIPLE 7

Wherever possible, tree planting in individual streets must be uniform, with either a single species or a consistent pattern, to establish and enhance streetscape character and sense of place.



GREENING PRINCIPLE 8

Plant the biggest tree a site can accommodate, appropriate to existing character and surrounding infrastructure.

6.8 Size matters

Large trees have bigger canopies and are therefore able to provide maximum benefit. They can sequester up to 90% more carbon dioxide, remove more air pollution, provide greater reduction in storm water flows, have greater cooling effect and more economic benefits compared to smaller trees (Beecham & Lucke, 2015).

Various site restrictions, such as the location of existing infrastructure and services, means planting large trees is not always feasible, highlighting the importance of planting large trees wherever possible. Planting a small tree in a large verge or spacious park is considered a lost opportunity to increase urban canopy cover and enhance amenity.

Examples of small, medium and large trees recommended for use within the City's POS and road reserves can be found in Appendix A.

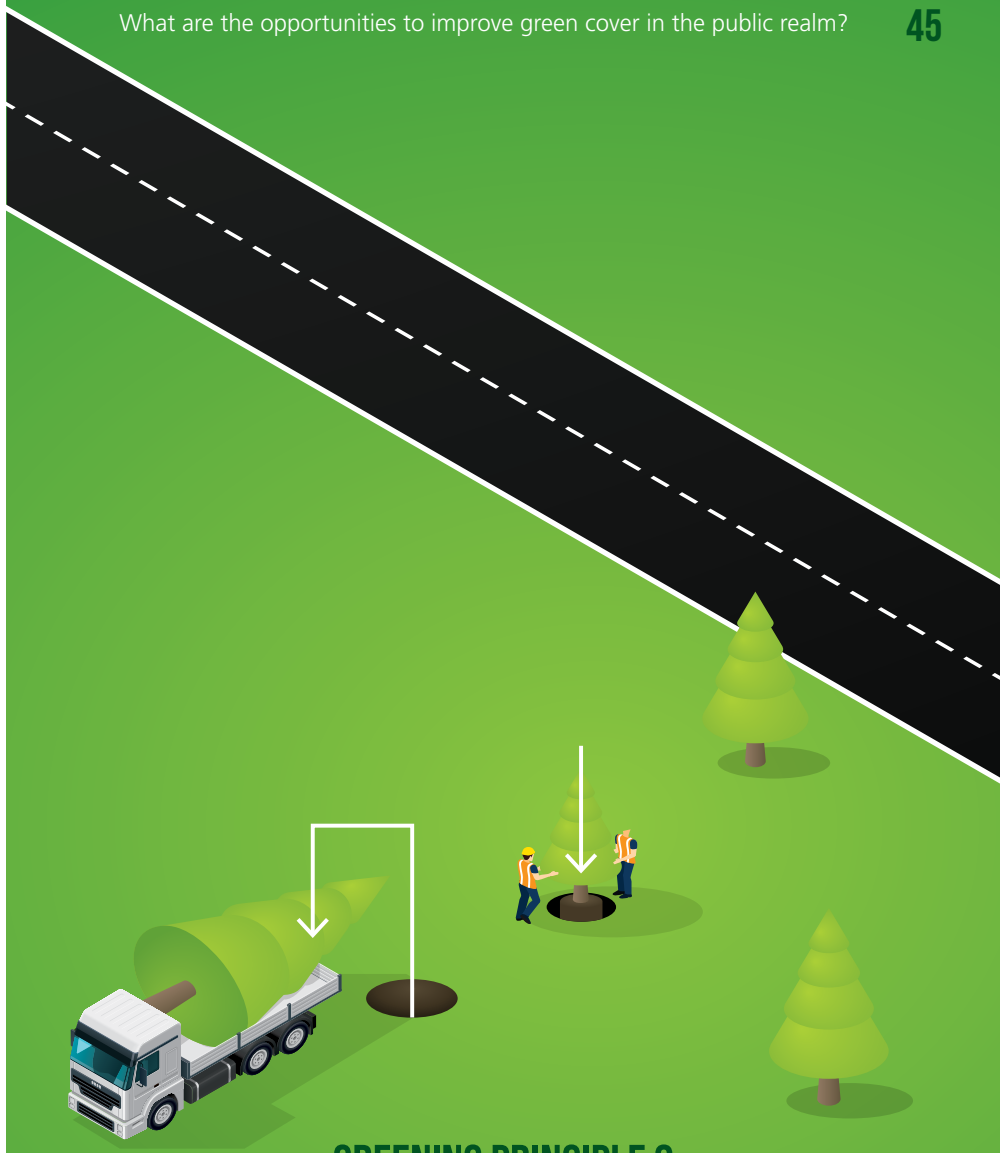
6.9 Health and longevity

As discussed, the health and longevity of the urban greening is largely reliant upon planting the right tree in the right place. However, the systematic renewal and replacement of existing trees is also important. This requires an understanding of the Useful Life Expectancy (ULE) of trees, together with accurate records of tree removal, in order to sustain a vibrant urban forest for the future.

ULE is an estimate of how long a tree is likely to remain in the landscape based on health and amenity, rather than viewing biological age in isolation. This concept is more applicable to public trees due to the many other factors requiring consideration for management, including tree survival in the harsh urban environment and potential risks to public safety as trees age.

Many of the City's public trees are well over 60 years old. For the City to maintain its existing canopy cover and amenity, it is critical that all trees in decline are recorded and that all public trees removed are replaced with an equivalent species. Where it is no longer appropriate for a tree to be planted in the same location (i.e. due to road widening), the removal must be offset like for like with a street or parkland tree as close to the site as practicable.

The City already maintains a comprehensive inventory of all assets, with every park bench, water fountain and street light mapped and recorded. While our public trees are most certainly an asset for the community, they are not currently recorded in the same manner. The establishment of a Tree Inventory will allow the City to better manage maintenance activities and to monitor the removal and health urban greening.



GREENING PRINCIPLE 9

Public trees are a City asset and should only be removed as a last resort. Every public tree removed must be replaced with an advanced tree of the same species in the same location within 12 months, appropriate to site conditions

7 How do we get there?

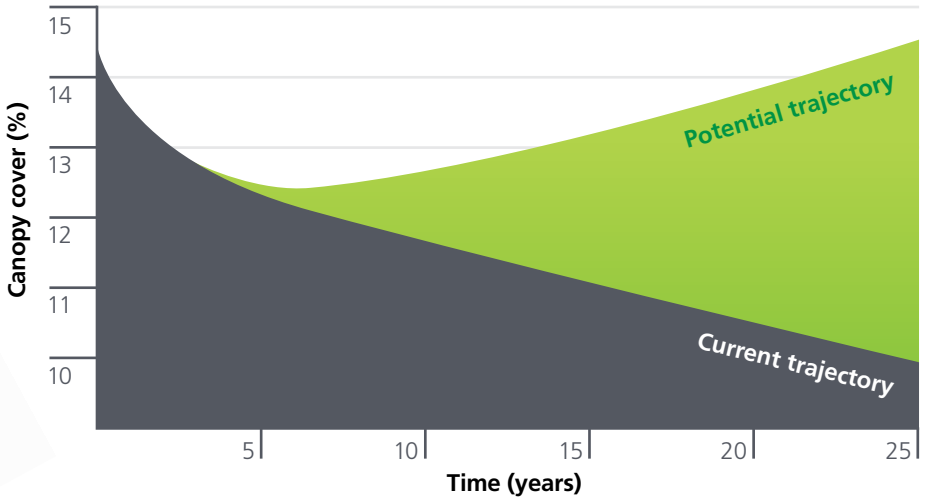
By capitalising on the identified opportunities and with consideration for the key greening principles, the City aims to achieve the following Green Goals. To support the implementation and achievement of these goals, detailed information is provided specific to each suburb in Section 7 of this Plan.

7.1. Green Goal One: Improve the trajectory of the City's green cover

This target has been established through an assessment of existing cover and potential losses due to urban development and natural decline, together with the number of vacant spaces which could potentially accommodate tree planting within streetscapes and POS.

The estimated trajectory is based on the assumption that trees planted will have a medium to large canopy at maturity (Figure 14). This target is still achievable by planting smaller trees; however, a greater number would be required to establish the equivalent canopy cover over 25 years. On this basis, planting numbers recommended in this plan can be adjusted to achieve this target as required based on the assumption that 4 small trees would have a similar canopy cover as 2 medium trees or 1 large tree. This highlights the importance of planting large trees wherever possible in accordance with Greening Principle 8.

Figure 14: Canopy targets



TARGET: ACHIEVE 14.5% CANOPY COVER OVER 25 YEARS

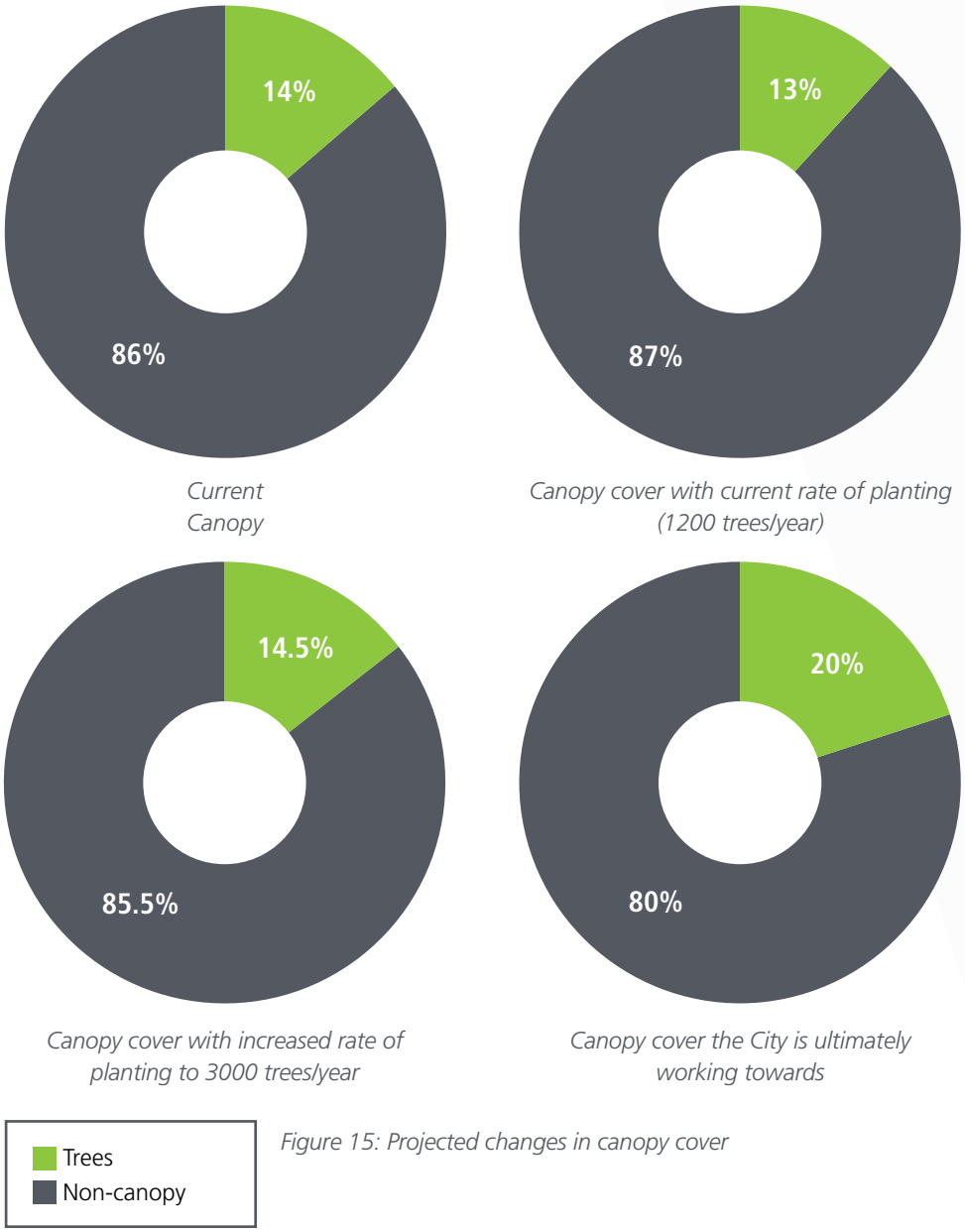


Figure 15: Projected changes in canopy cover

This may seem minimal given that current canopy cover is 14%, however, this actually equates to an 18.7% increase in canopy cover in the public realm, with the area of canopy increasing over time as newly planted trees reach maturity.

18.7% INCREASE IN CANOPY COVER IN THE PUBLIC REALM

The targets for changes in the City's canopy cover following implementation of this Plan are shown in Table 3. Note that the columns on the left indicate predicted change in canopy cover across the entire municipal area (private and public land), while the right hand columns show predicted change in canopy cover within the public realm (road reserves and POS). Negative targets take into account potential losses across the City due to development in the short term, which is likely to be counteracted as newly planted trees mature.

Table 3: Predicted changes in canopy cover over the next 5 and 25 years, with consideration for potential losses and the implementation of this Plan.

Change in canopy cover total (%)		Change in canopy cover public land (%)	
25 years	5 years	25 years	5 years
0.5%	-0.3%	18.7%	3.7%

ASPIRATIONAL TARGET:

The City is ultimately working towards a canopy cover of 20% through continued planting beyond the five year timeframe of this plan. In theory, to achieve 20% after 5 years would require 10,000 trees per year to be planted, almost 10 times the City's current effort.

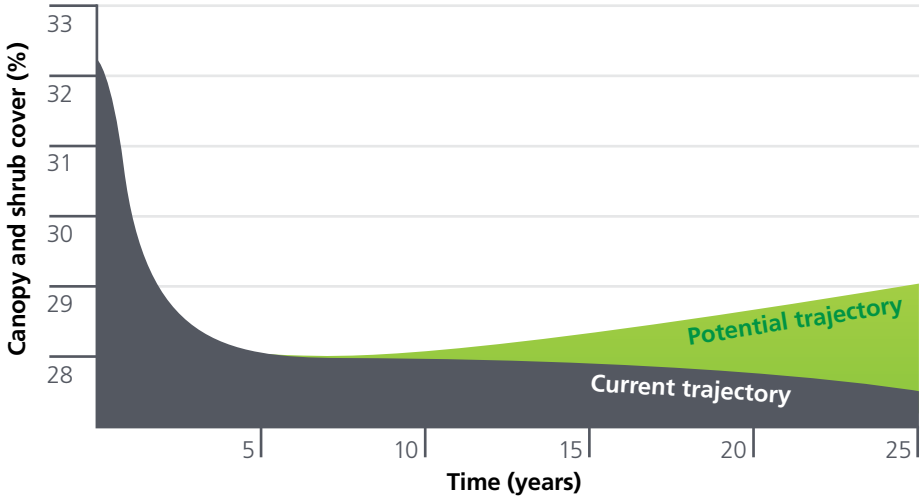
Any increase in planting numbers would be subject to securing necessary resources in the Parks Services budget relative to other priorities.

Works to achieve these targets will be undertaken by the City's Parks Services team, as per the implementation table in Section 9 which outlines priority areas for tree planting within each suburb over the next five years.

TARGET: ACHIEVE 29% GREEN COVER (TREES AND SHRUBS) OVER 25 YEARS

The implementation of this Plan focuses primarily on tree planting, as trees are considered to provide the greatest level of environmental, social and economic benefits. However, the Plan also acknowledges the importance of all types of green cover, particularly as tall trees would not naturally occur in some of the City's wetland and coastal environments.

Figure 16: Green cover targets



The City currently has a total of 32% green cover, which is comprised of 14% tree cover (>3m) and 18% shrub cover (<3m). Currently, this is predicted to reduce to 28% with potential losses from development and natural decline. The City aims to improve the trajectory of total green cover not only through medium to large tree planting in accordance with this Plan, but by continuing to plant smaller trees and native shrubland within POS and streetscapes, resulting in green cover being 29% after 25 years (Figure 14).

The aggregate extent of green cover in the City can be influenced greatly by shrubland planting on private property. The use of native species in residential gardens also has positive flow on effects by reducing ambient temperatures around the home and by providing small ecological links for birds and other species in an urban environment.

15,000 TREES OVER THE NEXT FIVE YEARS

Actions:

i. Plant at least 15,000 trees over the next five years within streetscapes and POS, as per the implementation outlined in Section 9. This equates to 3000 trees per year which is more than double what the City planted in the 2014/15 financial year.

ii. The City will investigate appropriate planning mechanisms to protect individual trees on private property through the development of an Environmental Planning Strategy.

iii. The City's new Local Planning Strategy and Town Planning Scheme are to effectively prioritise and provide for the protection of the City's environmentally significant areas on private land.

iv. New trees planted in accordance with this Plan must also account for necessary maintenance to support establishment of trees, including the use of a watering truck and mulch.

v. Continue the establishment and maintenance of a range of garden beds and turfed areas which collectively contribute to the City's total area of green space.

vi. Investigate suitable mechanisms to ensure tree plantings are factored into the early stages of planning for all of the City's capital works, including upgrades to roads, car parks, footpaths and POS

vii. Investigate suitable mechanisms to support the provision of a street tree for every lot in new developments.

viii. Develop a Public Open Space Strategy outlining the City's expectations for tree retention and provision in POS.

ix. Investigate suitable policies and procedures to support retention of trees on private landholdings.

x. Identify and plant existing arbors within City managed parkland.

7.2 Green Goal Two: Encourage community involvement in urban greening

The following measures will be undertaken to help raise community awareness of the benefits of urban greening and promote support for this Plan, acknowledging that community support can greatly influence the trajectory of the City's green cover, with 80% of trees occurring on private land.

Actions:

i. Update the City's website regularly to enable the community to access information relating to the Greening Plan.

ii. Promote the existing Winter Street Tree Planting Program, whereby residents can request a tree to be planted on their verge

iii. Liaise with residents regarding suitable tree planting relative to their location and verge size

iv. Update the City's Street Tree Planting List for character zone consistency

v. Establish a Native Gardens Program, whereby the City provides free native plants to residents to establish low maintenance and water wise green spaces in their gardens

vi. Promote urban greening programs and initiatives through the City's Facebook page, City Chronicle and Community Libraries.

7.3 Green Goal Three: Protect and maintain our green assets

While planting new public trees is important to account for potential losses on private land, these trees will take many years to reach maturity. Therefore, maintain existing canopy cover provides a foundation upon which improvements may be made.

Actions:

i. Investigate suitable mechanisms to ensure existing street and parkland trees are protected from damage as a result of construction and other works in the City.

ii. The City will investigate appropriate planning mechanisms to protect individual trees on private property through the development of an Environmental Planning Strategy.

iii. The City's new Local Planning Strategy and Town Planning Scheme are to effectively prioritise and provide for the protection of the City's environmentally significant areas on private land.

iv. Plan for the gradual and timely replacement of street and parkland trees as they reach the end of their Useful Life Expectancy, prioritising areas where there are large number of trees expected to reach the end of their lifespan in the same timeframe, or where loss of trees will have a significant impact on amenity, such as in key parkland areas and streetscapes.

v. Where appropriate, ensure that any public tree removed is replaced like for like within 12 months, consistent with Greening Principle 9.

vi. Update the City's GIS database to establish a Tree Inventory.

vii. Maintain the City's Tree Inventory to record and monitor tree maintenance and management activities.

viii. All street and parkland trees planted in new developments are to be recorded on the database.

ix. Undertake regular audits of public trees to improve database accuracy.

7.4 Green Goal Four: Plant the right tree in the right place

Planting the right tree in the right place is important to ensure the City's urban forest is healthy and capable of making a long term contribution to community wellbeing, together with enhancing the amenity and character of our public spaces. No matter how many trees are planted, if the species selected is not suitable, they are likely to exhibit poor growth and structure and may ultimately require removal.

The City invests considerable resources into tree planting annually and it is important that maximum benefits are being realised relative to this effort.

Actions:

i. All tree planting must be undertaken with consideration for the Greening Principles.

ii. Undertake an annual review of tree planting relative to the implementation schedule in this Plan and discuss lessons learnt with regard to tree selection and observed planting success.

iii. Ensure tree planting opportunities are integrated during urban water management planning in accordance with Water Sensitive Urban Design best management practices and principles.

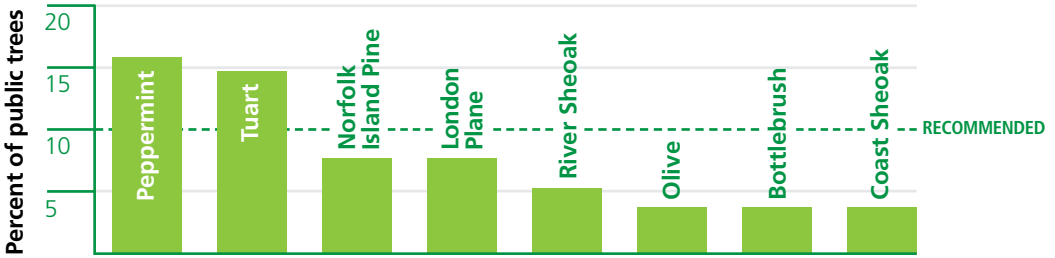
7.5 Green Goal Five: Ensure a diverse urban forest

Research suggests that to achieve best practise urban forest diversity, the representation of any one species should not exceed 10% (Santamour, 1990, Miller and Miller 1991, Jaenson et al. 1992). The City's current species composition is indicated in Figure 17, based on an assessment of 27,988 public trees. Note that the results may be skewed relative to the areas surveyed and as such, this data provides a high level indication only.

The intent is for this target, as shown in Figure 17, to provide overarching guidance only and under no circumstance should over represented species be removed to facilitate achievement of this target.

TARGET: NO MORE THAN 10% OF THE URBAN FOREST SHOULD BE COMPRISED OF TREES FROM THE SAME SPECIES

Figure 17: Best practise species diversity targets



Note: A large number of Eucalyptus species (in addition to Tuarts) were recorded across the City but were not identified to species level due to the sheer number. Collectively, Eucalyptus spp. made up 19% of the urban forest, although no one species was over represented.

Actions:

i. Undertake an annual review of tree species planted by both Parks Services and developers to determine if the City is effectively working towards this goal.

ii. Undertake a detailed inventory of public tree species to provide a more accurate baseline against which species diversity targets may be monitored.

iii. Review the Greening Plan implementation schedule as required following the Local Biodiversity Assessments being undertaken to inform the development of the Local Planning Strategy, particularly with regard to priority ecological linkages and opportunities to improve ecosystem services in an urban setting.

8 Suburb Snapshots

8.1 Baldivis

Overview

Baldivis is the largest suburb with the City of Rockingham located approximately 10 km inland of the coast. Historically, Baldivis has been a predominantly rural area, supporting a range of agricultural land uses. In recent years, Baldivis has undergone considerable urbanisation and now contains numerous housing estates. The suburb contains a number of conservation significant wetlands, in addition to remnant woodlands of Tuart *(Eucalyptus gomphocephala)*, Jarrah *(Eucalyptus marginata)*, Marri *(Corymbia calophylla)* and Banksia spp. As such, this area provides significant habitat value for a range of native fauna, including Carnaby's Black Cockatoo (endangered) and Red-tailed Black Cockatoo (threatened).

Character description

Residential Baldivis: a range of species have been planted throughout this zone associated with the different housing developments. Moving forward, native trees are to be prioritised. A broad selection of Australian native species has been included on the recommended planting list (Appendix A) to provide flexibility relative to site conditions.

Rural: characterised by gently undulating, open areas of pasture and pockets of remnant vegetation. Only species native to the region are recommended within this zone.

Urban centre: the Baldivis Town Centre is located on Safety Bay Road, with a second urban centre being further developed on Kerosene Lane. The Baldivis Town Centre contains non-native deciduous trees around built form such as Bradford Pear *(Pyrus calleryana)* and London Planes *(Platanus × acerifolia)*, with a number of *Eucalyptus spp.* on the periphery. This character is to be maintained and enhanced.

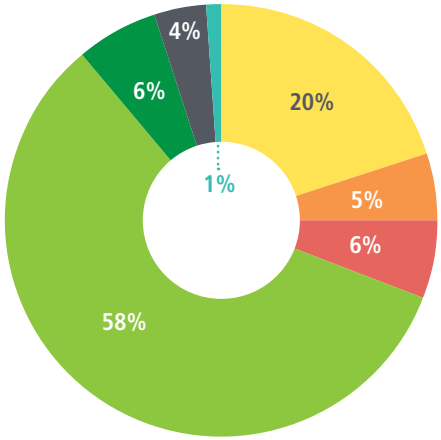
Please refer to Appendix A for the recommended species relative to these character zones.

Key considerations

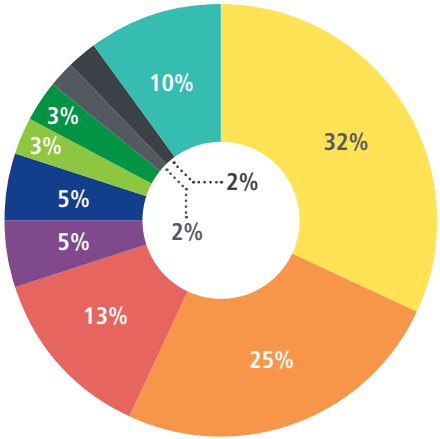
- Priority area to establish ecological linkages with native species, between areas of conservation significance
- Priority area to mitigate urban heat island effects
- Opportunity to enhance green cover with large trees in areas of POS
- Suitable vacant verges provide significant opportunity to establish street trees
- Opportunity to enhance character with uniform planting that complements existing mature street trees
- Plantings will need to be consistent with SPP 3.7 and the City's Bushfire Risk Management Plan
- Opportunity to improve green cover and streetscape character on key roads (Safety Bay Road, Nairn Drive).

Public trees at a glance

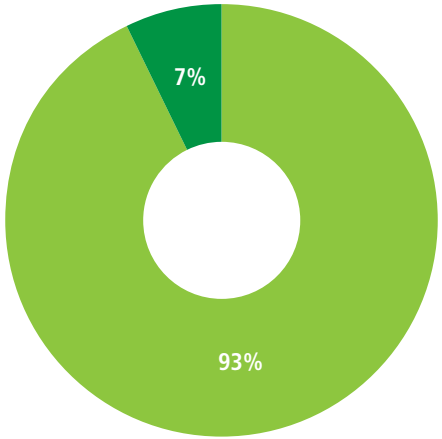
Percentage terrain cover



Species diversity



Canopy cover on public vs private land



Existing number public trees

POS	ROADS	TOTAL
4,345	6,574	10,919

Implementation

Street	Character	# trees
Abington Avenue	RB	40
Amazon Drive	RB	20
Area south of Tamworth Blvd, north of Mennock App	RB	50
Baldivis Road, Makybe Drive to Highbury Blvd (along median)	RB	100
Baldivis Road, Pemberton Blvd to Amazon Drive (western verge)	RB	30
Blaxland Terrace	RB	30
Bramall Tce, Nairn Dirve to Makybe Drive	RB	40
Brennan Promenade	RB	90
Bristlebird App (Kagu Way, Wanderer Pwy), from Nairn Drive to Eighty Rd	RB	40
Clyde Avenue, Nairn Drive to Baldivis Road	RB	50
Fairchild Drive and Elderberry Drive	RB	30
Fifty Road, McDonald Road to Nairn Drive (median and verge)	RB	30
Goulburn Road	U	10
Greenock Road	RB	30
Heritage Park Drive, Coolibah Way to Furioso Grn	RB	50
Kendall Blvd	RB	50
Kerosene Lane, Jennings Way to Annabelle Way (median and verge)	RB	30
Kulija Road, Kwinana Freeway to Millar Road	R	200
Makybe Drive	RB	50
Mennock Approach	U	10
Nairn Drive, Blaxland Terrace to Ridge Blvd*	RB	350
Nairn Drive, Fifty Road to Fairchild Road*	RB	200
Nairn Drive/Eighty Road, Burch Way to Fifty Road*	RB	400
Norseman Approach	U	10
Norwood Avenue	RB	30
Patron Road and Baystone Road	RB	40
Pemberton Boulevard	RB	50
Pike Road	R	50
Safety Bay Rd, Baldivis Rd to Nairn Drive (southern verge and median)	U	70
Safety Bay Rd, Kwinana Freeway to Baldivis Road	RB	80
Smirk Rd	RB	100
Tamworth Blvd, Baldivis Rd to Nairn Drive	RB	20
Total street trees		**2,380**

**Planting on Nairn Drive subject to future upgrade works*

CHARACTER ZONES:

(C) Coastal (F) Foreshore (I) Industrial (R) Rural (RB) Residential Baldivis (U) Urban centre

Public Open Space	Character	# trees
1. Elderberry Reserve	RB	80
2. Whitehart Easement	RB	70
3. Spinifex Reserve	RB	60
4. Norseman Reserve	RB	50
5. Campolina Reserve	RB	40
6. Hathaway Reserve	RB	40
7. Maiden Reserve	RB	40
8. Selina Reserve	RB	40
9. The Hawthorns Easement	RB	40
10. Burlington Reserve	RB	30
11. Camley Fairway Reserve	RB	30
12. Wise Meander Reserve	RB	30
13. Ballaballa Reserve	RB	20
14. Liesham Crescent	RB	20
15. Notman Reserve	RB	20
16. St James Dr Reserve	RB	10
17. Bonnington Reserve	RB	10
18. Bravo Reserve	RB	10
19. Chelsea Way Reserve	RB	10
20. Elm Reserve	RB	10
21. Rushmore	RB	10
22. Timbarra Reserve	RB	10
23. Zedora Reserve	RB	20
24. Ingarfield Green	RB	10
25. Delta Reserve	RB	10

Public Open Space	Character	# trees
26. Diamondbird Reserve	RB	10
27. Jerboa Green	RB	10
28. Kingaroy Reserve	RB	10
29. Lamorak	RB	10
30. Len Pike Park	RB	10
31. Stillwater Reserve	RB	10
32. Tranby Reserve	RB	10
33. Appaloosa Reserve	RB	10
34. Ardea Way Reserve	RB	10
35. Atherstone Reserve	RB	10
36. Liddard Gardens	RB	10
37. Birdsville Reserve	RB	10
38. Blaxland Reserve	RB	10
39. Breton reserve	RB	10
40. Cervantes Reserve	RB	10
41. Clyde/Vernon Gough Reserve	RB	10
42. Colonial Reserve	RB	10
43. Coolimba Turn Drainage	RB	10
44. Elland Way	RB	10
45. Furnivall reserve	RB	10
46. Gillespie Reserve	RB	10
47. Grail Reserve	RB	10
48. Highbury Reserve	RB	10
49. Hocking Reserve	RB	10

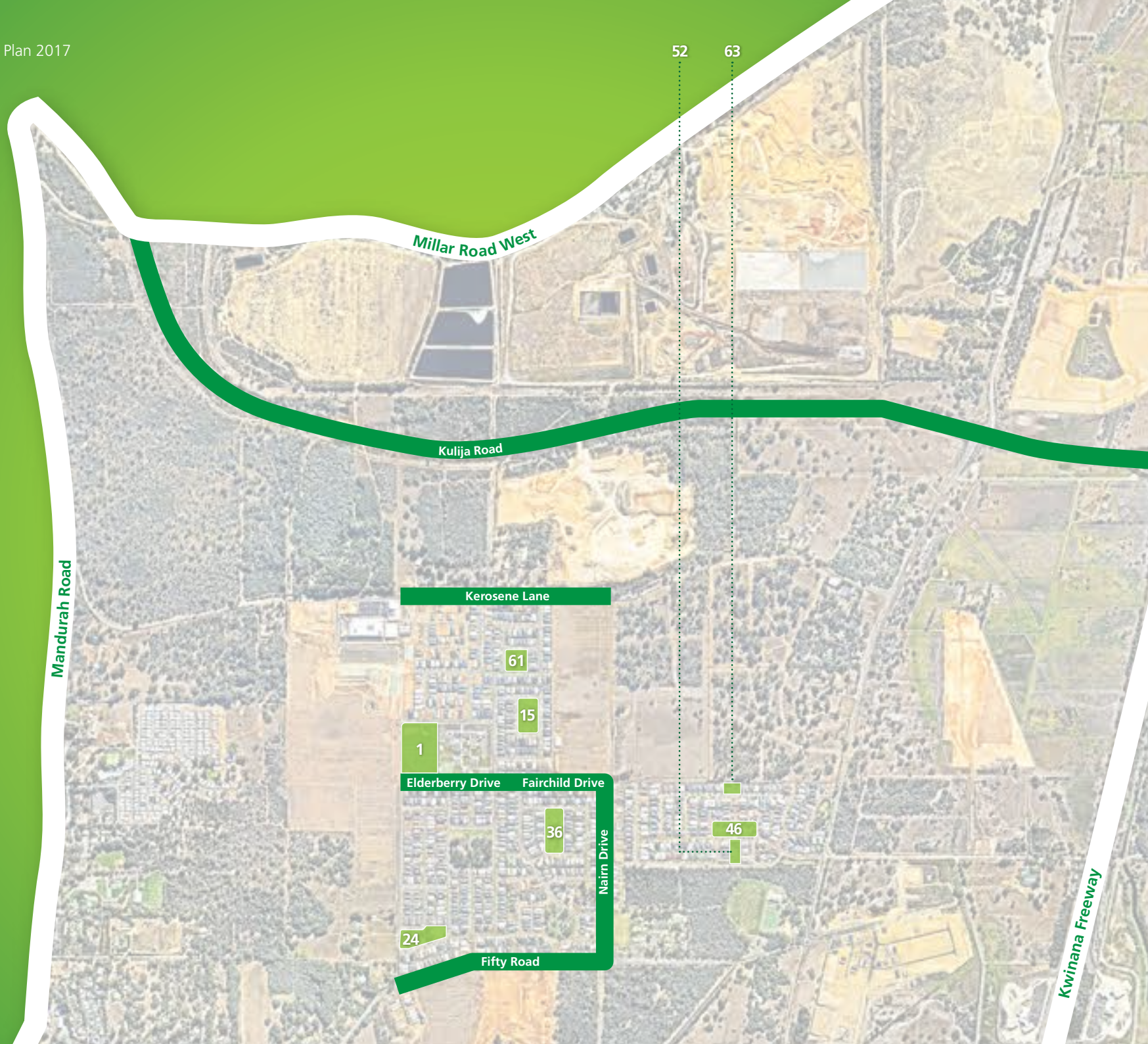
Public Open Space	Character	# trees
50. Kenndel Reserve	RB	10
51. Mentor Street Reserve	RB	10
52. Monument Reserve	RB	10
53. Overton Lane Reserve	RB	10
54. Palomino Reserve	RB	10
55. Pemberton Reserve North	RB	10
56. Pemberton Reserve South	RB	10
57. Peverett Park	RB	10
58. Pinnacle Reserve	RB	10
59. Province Reserve	RB	10
60. Smirk Reserve	RB	10
61. Steer Reserve	RB	10
62. Tintagel	RB	10
63. Tribute Reserve	RB	10
64. Trusty Park	RB	10
65. Villa Park Reserve	RB	10
66. Willow Reserve	RB	10
67. Ballaballa Reserve South	RB	10
Total POS trees		**1,140**

Public trees to be planted in **Baldivis**

3,520

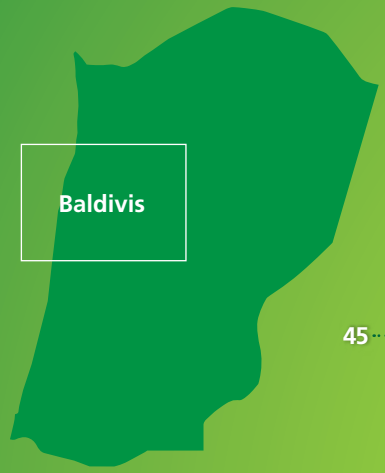
This means the number of Baldivis public trees will increase by 32% over 5 years

PRIORITY PLANTING LOCATIONS



Legend

- Road (orientation)
- Priority street tree planting
- POS (numbers refer to table)



45

Mandurah Road

Safety Bay Road

Amazon Drive

21

40

Baldivis Road

Nairn Drive

25

Pemberton Boulevard

Tamworth Boulevard

4

13

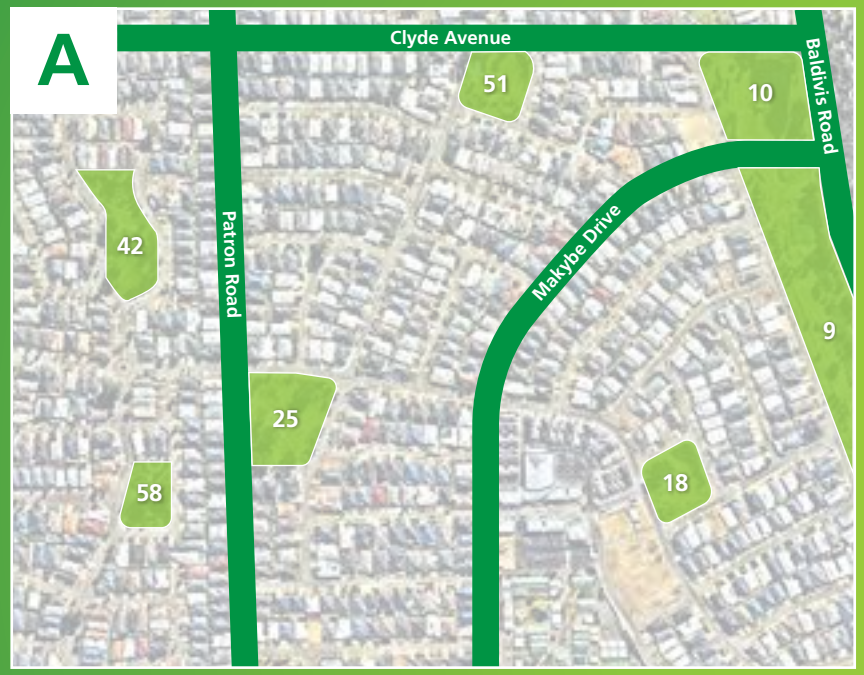
67

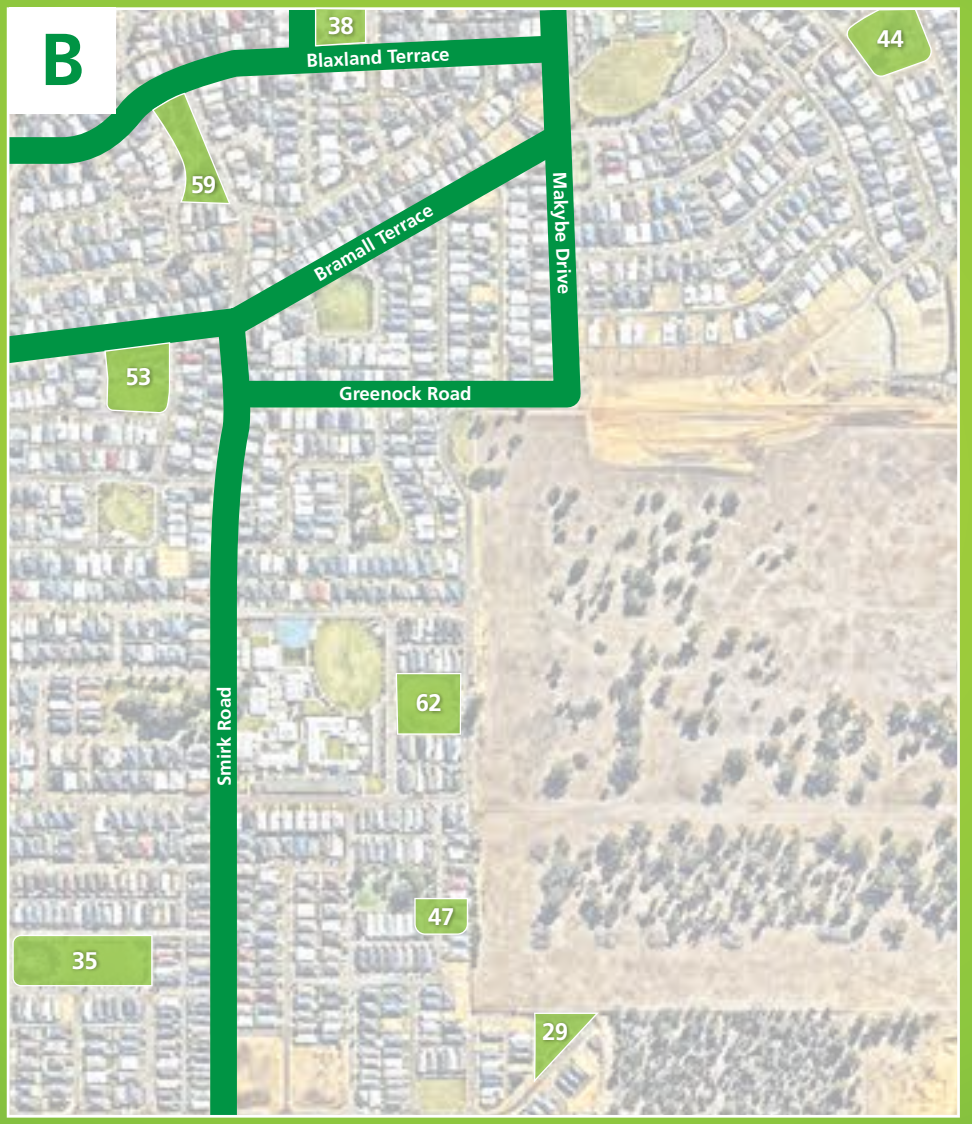
Goulburn Rd

Mennock App

Norseman App

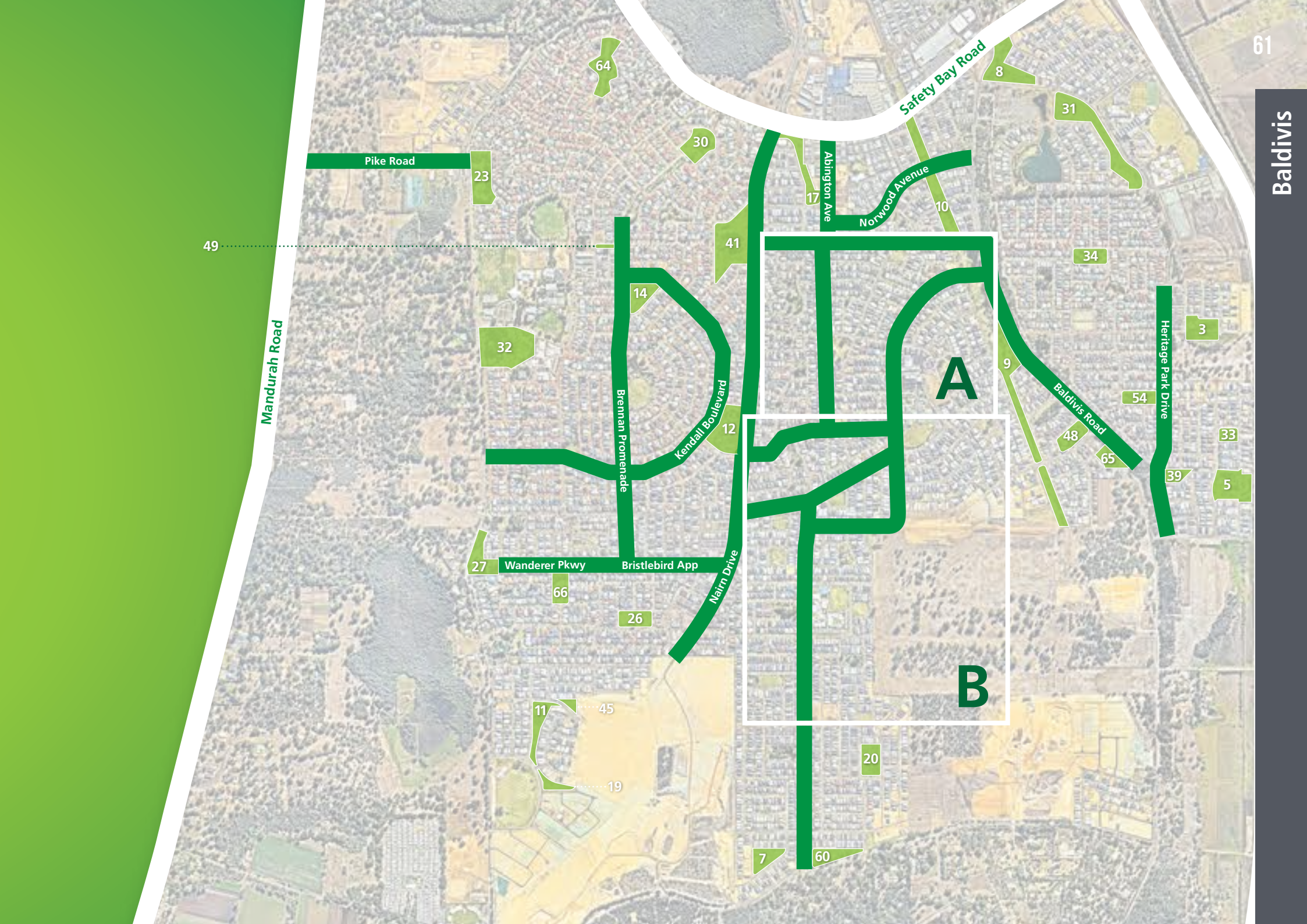
Safety Bay Road





Legend

- Road (orientation)
- Priority street tree planting
- POS (numbers refer to table)


Safety Bay Road
Pike Road
Mandurah Road
Abington Ave
Norwood Avenue
Brennan Promenade
Kendall Boulevard
Baldivis Road
Heritage Park Drive
Wanderer Pkwy
Bristlebird App
Nairn Drive
A
B
64
8
31
30
23
17
10
49
41
34
14
3
32
9
54
12
48
33
65
39
5
27
66
26
11
45
19
20
7
60

8.2 Cooloongup

Overview

Cooloongup is predominantly residential suburb inland from Safety Bay. The suburb is bound to the north by Rae Road, the west by Read Street and the east by Mandurah Road, with Ennis Avenue passing through the centre of the suburb. Lots are mid-sized and houses are typically single storey. Lake Cooloongup Reserve, which forms part of the Rockingham Lakes Regional Park under management by the Department of Parks and Wildlife, and the Rockingham Gold Club collectively account for over 50% of the suburb area.

Character description

Coastal: although not located on the coastline, Cooloongup has a character consistent with the City's coastal suburbs including Peppermints *(Agonis flexuosa)*, Tuarts *(Eucalyptus gomphocephala)*, Sheoaks *(Allocasuarina fraseriana)*, New Zealand Christmas Trees *(Metrosideros excelsa)*, Coastal Moorts *(Eucalyptus platypus)* and Bottlebrushes *(Callistemon spp.)*, with various other Eucalypt spp. and some exotics such as London Planes *(Platanus x acerifolia.)*.

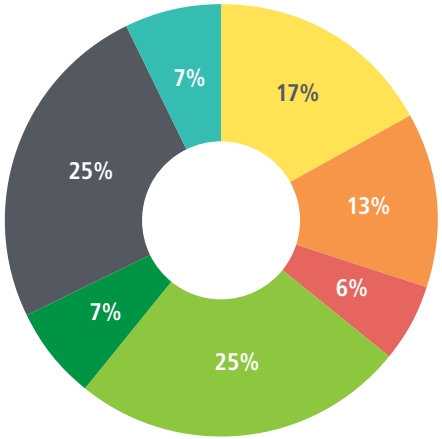
Please refer to Appendix A for the recommended species relative to character zones.

Key considerations

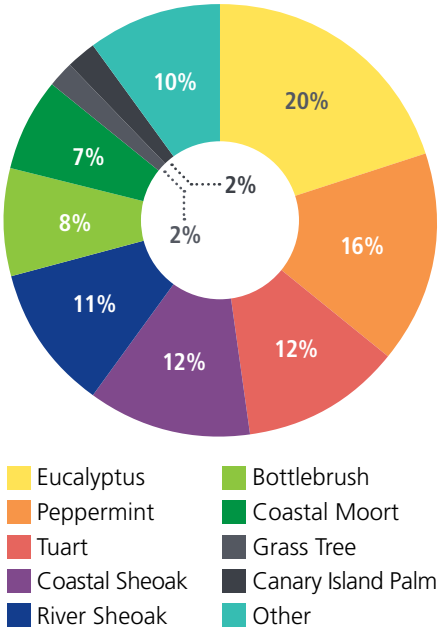
- Main Roads approval required to plant along Ennis Ave
- Priority area to establish ecological linkages with native species north-south along Ennis Ave and west of Lake Cooloongup
- Suitable vacant verges provide significant opportunity to establish neighbourhood street trees
- Overhead power lines to be considered when selecting species on residential streets
- Opportunity to establish street tree themes through uniform planting
- Opportunity to enhance canopy cover by planting large trees in areas of established POS.

Public trees at a glance

Percentage terrain cover



Species diversity



Canopy cover on public vs private land

Existing number public trees

POS	ROADS	TOTAL
932	1,689	2,621

Implementation

Street	Character	# trees
Breaden Drive (both verges)	C	40
Cambridge Crescent (prioritise northern verge)	C	40
Elanora Drive	C	20
Ennis Ave	C	50
Gascoyne Way	C	40
Grange Drive (prioritise residential verges)	C	50
Willmott Drive	C	50
Total street trees		**290**

Public Open Space	Character	# trees
1. Alf Powell Reserve	C	100
2. Deanna A Reserve	C	10
3. Don Cuthbertson Reserve	C	60
4. Inverness Reserve	C	20
5. Madison Place Reserve	C	-
6. Paul Garnett Oval	C	40
7. Solquest Park		20
8. St Michaels Reserve	C	30
9. Breaden Drive Reserve	C	10
Total POS trees		**290**

Public trees to be planted in **Cooloongup**

580

This means the number of public trees in Cooloongup will increase by 22% over 5 years

CHARACTER ZONES:

(C) Coastal (F) Foreshore (I) Industrial (R) Rural (RB) Residential Baldivis (U) Urban centre


Legend
Road (orientation)
Priority street tree planting
POS
(numbers refer to table)
Rae Road
Cambridge Crescent
Grange Drive
Ennis Ave
Elanora Drive
Willmott Drive
Breaden Drive
Goongarrie Drive
1
2
3
4
5
6
7
8
9
COOLOONGUP

8.3 East Rockingham

Overview

East Rockingham is the northernmost coastal suburb of the City of Rockingham and sits within the Kwinana Industrial Area. The suburb is dominated by large industrial lots with minimal roads or access routes other than the distributor roads which service it. While extensive areas of remnant bushland remain, only the Foreshore Reserve and the Rockingham Industrial Zone Conservation Area are to be formally protected in perpetuity. The approved East Rockingham Structure Plan ensures the further development of serviced industrial land into the future. It is anticipated that this will lead to losses in green cover in the coming years.

Character description

Coastal: includes numerous existing Peppermints *(Agonis flexuosa)*, Rottnest Island Pines *(Callitris preissii)* and Coastal Moorts *(Eucalyptus utilis)*. There is opportunity to extend this existing character and enhance it with further planting of Norfolk Island Pines *(Araucaria hetorphylla)* and Rottnest Island Tea Trees *(Melaleuca lanceolata)* consistent with other coastal areas of the City.

Industrial: trees have been selected for their colour and form which contrast the existing industrial buildings. Such trees include Smooth Barked Apple *(Angophora costata)*, Ironbark *(Eucalyptus sideroxylon)*, Albany Red Flowering Gum *(Corymbia ficifolia)* and Red Flowering Yellow Gum *(Eucalyptus leucoxylon 'rosea')*.

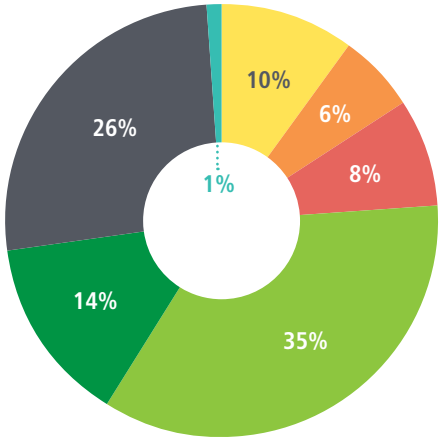
Please refer to Appendix A for the recommended species relative to character zones.

Key considerations

- Main Roads approval required to plant MRWA road reservations
- Priority area to establish ecological linkages with native species to Lewington Nature Reserve
- Suitable vacant verges provide significant opportunity to establish street trees
- Opportunity to establish street tree themes through uniform planting
- Foreshore Reserve is the only POS area within the suburb, meaning there is minimal opportunity to enhance green cover with parkland trees
- Plantings will need to be consistent with SPP 3.7 and the City's Bushfire Risk Management Plan
- Priority area to reduce industrial air/noise pollution and urban heat island effect.

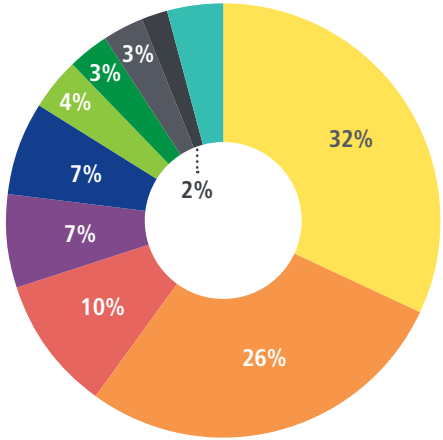
Public trees at a glance

Percentage terrain cover



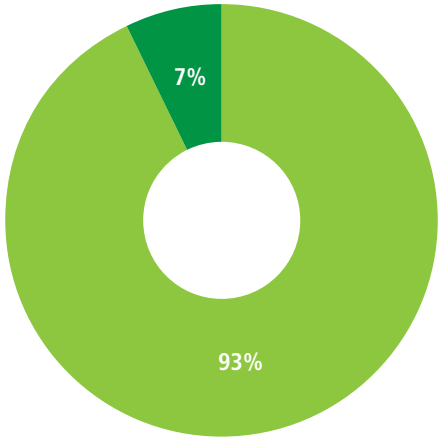
Tree
Bare Soil
Builtform
Grass
Hardstand
Shurb
Water

Species diversity



Peppermint
Tuart
Grass Tree
Eucalyptus
Bottlebrush
Paperbark
Coastal Moort
Coastal Sheoak
River Sheoak
Other

Canopy cover on public vs private land



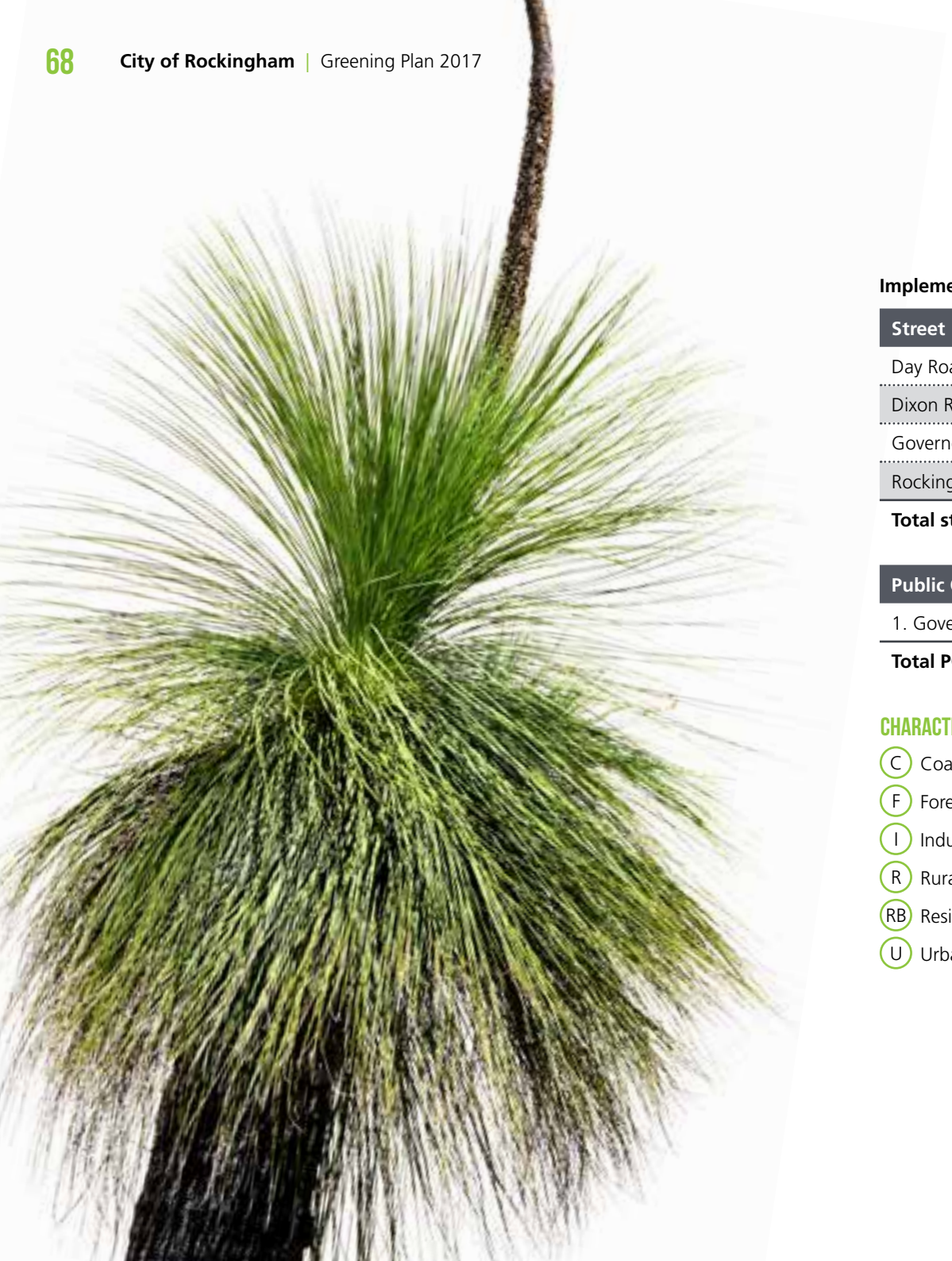
Private
Public

Existing number public trees

POS
82

ROADS
1,153

TOTAL
1,235



Implementation

Street	Character	# trees
Day Road (prioritise middle to southern end)	I	40
Dixon Road (north verge)	I	110
Governor Road	C	20
Rockingham Beach Road (both verges)	F	150
Total street trees		**320**

Public Open Space	Character	# trees
1. Governor Road Foreshore Reserve	F	80
Total POS trees		**80**

CHARACTER ZONES:

- (C) Coastal
- (F) Foreshore
- (I) Industrial
- (R) Rural
- (RB) Residential Baldivis
- (U) Urban centre

Public trees to be planted in
East Rockingham
400

This means the number of public trees in East Rockingham will increase by 32% over 5 years


Legend
Road (orientation)
Priority street tree planting
POS
(numbers refer to table)
1
Rockingham Beach Road
Governor Road
Patterson Road
Mandurah Road
Ennis Avenue
Day Road
Dixon Road
EAST ROCKINGHAM

8.4 Golden Bay

Overview

Golden Bay contains established residential areas and lots zoned Special Residential which are situated within remnant coastal vegetation, together with an area of new development. The suburb is bound by Mandurah Road to the east and the Indian Ocean to the west.

Character description

Coastal: has numerous Peppermints *(Agonis flexuosa)*, Norfolk Island Pines *(Araucaria heterophylla)*, Tuarts *(Eucalyptus gomphocephala)*, Sheoak *(Allocasuarina fraseriana)*, Casuarina spp. and Coastal Moort *(Eucalyptus platypus)*. The recommended trees were selected to enhance this existing character.

The streets in the special residential zone to the east side of Warnbro Sound Avenue have small Eucalyptus sp. as street trees, and future planting should aim to be consistent with these species.

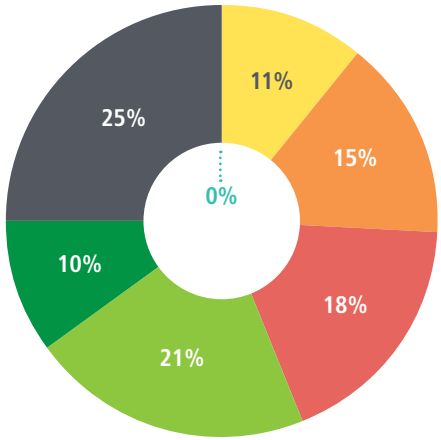
Please refer to Appendix A for the recommended species relative to character zones.

Key considerations

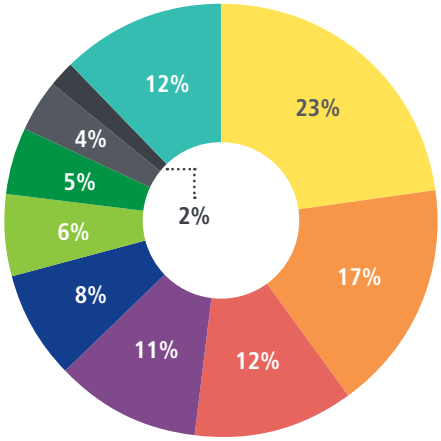
- Opportunity to significantly improve greening along Warnbro Sound Avenue
- Prioritise planting native species to enhance ecological linkage to nearby conservation areas i.e. Trenant Park Gardens
- Opportunity to enhance character and increase amenity of POS through larger tree planting
- Suitable vacant verges provide significant opportunity to establish neighbourhood street trees
- Smaller verges in newly developed areas will require smaller species
- Priority area to reduce urban heat island effect with relative to smaller lots
- Plantings will need to be consistent with SPP 3.7 and the City's Bushfire Risk Management Plan.

Public trees at a glance

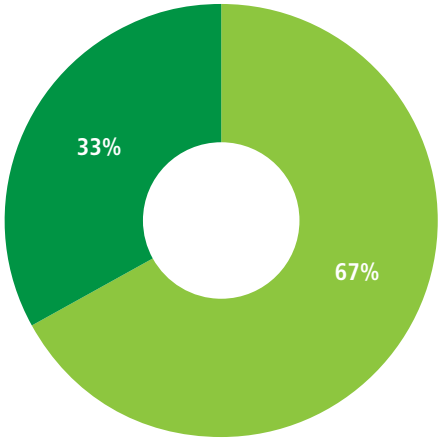
Percentage terrain cover



Species diversity



Canopy cover on public vs private land



Existing number public trees

POS **344**

ROADS **1,217**

TOTAL **1,561**

Implementation

Street	Character	# trees
Crystaluna Drive	C	50
Mandurah Road	C	140
Warnbro Sound Avenue (median/eastern verge)	C	120
Total street trees		**310**

Public Open Space	Character	# trees
1. Callawa Reserve	C	40
2. George Foster Reserve	C	10
3. Glenburgh Reserve	C	10
4. Mallina Reserve	C	150
5. Woolibar Reserve	C	50
6. Yamarna Road Reserve	C	50
Total POS trees		**310**

CHARACTER ZONES:

- (C) Coastal
- (F) Foreshore
- (I) Industrial
- (R) Rural
- (RB) Residential Baldivis
- (U) Urban centre

Public trees to be planted in **Golden Bay**

620

This means the number of public trees in Golden Bay will increase by 40% over 5 years


Legend
Road (orientation)
Priority street tree planting
POS (numbers refer to table)
1
2
3
4
5
6
Warnbro Sound Avenue
Dampier Drive
Mandurah Road
Crystaluna Drive
GOLDEN BAY

8.5 Hillman

Overview

Hillman is a small established residential suburb bound by Ennis Avenue, Dixon Road and the Perth-Rockingham railway. The suburb also encompasses the Dixon Road Conservation Precinct, which is one of the City's environmental offset sites. The Conservation Precinct is also part of an important ecological linkage as it forms part of the Rockingham Lakes Regional Park.

Character description

Coastal: predominantly planted with Tuarts *(Eucalyptus gomphocephala)*, Peppermints *(Agonis flexuosa)*, New Zealand Christmas Trees *(Metrosideros excels)* and Sheoaks *(Allocasuarina fraseriana)* and *Callistemon spp*.

There is high percentage of *Ficus spp*. within Hillman, a unique characteristic compared with other suburbs. This creates a very shady, dark green, leafy feel to certain streets, a contrast to the more obvious coastal character of the surrounding streets. Future planting in these streets should be consistent with this character.

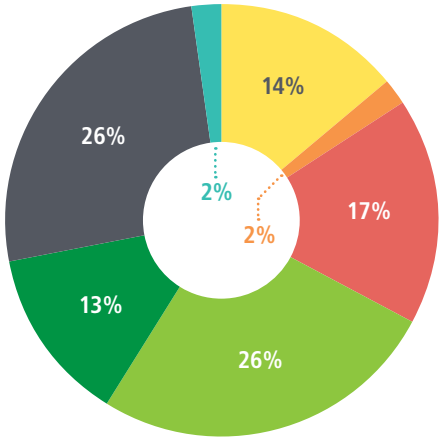
Please refer to Appendix A for the recommended species relative to character zones.

Key considerations

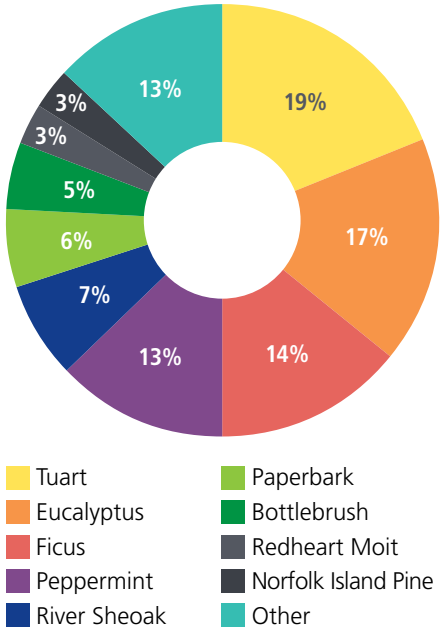
- Main Roads approval required to plant in MRWA road reservations
- Priority area to establish ecological linkages to Dixon Road Conservation Precinct and Lake Walyungup
- Suitable vacant verges provide significant opportunity to establish street trees
- Overhead power lines to be considered when selecting species on residential streets
- Opportunity to establish street tree themes through uniform planting
- Opportunity to improve greening along Dixon Road
- Priority area to reduce urban heat island effect.

Public trees at a glance

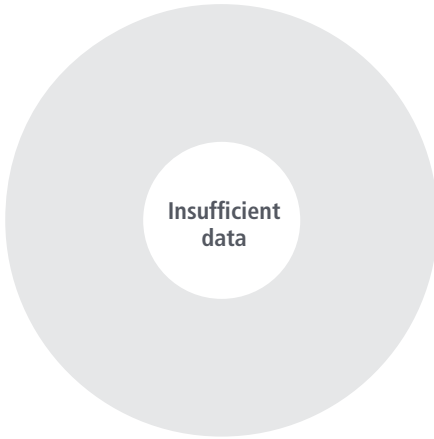
Percentage terrain cover



Species diversity



Canopy cover on public vs private land



Existing number public trees

POS **115**

ROADS **619**

TOTAL **734**

Implementation

Street	Character	# trees
Carvie Street	C	50
Dixon Road	I	180
Unnaro Street	C	30
Total street trees		**260**

Public Open Space	Character	# trees
1. Ennis Avenue Reserve	C	150
2. Gabyon Park	C	20
3. Long Park	C	80
4. Tarwarri Park	C	10
Total POS trees		**260**

CHARACTER ZONES:

- (C) Coastal
- (F) Foreshore
- (I) Industrial
- (R) Rural
- (RB) Residential Baldivis
- (U) Urban centre

Public trees to be planted in **Hillman**

520

This means the number of public trees in Hillman will increase by 70% over 5 years

Legend

- Road (orientation)
- Priority street tree planting
- POS (numbers refer to table)

8.6 Karnup

Overview

Karnup is located in the southeast of the City and is predominantly zoned Rural, with the exception of the Vistas estate in West Karnup.

The Karnup Munitions Depot, also represents a large portion of the land area of the suburb, is predominantly devoid of vegetation. The depot has been earmarked for urban development in the future and presents a significant opportunity to establish green cover in the future streetscapes.

As Karnup already has significant canopy cover and given that the Vistas is not under management by the City, the suburb is not currently considered a high priority for POS and street tree planting. As such, there are no recommended plantings proposed for Karnup in this Plan.

Notwithstanding, residents in Karnup may still request a street tree be planted on their verge as part of the Winter Street Tree Program.

Character description

Rural: the suburb is characterised by Tuart *(Eucalyptus gomphocephala)*, Jarrah *(Eucalyptus marginata)*, Marri *(Corymbia calophylla)* and *Banksia spp.*, endemic to the Rockingham region. Planting should aim to enhance this character and in doing so, will provide ecological linkages for native fauna species.

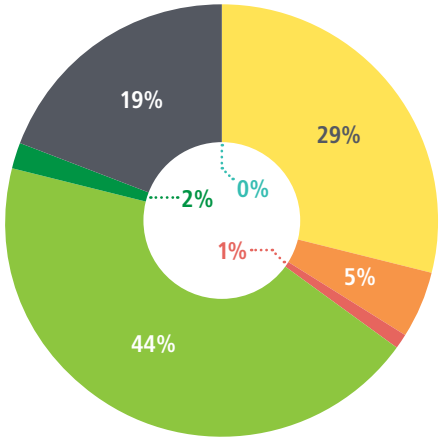
Please refer to Appendix A for the recommended species relative to character zones.

Key considerations

- Opportunity to establish ecological linkages with native species to nearby conservation areas i.e. Paganoni Swamp
- Suitable vacant verges provide significant opportunity to establish street trees in the future
- Overhead power lines to be considered when selecting species on residential streets
- Residential development is only just commencing in Karnup, so the establishment of neighbourhood character during planning is key
- Where the Rural character zone species are not suitable in newly developed areas, the planting themes should reflect recommended species for the Baldivis Residential zone.
- Plantings will need to be consistent with SPP 3.7 and the City's Bushfire Risk Management Plan.

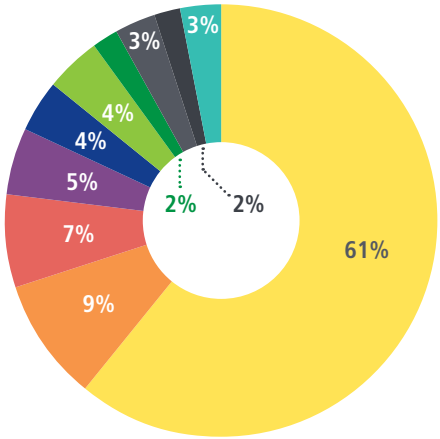
Public trees at a glance

Percentage terrain cover



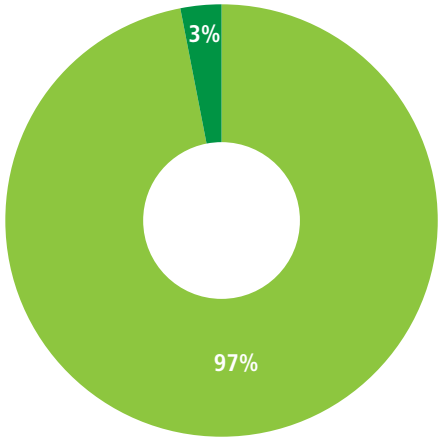
Tree
Hardstand
Bare Soil
Shurb
Builtform
Water
Grass

Species diversity



Tuart
River Red Gum
Bottlebrush
Oleander
Wattle
Eucalyptus
Jarrah
Grevillea
Banksia
Other

Canopy cover on public vs private land



Private
Public

Existing number public trees

POS	ROADS	TOTAL
N/A	433	433

**Note: as Karnup has high canopy cover, counting of individual public trees was not a priority compared to other suburbs. Therefore, this number is considered to be a gross underestimation of the actual number of trees in Karnup road reservations.*

8.7 Port Kennedy

Overview

Port Kennedy is a coastal suburb located south of Warnbro, with large portions occupied by the Port Kennedy Foreshore Park, Scientific Park, 'The Links' Golf Course, the southern tip of Lake Walyungup Reserve and the Lark Hill Sports Complex. Port Kennedy is predominantly a coastal residential suburb which also contains an industrial zone to the east of Warnbro Sound Avenue. With the exception of those directly adjoining POS, residential streets have limited tree planting and there is great opportunity for to establish a distinctive character for the suburb.

Character description

Coastal: residential street trees typically include Peppermints *(Agonis flexuosa)*, Bottlebrushes *(Callistemon sp.)* and Norfolk Island Pines *(Araucaria heterophylla)*. Other trees include Tuarts *(Eucalyptus gomphocephala)*, Sheoaks *(Allocasuarina fraseriana)*, Jacarandas *(Jacaranda mimosifolia)* and New Zealand Christmas Trees *(Metrosideros excelsia)*.

Industrial: recommended species includes a mixture of natives chosen for their colour and form to contrast with the industrial buildings, such as Ironbark *(Eucalyptus sideroxylon)* and Red Flowering Gum *(Corymbia ficifolia)*.

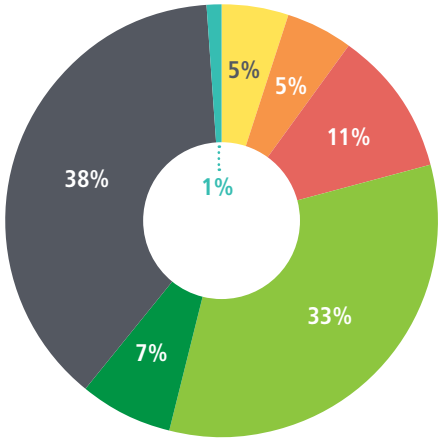
Please refer to Appendix A for the recommended species relative to character zones.

Key considerations

- Priority area to establish ecological linkages with native species, to Lake Walyungup and Port Kennedy Scientific Park
- Suitable vacant verges provide significant opportunity to establish street trees
- Overhead power lines to be considered when selecting species on residential streets
- Opportunity to establish street tree themes through uniform planting that complements existing mature street trees
- Priority area to reduce industrial air pollution and urban heat island effect
- Opportunity to enhance green cover with large trees in areas of POS
- Main Roads approval required to plant in MRWA road reservations
- Opportunity to create a colourful contrast to the surrounding uniformity of the industrial buildings by planting flowering species.

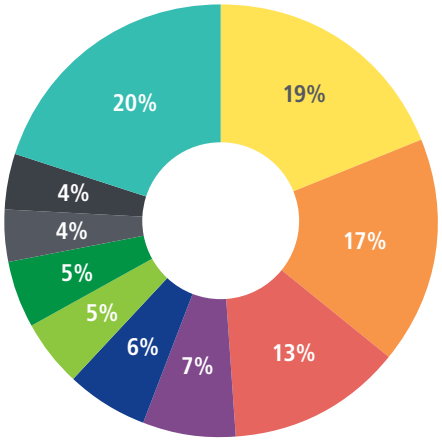
Public trees at a glance

Percentage terrain cover



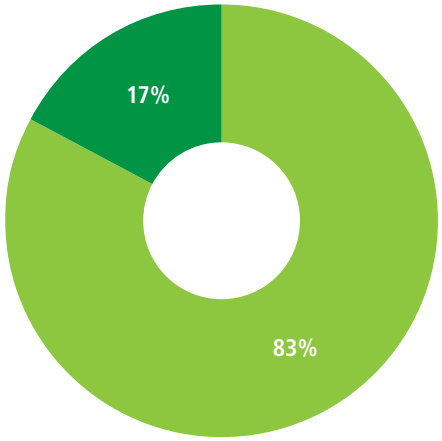
Tree
Hardstand
Bare Soil
Shurb
Builtform
Water
Grass

Species diversity



Norfolk Island Pine
London Plane
Eucalyptus
Paperbark
Peppermint
Tuart
River Sheoak
Coastal Sheoak
Grass Tree
Other

Canopy cover on public vs private land



Private
Public

Existing number public trees

POS
1,869

ROADS
3,124

TOTAL
4,993

Implementation

Street	Character	# trees
Bayside Boulevard	C	40
Blackburn Drive	I	30
Chelmsford Avenue	C	40
Clipper Drive	C	10
Discovery Crescent	C	40
Endeavour Drive	C	50
Fendam Street	C	10
Grand Ocean Boulevard (north)	C	10
Grand Ocean Boulevard (south)	C	20
Port Kennedy Drive	I, C, F	290
Warnbro Sound Avenue	I, C	230
Total street trees		**770**

Public trees to be planted in **Port Kennedy**

1,540

This means the number of public trees in Port Kennedy will increase by 31% over 5 years

Public Open Space	Character	# trees
1. Amadeus Crescent	C	20
2. Athens Entrance	C	10
3. Bayeux Reserve	C	10
4. Carpentaria Drive	C	10
5. Ceri Close Reserve	C	20
6. Chelmsford Reserve	C	50
7. Fountain Park	C	10
8. Majestic Close Reserve	C	40
9. Mayflower Reserve	C	20
10. Merida Loop	C	10
11. Orleans Drive Reserve	C	10
12. Pimento Circle	C	30
13. Round Hill Reserve	C	30
14. Salamanca Reserve	C	20
15. San Sebastian Reserve	C	10
16. Spiral Park Reserve	C	10
17. St Clair Reserve	C	60
18. St Raphael Reserve	C	280
19. Strasbourg Ramble	C	10
20. Veterans Memorial Park	C	100
21. Sunlight Park	C	10
Total POS trees		**770**

CHARACTER ZONES:

(C) Coastal (F) Foreshore (I) Industrial (R) Rural (RB) Residential Baldivis (U) Urban centre


Legend
Road (orientation)
Priority street tree planting
POS (numbers refer to table)
Fendam St
Chelmsford Avenue
Grand Ocean Boulevard
Discovery Cres
Clipper Lane
Endeavour Drive
Blackburn Drive
Port Kennedy Drive
Warnbro Sound Avenue
Ennis Avenue
Mandurah Road
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
PORT KENNEDY

8.8 Rockingham

Overview

Rockingham is a Strategic Metropolitan Centre and encompasses the existing City centre, foreshore reserves, old established residential areas and newly developed high density residential areas. The suburb is bounded to the north by the Cockburn Sound, the south by Rae Road and the east by Ennis Avenue, with Patterson Road passing through the suburb as key entry road into the City centre.

Character description

Urban: the Kent Street area is characterised by significant mature trees including Peppermints *(Agonis flexuosa)*, Coral Trees *(Erythrina indica)*, Canary Island Date Palms *(Phoenix canariensis)* and London Planes *(Plantanus x acerifolia)*; and the Rockingham Shopping Centre and City of Rockingham Administration precinct have mature street tree plantings of London Planes *(Plantanus x acerifolia)*, Liquid Ambers *(Liquidambar styraciflua)* and Canary Island Date Palms *(Phoenix caneriensis)*.

Industrial: tree planting includes a number of existing *Eucalyptus spp.* and Tuarts *(Eucalyptus gomphocephala)*. Proposed trees for this zone include a mix of native and exotics chosen for their colour and form which is a contrast to the surrounding uniformity of the industrial buildings such as Ironbark *(Eucalyptus sideroxylon)*.

Foreshore Park: this area includes the area west of the most seaward street and is characterised by numerous Norfolk Island Pines *(Araucaria heterophylla)*, Tuarts *(Eucalyptus gomphocephala)* and Peppermints *(Agonis flexuosa)*. The Rockingham Beach Foreshore Master Plan, 2015 (RBFMP), will dictate planting along the Rockingham Beach Foreshore precinct.

Coastal: characterised by a range of *Eucalyptus spp.*, Peppermints *(Agonis flexuosa)*, New Zealand Christmas Trees *(Metrosideros excels)* and Norfolk Island Pines *(Araucaria heterophylla)*, while Olive trees *(Olea europaea)* and Cook Island Pines *(Araucaria columnaris)* are characteristic of the Anchorage residential estate. Future planting should aim to deliver consistency with existing planting themes, with the exception of Olive trees which are no longer supported.

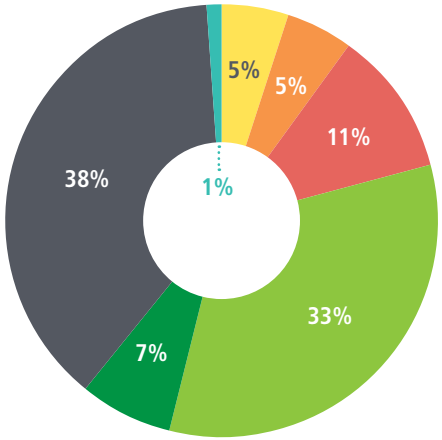
Please refer to Appendix A for the recommended species relative to character zones.

Key considerations

- Overhead power lines to be considered when selecting species on residential streets
- Priority area to establish ecological linkages with native species from Point Peron and Lake Richmond to the City centre
- Suitable vacant verges provide significant opportunity to establish neighbourhood street trees
- Existing character to be maintained and strengthened
- Priority area to reduce urban heat island effect
- Opportunity to enhance canopy cover by planting large trees in areas of POS.

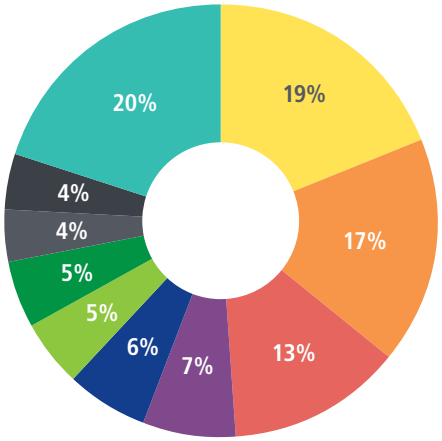
Public trees at a glance

Percentage terrain cover



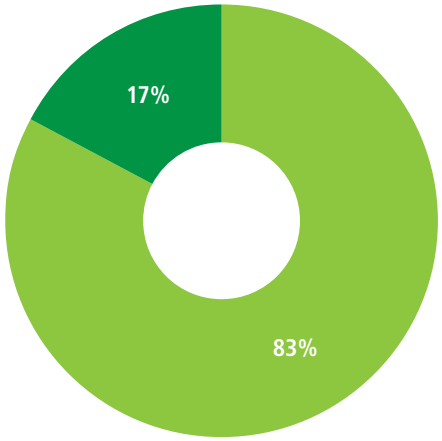
Tree
Hardstand
Bare Soil
Shurb
Builtform
Water
Grass

Species diversity



Norfolk Island Pine
London Plane
Eucalyptus
Paperbark
Peppermint
Tuart
River Sheoak
Coastal Sheoak
Grass Tree
Other

Canopy cover on public vs private land



Private
Public

Existing number public trees

POS
2,163

ROADS
6,193

TOTAL
8,356

Implementation

Street	Character	# trees
Alexandra Street	C	40
Bell Street	C	40
Chalgrove Avenue	U	40
Contest Parade	U	30
Council Avenue	U	90
Crompton Road	I	40
Cygnus Street	C	30
Dixon Road	I	90
Dowling Street	U	30
Esplanade	F	30
Fisher Street	C	50
Gregson Street	C	20
Harrison Street	C	50
Houston Street	C	30
Hurrell Way	I	30
Jecks Street	C	30
Langley Street	C	20
Leeuwin Parade	U	70

Street	Character	# trees
Leghorn Street	U	20
Lewington Street	C	50
Louise Street	U	40
Morgan Street	I	20
Nasmyth Road	I	10
Parkin Street	C	100
Patterson Road	C, U	80
Rae Road	C	80
Ray Street	C	40
Read Street	C, U	130
Seabrooke Avenue	C	60
Simpson Avenue	C	50
Swinstone Street	C	20
Thorpe Street	C	20
Townsend Road	C	40
Victoria Street	C	30
Vista Ave	C	20
Wanliss Street	U	20
Total street trees		**1,590**

Public Open Space	Character	# trees
1. Antila Place Reserve	C	30
2. Careeba Park	C	30
3. Ashford Avenue Reserve	C	10
4. Bay View Reserve	C	60
5. Bismarck Reserve	C	50
6. Bungaree Drain - East Section	C	60
7. Bungaree Drain - West Section	C	60
8. Christison Way Reserve	C	20
9. City Park	U	60
10. Delphinus Reserve	C	50
11. Stan Twight Reserve	C	40
12. Falcon Reserve	C	10
13. Haselmere Circuit	C	40
14. Houston Reserve	C	10
15. Liechardt Loop	C	20
16. Lynx Place Reserve	C	30
17. Bay View Reserve Drain	C	80
18. Rotary Park	C	50
19. Seabrooke/Barron Reserve	C	40
20. Renegade Reserve	C	20
21. Sepia Court Reserve	C	20
22. Townsend Road Reserve	C	50
23. Anniversary Park	C	100
24. Nasmyth Reserve	I	10
Total street trees		**950**

CHARACTER ZONES:

(C) Coastal (F) Foreshore (I) Industrial (R) Rural (RB) Residential Baldivis (U) Urban centre

Public trees to be planted in **Rockingham**

2,540

This means the number of public trees in Rockingham will increase by 30% over 5 years

8.9 Safety Bay

Overview

The established coastal suburb of Safety Bay is situated immediately south of Shoalwater and is bound by Rae Road to the north, Read Street to the east and the Safety Bay Foreshore to the west. The suburb contains many mature street and POS trees and there is ample opportunity to supplement the existing street trees with additional planting.

Character description

Coastal: characertised by numerous Peppermints *(Agonis flexuosa)*, Tuarts *(Eucalyptus gomphocephala)*, Sheoaks *(Casuarina spp.)*, Norfolk Island Pines *(Araucaria heterophylla)*. and Coastal Moorts *(Eucalyptus platypus)*.

Foreshore Park: predominantly characterized by Norfolk Island Pines *(Araucaria heterophylla)* along Arcadia Drive and Safety Bay Road.

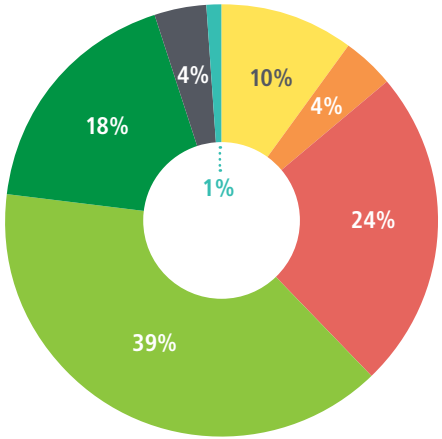
Please refer to Appendix A for the recommended species relative to character zones.

Key considerations

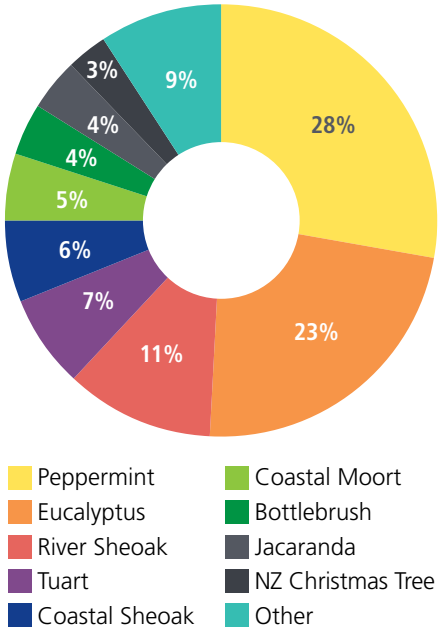
- Priority area to establish ecological linkages to the Foreshore Reserve.
- Suitable vacant verges provide significant opportunity to establish street trees
- Overhead power lines to be considered when selecting species on residential streets
- Opportunity to establish street tree themes through uniform planting that complements existing mature street trees
- Opportunity to enhance green cover with large trees in areas of POS.

Public trees at a glance

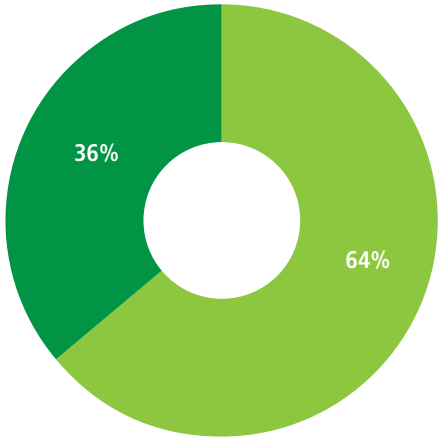
Percentage terrain cover



Species diversity



Canopy cover on public vs private land



Existing number public trees

POS **790**

ROADS **1,577**

TOTAL **2,367**

Implementation

Street	Character	# trees
Acapulco Road	C	20
Charthouse Road	C	60
June Road	C	80
Malibu Road	C	90
Rae Road	C	110
Safety Bay Road - East Section	F, C	90
Waikiki Road	C	50
Total street trees		**500**

Public Open Space	Character	# trees
1. Catalina Reserve	C	20
2. Centenary Park - Safety Bay	C	90
3. Costa Rica Reserve	C	10
4. Gumnut Reserve	C	20
5. Hawker Street Reserve	C	10
6. Janet Park	C	10
7. June Road Reserve	C	60
8. Maderia Reserve	C	10
9. Malibu A	C	10
10. Malibu B	C	10
11. Malibu C	C	20
12. Malibu D	C	10
13. Nettleton Way Reserve	C	110
14. Noel France Reserve	C	10
15. Panama Place Reserve	C	10
16. Wallsend Street Reserve	C	90
Total POS trees		**500**

CHARACTER ZONES:

- C Coastal
- F Foreshore
- I Industrial
- R Rural
- RB Residential Baldivis
- U Urban centre

Public trees to be planted in **Safety Bay**

1,000

This means the number of public trees in Safety Bay will increase by 42% over 5 years


Rae Road
Safety Bay Road
June Road
Waikiki Road
Acapulco Road
Read Street
Malibu Road
Charthouse Road
Safety Bay Road
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Legend
Road (orientation)
Priority street tree planting
POS (numbers refer to table)
Safety Bay

8.10 Secret Harbour

Overview

Secret Harbour is a residential suburb bound by Mandurah Road to the east, Scientific Park to the North and the Foreshore Reserve to the west. The 'Secrets' golf course occupies a large portion of the suburb west of Warnbro Sound Avenue. The suburb also contains an Urban Centre located on Warnbro Sound Avenue. Of the City's beachside suburbs, Secret Harbour has the most defined streetscape character.

Character description

Coastal: includes Tuarts *(Eucalyptus gomphocephala)*, Norfolk Island Pines *(Araucaria heterophylla)*, Cook Island Pines *(Araucaria columnaris)*, Fig Trees (Ficus spp.), Sheoaks *(Casuarina spp.)* and Olive trees *(Olea europaea)*.

Urban: Jacarandas *(Jacaranda mimosifolia)*, Liquid Ambers *(Liquidambar styraciflua)*, Date Palms *(Phoenix dactylifera)* and Chinese Elms *(Ulmus parvifolia)* are recommended to enhance the existing character.

Foreshore Park: Cook Island Pines *(Araucaria columnaris)*, Norfolk Island Pines *(Araucaria heterophylla)*, Rottnest Island Tea Trees *(Melaleuca lanceolata)*, New Zealand Christmas Trees *(Metrosideros excels)* and Olive trees *(Olea europaea)*. Future planting should aim to deliver consistency with existing planting themes, with the exception of Olive trees which are no longer supported.

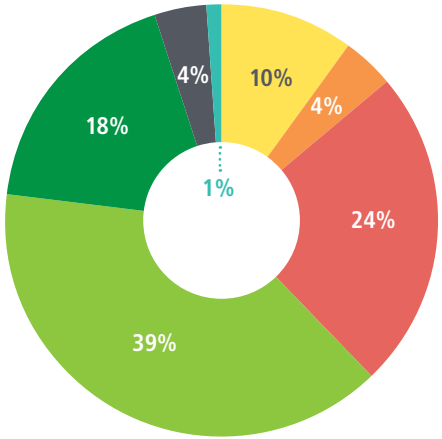
Please refer to Appendix A for the recommended species relative to character zones.

Key considerations

- Priority area to establish ecological linkages to Port Kennedy Scientific Park and the Foreshore Reserve.
- Suitable vacant verges provide significant opportunity to establish street trees
- Opportunity to establish street tree themes through uniform planting that complements existing mature street trees
- Opportunity to enhance green cover with large trees in areas of POS
- Main Roads approval required to plant in MRWA reservations
- Opportunity to strengthen the existing urban theme and blend it with the surrounding coastal zone.

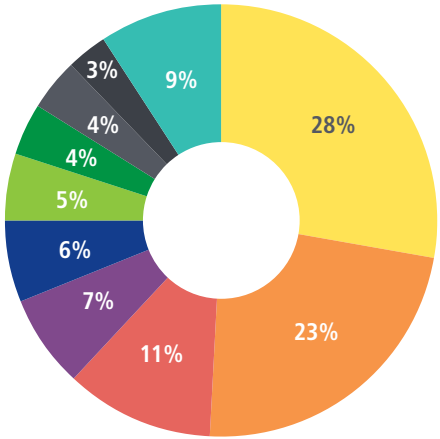
Public trees at a glance

Percentage terrain cover



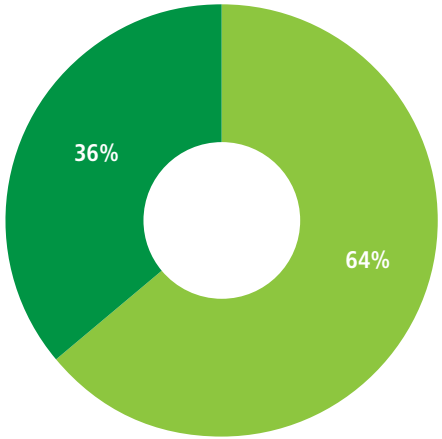
Tree
Hardstand
Bare Soil
Shurb
Builtform
Water
Grass

Species diversity



Tuart
Chinese Elm
Norfolk Island Pine
Bottlebrush
Peppermint
Cottonwood
Olive
Canary Island Palm
Eucalyptus
Other

Canopy cover on public vs private land



Private
Public

Existing number public trees

POS
1,011

ROADS
2,414

TOTAL
3,425

Implementation

Street	Character	# trees
Secret Harbour Boulevard (La Spezia Dr to Villa Do Porto Cr)	C	100
Surf Drive	C	50
Warnbro Sound Avenue (south of Anstey Rd)	C	170
Bancoura Parkway	C	50
Total street trees		**370**

Public Open Space	Character	# trees
1. Anvils Circle	C	10
2. Bonaparte	C	10
3. Bramstone Reserve	C	10
4. Coffs Bend	C	10
5. Greeson Reserve	C	10
6. Lennox Reserve	C	160
7. Malabar Reserve	C	10
8. Surf Reserve	C	90
9. Swanbourne Reserve	C	10
10. Three Bears Loop Reserve	C	30
11. Torquay Reserve	C	10
12. Yampi Vale	C	10
Total POS trees		**370**

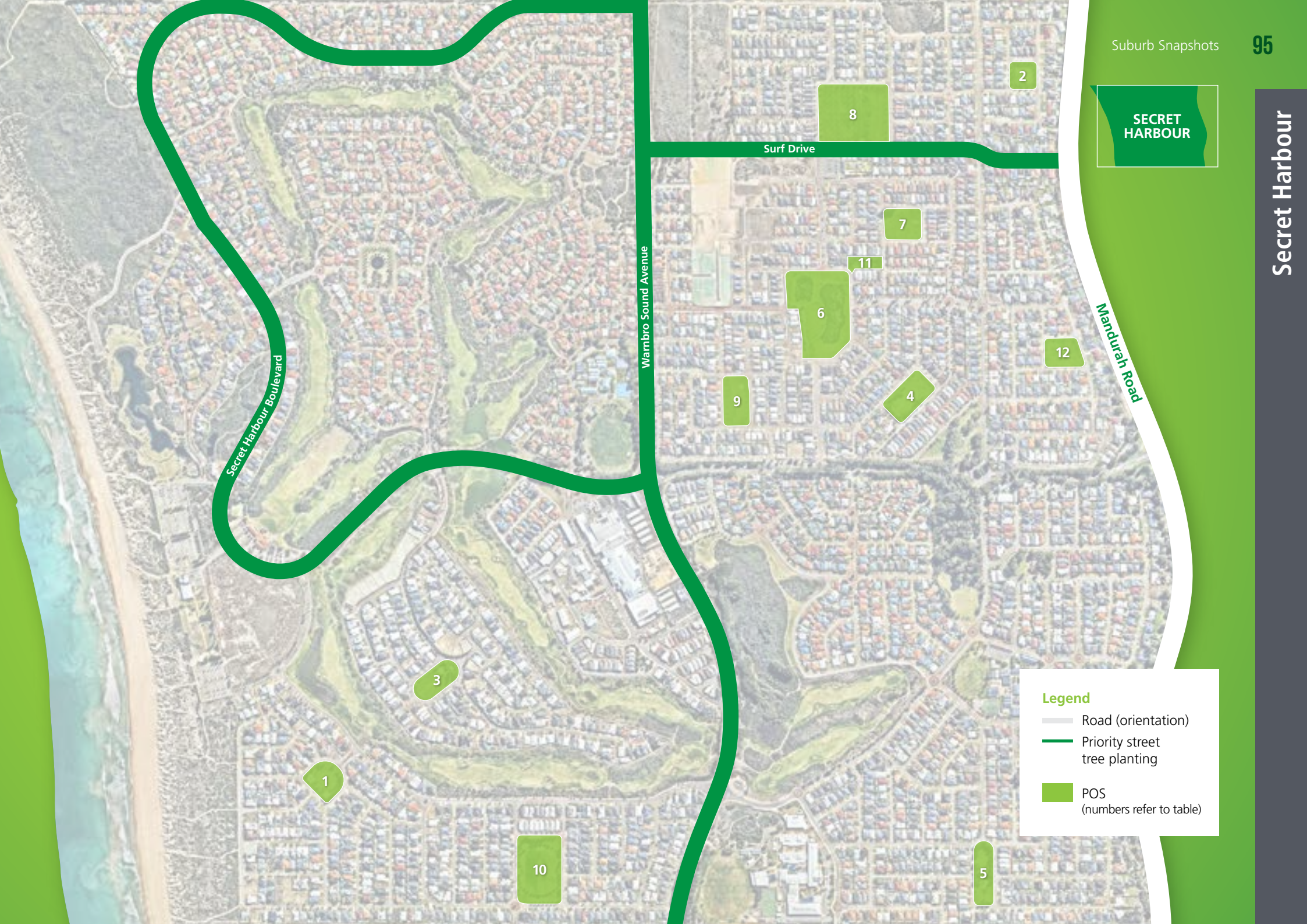
CHARACTER ZONES:

- (C) Coastal
- (F) Foreshore
- (I) Industrial
- (R) Rural
- (RB) Residential Baldivis
- (U) Urban centre

Public trees to be planted in **Secret Harbour**

740

This means the number of public trees in Secret Harbour will increase by 22% over 5 years


SECRET HARBOUR
Surf Drive
Warnbro Sound Avenue
Secret Harbour Boulevard
Mandurah Road
1
2
3
4
5
6
7
8
9
10
11
12
Legend
Road (orientation)
Priority street tree planting
POS
(numbers refer to table)

8.11 Shoalwater

Overview

Shoalwater is a coastal suburb, bound by Rae Road to the east and the foreshore reserve to the west. Streetscapes are characterised by single storey houses, wide grassy verges and a general lack of front walls and fences. The suburb contains many mature street and POS trees and there is ample opportunity to supplement the existing street trees with additional planting.

Character description

Coastal: dominated by Peppermints *(Agonis flexuosa)*, but also includes Tuarts *(Eucalyptus gomphocephala)*, Norfolk Island Pines *(Araucaria heterophylla)*, Cook Island Pines *(Araucaria columnaris)* and Bottlebrushes *(Callistemon spp)*.

Foreshore Park: recommended trees have been selected to strengthen existing character include Peppermints *(Agonis flexuosa)*, Tuarts *(Eucalyptus gomphocephala)*, Coastal Moort *(Eucalyptus platypus)*, Norfolk Island Pines *(Araucaria heterophylla)* and Rottnest Island Tea Trees *(Melaleuca lanceolata)*.

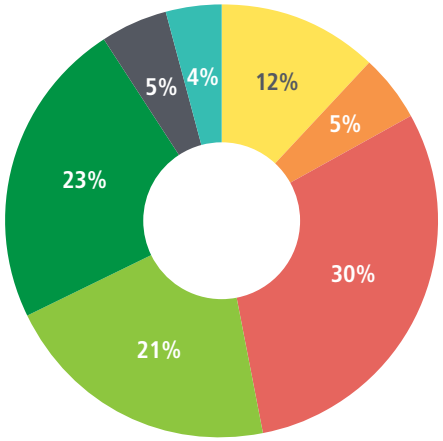
Please refer to Appendix A for the recommended species relative to character zones.

Key considerations

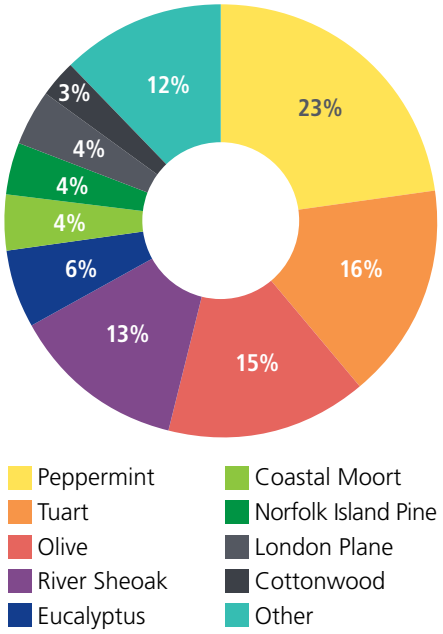
- Priority area to establish ecological linkages from to Lake Richmond and the Foreshore Reserve
- Suitable vacant verges provide significant opportunity to establish street trees
- Overhead power lines to be considered when selecting species on residential streets
- Opportunity to enhance street tree themes through uniform planting that complements existing mature street trees
- Opportunity to enhance green cover with large trees in areas of POS.

Public trees at a glance

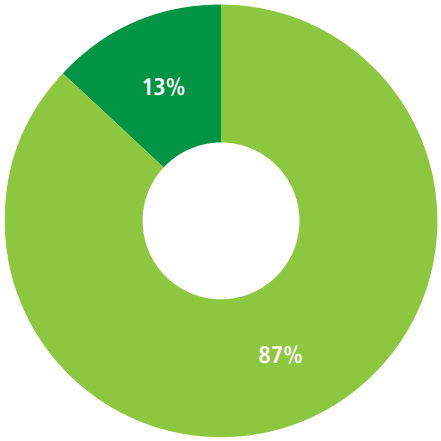
Percentage terrain cover



Species diversity



Canopy cover on public vs private land



Existing number public trees

POS	ROADS	TOTAL
359	1,288	1,647

Implementation

Street	Character	# trees
Penguin Road	C	30
Safety Bay Road	C	50
Total street trees		**80**

Public Open Space	Character	# trees
1. Apex Reserve	C	50
2. Waterfront Parkway	C	30
Total POS trees		**80**

CHARACTER ZONES:

- (C) Coastal
- (F) Foreshore
- (I) Industrial
- (R) Rural
- (RB) Residential Baldivis
- (U) Urban centre

Public trees to be planted in **Shoalwater**

160

This means the number of public trees in Shoalwater will increase by 10% over 5 years


Arcadia Drive
Safety Bay Road
Penguin Road
Rae Road
1
2
SHOALWATER
Legend
Road (orientation)
Priority street tree planting
POS
(numbers refer to table)

8.12 Singleton

Overview

Singleton is an established coastal suburb on the City's southernmost municipal boundary and is bound by Mandurah Road to the east. Singleton contains areas of remnant coastal shrub land, old holiday homes on larger blocks, as well as an area of new residential development.

Character description

Coastal: dominated by Peppermints *(Agonis flexuosa)*, Tuarts *(Eucalyptus gomphocephala)* and Norfolk Island Pines *(Araucaria heterophylla)*.

Foreshore Park: Sheoaks *(Allocasuarina fraseriana)*, *Casuarina spp.*, Coastal Moorts *(Eucalyptus platypus)*, Tuarts *(Eucalyptus gomphocephala)*, Norfolk Island Pines *(Araucaria heterophylla)* and Rottnest Island Tea Trees *(Melaleuca lanceolata)*.

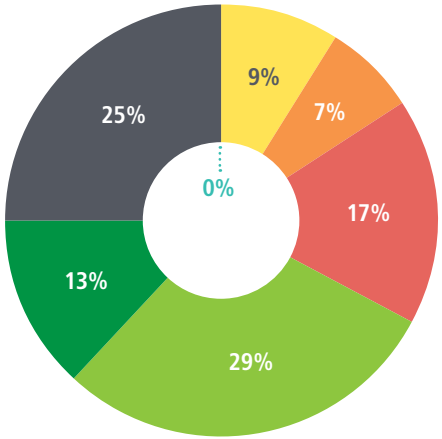
Please refer to Appendix A for the recommended species relative to character zones.

Key considerations

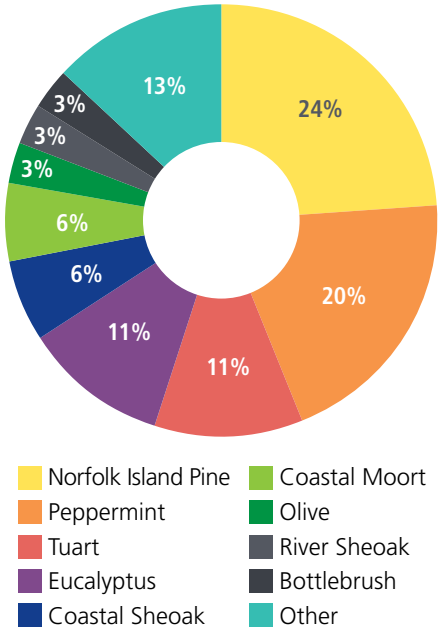
- Priority area to establish ecological linkages to nearby conservation areas i.e. Paganoni Swamp
- Suitable vacant verges provide significant opportunity to establish street trees
- Overhead power lines to be considered when selecting species on residential streets
- Opportunity to enhance street tree themes through uniform planting that complements existing mature street trees
- Opportunity to enhance green cover with trees in areas of POS
- Plantings will need to be consistent with SPP 3.7 and the City's Bushfire Risk Management Plan.

Public trees at a glance

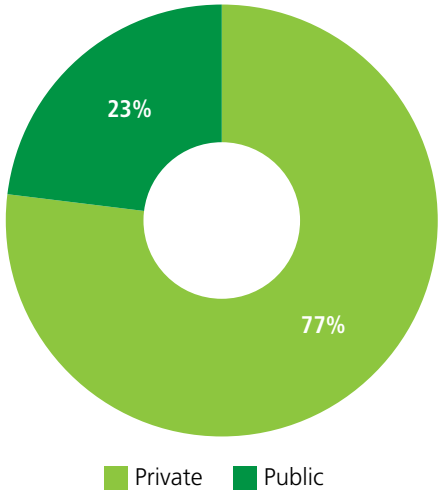
Percentage terrain cover



Species diversity



Canopy cover on public vs private land



Existing number public trees

POS	ROADS	TOTAL
471	701	1,172

Implementation

Street	Character	# trees
Bight Reefs Road	C	20
Cavender Street	C	20
Dorado Street	C	30
Federation Drive	C	10
Naval Avenue	C	10
Singleton Beach Road	C	10
Total street trees		**100**

Public Open Space	Character	# trees
1. Brownrigg Reserve	C	20
2. Harmony Park	C	70
3. Laurie Stanford Reserve	C	10
Total POS trees		**100**

CHARACTER ZONES:

- (C) Coastal
- (F) Foreshore
- (I) Industrial
- (R) Rural
- (RB) Residential Baldivis
- (U) Urban centre

Public trees to be planted in **Singleton**

200

This means the number of public trees in Singleton will increase by 17% over 5 years


Dorado Street
2
Naval Avenue
1
Federation Drive
Mandurah Road
Singleton Beach Road
3
Cavender Street
Bight Reefs Road
SINGLETON
Legend
Road (orientation)
Priority street tree planting
POS
(numbers refer to table)

8.13 Waikiki

Overview

Waikiki is a residential beachside suburb bound by Mandurah Road to the east and Safety Bay Road to the south. The suburb contains many establish trees within streetscapes and POS and also encompasses a small section of foreshore reserve and a large expanse of the Lake Walyungup.

Character description

Coastal: Peppermints *(Agonis flexuosa)*, Bottlebrushes *(Callistemon spp.)*, Coastal Moorts *(Eucalyptus utilis)* and New Zealand Christmas Trees *(Metrosideros excels)*, with occasional non-native species such as Palm Trees *(Phoenix canariensis)*, Jacarandas *(Jacaranda mimosifolia)* and Liquid Amber *(Liquidambar styraciflua)*.

Foreshore Park: the small area of Foreshore Park in Waikiki on the corner of Francis Street and Warnbro Beach Road does not currently contain any trees. Norfolk Island Pines *(Araucaria heterophylla)* and Cook Island Pines *(Araucaria columnaris)* should be prioritised in this location to tie in with the Foreshore Park to the north.

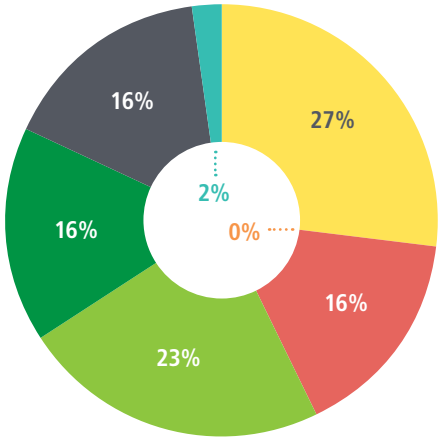
Please refer to Appendix A for the recommended species relative to character zones.

Key considerations

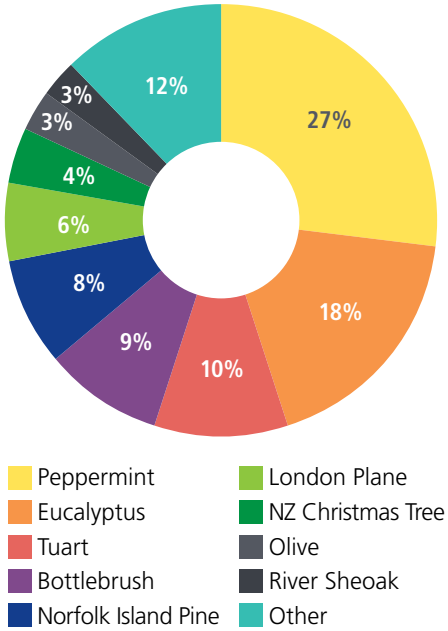
- Priority area to establish ecological linkages to Lake Walyungup
- Suitable vacant verges provide significant opportunity to establish street trees
- Overhead power lines to be considered when selecting species on residential streets
- Opportunity to enhance street tree themes by complementing existing mature street trees
- Opportunity to enhance green cover with large trees in areas of POS
- Main Roads approval required to plant in MRWA road reservations
- Opportunity to establish urban greening along some of the City's major roads.

Public trees at a glance

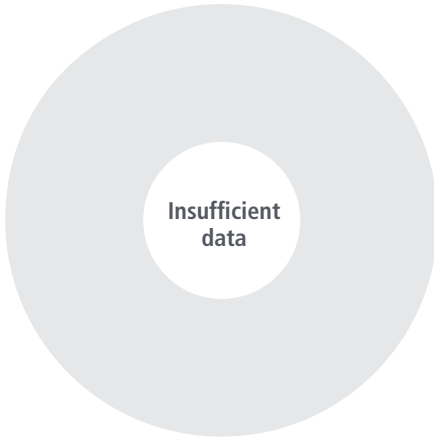
Percentage terrain cover



Species diversity



Canopy cover on public vs private land



Existing number public trees

POS	ROADS	TOTAL
966	2,171	3,137

Implementation

Street	Character	# trees
Charthouse Road	C	50
Chalmers Avenue	C	40
Fendam Street	C	30
Gascoyne Way	C	70
Gnangara Drive	C	100
Goongarrie Drive	C	50
Hokin Street	C	20
Investigator Drive	C	30
Rand Avenue	C	60
Safety Bay Road	C	90
Read Street	C	50
Willmott Drive	C	70
Ennis Avenue	C	110
Total street trees		**770**

Public Open Space	Character	# trees
1. Blair Court Reserve	C	60
2. Bonaire Reserve	C	60
3. Buckle Court Reserve	C	10
4. Centenary Park - Waikiki	C	30
5. Charnley	C	130
6. Fairview Reserve	C	50
7. Fantasy Park	C	170
8. Gidgi Way Reserve	C	10
9. Java Park	C	10
10. Lakemba Reserve	C	70
11. Mornington Reserve	C	10
12. Santa Monica	C	20
13. Seahaven Reserve	C	140
Total POS trees		**770**

Public trees to be planted in **Waikiki**

1,540

This means the number of public trees in Waikiki will increase by 49% over 5 years

CHARACTER ZONES:

(C) Coastal (F) Foreshore (I) Industrial (R) Rural (RB) Residential Baldivis (U) Urban centre


Legend
Road (orientation)
Priority street tree planting
POS
(numbers refer to table)
Goongarrie Drive
Gascoyne Way
Willmott Drive
Charthouse Road
Investigator Dve
Gnangara Drive
Read Street
Ennis Avenue
Rand Avenue
Safety Bay Road
Hokin Street
1
2
3
4
5
6
7
8
9
10
11
12
13
WAIKIKI

8.14 Warnbro

Overview

Warnbro is bound by Mandurah Road to the east and Safety Bay Road to the north. The suburb is predominantly Residential, with a strip of Special Residential nestled amongst the Warnbro dunes. The suburb also contains as urban centre bound by Warnbro Sound Avenue, Haliburton Avenue, Palm Springs Boulevard and Royal Palm Drive. The suburb also encompasses a section of Foreshore Reserve and a significant portion of Lake Walyungup, however, there is not a dedicated foreshore road or managed foreshore parkland within Warnbro and therefore a Foreshore Park character zone does not apply.

Character description

Coastal: Peppermints *(Agonis flexuosa)*, New Zealand Christmas Trees *(Metrosideros excelsia)*, Swamp Sheoaks *(Casuarina obesa)*, Norfolk Island Pines *(Araucaria heterophylla)* and Cook Island Pines (*Araucaria columnaris* and Coastal Moorts *(Eucalyptus utilis)*.

Urban: *(Allocasuarina fraseriana)*, Chinese Elms *(Ulmus parvifolia)*, Chinese Tallow *(Sapium sebiferum)*, London Planes *(Platanus x acerifolia)* and Palm Trees *(Phoenix canariensis)*.

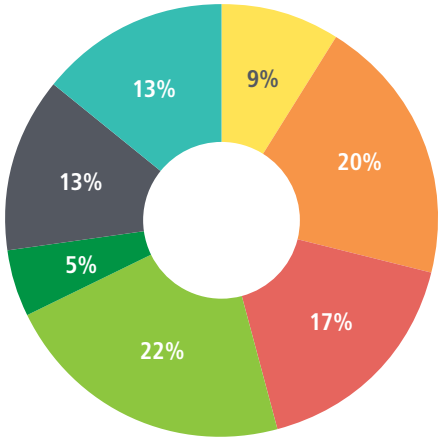
Please refer to Appendix A for the recommended species relative to character zones.

Key considerations

- Priority area to establish ecological linkages with native species to nearby conservation areas i.e. Lake Walyungup
- Suitable vacant verges provide significant opportunity to establish street trees
- Overhead power lines to be considered when selecting species on residential streets
- Opportunity to enhance street tree themes through uniform planting that complements existing mature street trees
- Opportunity to enhance green cover with large trees in areas of POS
- Main Roads approval required to plant in MRWA road reservations
- Opportunity to establish urban greening along some of the City's major roads
- Plantings will need to be consistent with SPP 3.7 and the City's Bushfire Risk Management Plan.

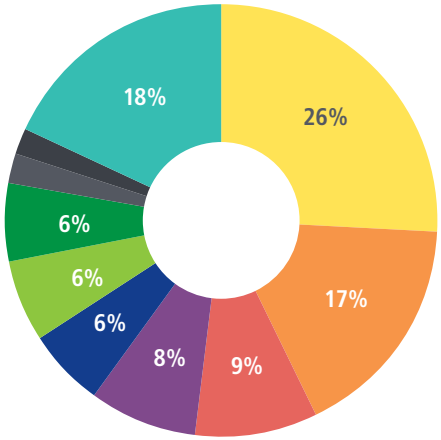
Public trees at a glance

Percentage terrain cover



Tree 9%
Bare Soil 20%
Builtform 17%
Grass 22%
Hardstand 5%
Shurb 13%
Water 13%

Species diversity



Peppermint 26%
Eucalyptus 17%
Coast Sheoak 9%
Bottlebrush 8%
River Sheoak 6%
Norfolk Island Pine 6%
Tuart 6%
Rottnest Island Pine 6%
Grass Tree 18%
Other

Canopy cover on public vs private land

Existing number public trees

POS 1,249

ROADS 2,595

TOTAL 3,844

Implementation

Street	Character	# trees
Coronata Drive	C	90
Currie Street	C	140
Fendam Street	C	90
Grand Ocean Boulevard	C	10
Hokin Street	C	10
Holcombe Road	C	40
Royal Palm Drive	C	100
Safety Bay Road (Tuarts between the Lakes)	C	50
The Avenue	C	100
Torbay Mews	C	20
Warnbro Sound Avenue	C	230
Total street trees		**880**

Public Open Space	Character	# trees
1. Axminster Reserve	C	30
2. Balaka Reserve	C	40
3. Cannes Place Reserve	C	30
4. Dress Circle	C	40
5. Eva Lynch Park	C	50
6. Indigo Reserve	C	40
7. Koorana Park	C	190
8. Monterey Crescent	C	40
9. The Avenue Reserve	C	70
10. Torbay Mews Reserve	C	160
11. Torcross Reserve	C	70
12. Turner Street Reserve	C	10
13. Warnbro Parklands	C	70
14. Welch Way Reserve	C	40
Total POS trees		**880**

Public trees to be planted in **Warnbro**

1,760

This means the number of public trees in Warnbro will increase by 45% over 5 years

CHARACTER ZONES:

(C) Coastal (F) Foreshore (I) Industrial (R) Rural (RB) Residential Baldivis (U) Urban centre


Safety Bay Road
Currie Street
Fendam Street
Warnbro Sound Avenue
The Avenue
Torbay Mews
Holcombe Road
Coronata Drive
Ennis Avenue
Mandurah Road
Grand Ocean Blvd
Royal Palm Drive
1
2
3
4
5
6
7
8
9
10
11
12
13
14
WARNBRO
Legend
Road (orientation)
Priority street tree planting
POS
(numbers refer to table)

9 Implementation

This implementation table is not designed to be prescriptive and a detailed analysis of all planting sites must be undertaken in accordance with the Greening Principles prior to planting.

Planting numbers may be reallocated between streets and POS, so long as the total planting number per suburb remains unchanged.

These trees are to be planted progressively over five years. The years in which these trees should be planted has not been specified for the purpose of allowing the City's Parks Services team to allocate and pool resources across planting sites as required.

Please refer to Appendix A for the recommended species relative to character zones.

BALDIVIS

Street	Character	# trees
Abington Avenue	RB	40
Amazon Drive	RB	20
Area south of Tamworth Blvd, north of Mennock App	RB	50
Baldivis Road, Makybe Drive to Highbury Blvd (along median)	RB	100
Baldivis Road, Pemberton Blvd to Amazon Drive (western verge)	RB	30
Blaxland Terrace	RB	30
Bramall Tce, Nairn Dirve to Makybe Drive	RB	40
Brennan Promenade	RB	90
Bristlebird App (Kagu Way, Wanderer Pwy), from Nairn Drive to Eighty Rd	RB	40
Clyde Avenue, Nairn Drive to Baldivis Road	RB	50
Fairchild Drive and Elderberry Drive	RB	30
Fifty Road, McDonald Road to Nairn Drive (median and verge)	RB	30
Goulburn Road	U	10
Greenock Road	RB	30
Heritage Park Drive, Coolibah Way to Furioso Grn	RB	50
Kendall Blvd	RB	50
Kerosene Lane, Jennings Way to Annabelle Way (median and verge)	RB	30
Kulija Road, Kwinana Freeway to Millar Road	R	200
Makybe Drive	RB	50
Mennock Approach	U	10
Nairn Drive, Blaxland Terrace to Ridge Blvd	RB	350

BALDIVIS

Street	Character	# trees
Nairn Drive, Fifty Road to Fairchild Road	RB	200
Nairn Drive/Eighty Road, Burch Way to Fifty Road	RB	500
Norseman Approach	U	10
Norwood Avenue	RB	30
Patron Road and Baystone Road	RB	40
Pemberton Boulevard	RB	50
Pike Road	R	50
Safety Bay Rd, Baldivis Rd to Nairn Drive (southern verge and median)	U	70
Safety Bay Rd, Kwinana Freeway to Baldivis Road	RB	80
Tamworth Blvd, Baldivis Rd to Nairn Drive	RB	20
Total street trees		**2,380**

Public Open Space	Character	# trees
1. Elderberry Reserve	RB	80
2. Whitehart Easement	RB	70
3. Spinifex Reserve	RB	60
4. Norseman Reserve	RB	50
5. Campolina Reserve	RB	40
6. Hathaway Reserve	RB	40
7. Maiden Reserve	RB	40
8. Selina Reserve	RB	40
9. The Hawthorns Easement	RB	40
10. Burlington Reserve	RB	30
11. Camley Fairway Reserve	RB	30

CHARACTER ZONES: (C) Coastal (F) Foreshore (I) Industrial (R) Rural (RB) Residential Baldivis

BALDIVIS

Public Open Space	Character	# trees
12. Wise Meander Reserve	RB	30
13. Ballaballa Reserve	RB	20
14. Liesham Crescent	RB	20
15. Notman Reserve	RB	20
16. St James Dr Reserve	RB	10
17. Bonnington Reserve	RB	10
18. Bravo Reserve	RB	10
19. Chelsea Way Reserve	RB	10
20. Elm Reserve	RB	10
21. Rushmore	RB	10
22. Timbarra Reserve	RB	10
23. Zedora Reserve	RB	20
24. Ingarfield Green	RB	10
25. Delta Reserve	RB	10
26. Diamondbird Reserve	RB	10
27. Jerboa Green	RB	10
28. Kingaroy Reserve	RB	10
29. Lamorak	RB	10
30. Len Pike Park	RB	10
31. Stillwater Reserve	RB	10
32. Tranby Reserve	RB	10
33. Appaloosa Reserve	RB	10
34. Ardea Way Reserve	RB	10
35. Atherstone Reserve	RB	10
36. Liddard Gardens	RB	10

BALDIVIS

Public Open Space	Character	# trees
37. Birdsville Reserve	RB	10
38. Blaxland Reserve	RB	10
39. Breton reserve	RB	10
40. Cervantes Reserve	RB	10
41. Clyde/Vernon Gough Reserve	RB	10
42. Colonial Reserve	RB	10
43. Coolimba Turn Drainage	RB	10
44. Elland Way	RB	10
45. Furnivall reserve	RB	10
46. Gillespie Reserve	RB	10
47. Grail Reserve	RB	10
48. Highbury Reserve	RB	10
49. Hocking Reserve	RB	10
50. Kenndel Reserve	RB	10
51. Mentor Street Reserve	RB	10
52. Monument Reserve	RB	10
53. Overton Lane Reserve	RB	10
54. Palomino Reserve	RB	10
55. Pemberton Reserve North	RB	10
56. Pemberton Reserve South	RB	10
57. Peverett Park	RB	10
58. Pinnacle Reserve	RB	10
59. Province Reserve	RB	10
60. Smirk Reserve	RB	10
61. Steer Reserve	RB	10

BALDIVIS

Public Open Space	Character	# trees
62. Tintagel	RB	10
63. Tribute Reserve	RB	10
64. Trusty Park	RB	10
65. Villa Park Reserve	RB	10
66. Willow Reserve	RB	10
67. Ballaballa Reserve South	RB	10
Total POS trees		**1,140**
BALDIVIS TOTAL		**3,520**

COOLOONGUP

Street	Character	# trees
Breaden Drive (both verges)	C	40
Cambridge Crescent (prioritise northern verge)	C	60
Elanora Drive	C	20
Gascoyne Way	C	40
Grange Drive (prioritise residential verges)	C	70
Willmott Drive	C	60
Total street trees		**290**

Public Open Space	Character	# trees
1. Alf Powell Reserve	C	100
2. Deanna A Reserve	C	10
3. Don Cuthbertson Reserve	C	60
4. Inverness Reserve	C	20
5. Paul Garnett Oval	C	40
6. Solquest Park	C	20

COOLOONGUP

Public Open Space	Character	# trees
7. St Michaels Reserve	C	30
8. Breaden Drive Reserve	C	10
Total POS trees		**290**
COOLOONGUP TOTAL		**580**

EAST ROCKINGHAM

Street	Character	# trees
Day Road (prioritise middle to southern end)	I	40
Dixon Road (north verge)	I	110
Governor Road	C	20
Rockingham Beach Road (both verges)	F	150
Total street trees		**320**

Public Open Space	Character	# trees
1. Governor Road Foreshore Reserve	F	80
Total POS trees		**80**
EAST ROCKINGHAM TOTAL		**400**

GOLDEN BAY

Street	Character	# trees
Crystaluna Drive	C	50
Mandurah Road	C	140
Warnbro Sound Avenue (median/eastern verge)	C	120
Total street trees		**310**

Public Open Space	Character	# trees
1. Callawa Reserve	C	40

CHARACTER ZONES: (C) Coastal (F) Foreshore (I) Industrial (R) Rural (RB) Residential Baldivis

GOLDEN BAY

Public Open Space	Character	# trees
2. George Foster Reserve	C	10
3. Glenburgh Reserve	C	10
4. Mallina Reserve	C	150
5. Woolibar Reserve	C	50
6. Yamarna Road Reserve	C	50
Total POS trees		**310**
GOLDEN BAY TOTAL		**620**

HILLMAN

Street	Character	# trees
Carvie Street	C	50
Dixon Road	I	180
Unnaro Street	C	30
Total street trees		**260**

Public Open Space	Character	# trees
1. Ennis Avenue Reserve	C	150
2. Gabyon Park	C	20
3. Long Park	C	80
4. Tarwarri Park	C	10
Total POS trees		**260**
HILLMAN TOTAL		**520**

PORT KENNEDY

Street	Character	# trees
Bayside Boulevard	C	40
Blackburn Drive	I	30
Chelmsford Avenue	C	40
Clipper Drive	C	10
Discovery Crescent	C	40
Endeavour Drive	C	50
Fendam Street	C	10
Grand Ocean Boulevard (north)	C	10
Grand Ocean Boulevard (south)	C	20
Port Kennedy Drive	I, C, F	290
Warnbro Sound Avenue	I, C	230
Total street trees		**770**

Public Open Space	Character	# trees
1. Amadeus Crescent	C	20
2. Athens Entrance	C	10
3. Bayeux Reserve	C	10
4. Carpentaria Drive	C	10
5. Ceri Close Reserve	C	20
6. Chelmsford Reserve	C	50
7. Fountain Park	C	10
8. Majestic Close Reserve	C	40
9. Mayflower Reserve	C	20
10. Merida Loop	C	10
11. Orleans Drive Reserve	C	10

PORT KENNEDY

Public Open Space	Character	# trees
12. Pimento Circle	C	30
13. Round Hill Reserve	C	30
14. Salamanca Reserve	C	20
15. San Sebastian Reserve	C	10
16. Spiral Park Reserve	C	10
17. St Clair Reserve	C	60
18. St Raphael Reserve	C	280
19. Strasbourg Ramble	C	10
20. Veterans Memorial Park	C	100
21. Sunlight Park	C	10
Total POS trees		**770**
PORT KENNEDY TOTAL		**1,540**

ROCKINGHAM

Street	Character	# trees
Alexandra Street	C	40
Bell Street	C	40
Chalgrove Avenue	U	40
Contest Parade	U	30
Council Avenue	U	90
Crompton Road	I	40
Cygnus Street	C	30
Dixon Road	I	90
Dowling Street	U	30
Esplanade	F	30

ROCKINGHAM

Street	Character	# trees
Fisher Street	C	50
Gregson Street	C	20
Harrison Street	C	50
Houston Street	C	30
Hurrell Way	I	30
Jecks Street	C	30
Langley Street	C	20
Leeuwin Parade	U	70
Leghorn Street	U	20
Lewington Street	C	50
Louise Street	U	40
Morgan Street	I	20
Nasmyth Road	I	10
Parkin Street	C	100
Patterson Road	C, U	80
Rae Road	C	80
Ray Street	C	40
Read Street	C, U	130
Seabrooke Avenue	C	60
Simpson Avenue	C	50
Swinstone Street	C	20
Thorpe Street	C	20
Townsend Road	C	40
Victoria Street	C	30
Vista Ave	C	20

CHARACTER ZONES: (C) Coastal (F) Foreshore (I) Industrial (R) Rural (RB) Residential Baldivis

ROCKINGHAM

Street	Character	# trees
Wanliss Street	U	20
Total street trees		**1,590**

Public Open Space	Character	# trees
1. Antila Place Reserve	C	30
2. Careeba Park	C	30
3. Ashford Avenue Reserve	C	10
4. Bay View Reserve	C	60
5. Bismarck Reserve	C	50
6. Bungaree Drain - East Section	C	60
7. Bungaree Drain - West Section	C	60
8. Christison Way Reserve	C	20
9. City Park	U	60
10. Delphinus Reserve	C	50
11. Stan Twight Reserve	C	40
12. Falcon Reserve	C	10
13. Haselmere Circuit	C	40
14. Houston Reserve	C	10
15. Liechardt Loop	C	20
16. Lynx Place Reserve	C	30
17. Bay View Reserve Drain	C	80
18. Rotary Park	C	50
19. Seabrooke/Barron Reserve	C	40
20. Renegade Reserve	C	20
21. Sepia Court Reserve	C	20

ROCKINGHAM

Public Open Space	Character	# trees
22. Townsend Road Reserve	C	50
23. Anniversary Park	C	100
24. Nasmyth Reserve	I	10
Total POS trees		**950**
ROCKINGHAM TOTAL		**2,620**

SAFETY BAY

Street	Character	# trees
Acapulco Road	C	20
Charthouse Road	C	60
June Road	C	80
Malibu Road	C	90
Rae Road	C	110
Safety Bay Road - East Section	F, C	90
Waikiki Road	C	50
Total street trees		**500**

Public Open Space	Character	# trees
1. Catalina Reserve	C	20
2. Centenary Park - Safety Bay	C	90
3. Costa Rica Reserve	C	10
4. Gumnut Reserve	C	20
5. Hawker Street Reserve	C	10
6. Janet Park	C	10
7. June Road Reserve	C	60
8. Maderia Reserve	C	10

SAFETY BAY

Public Open Space	Character	# trees
9. Malibu A	C	10
10. Malibu B	C	10
11. Malibu C	C	20
12. Malibu D	C	10
13. Nettleton Way Reserve	C	110
14. Noel France Reserve	C	10
15. Panama Place Reserve	C	10
16. Wallsend Street Reserve	C	90
Total POS trees		**500**
SAFETY BAY TOTAL		**1,000**

SECRET HARBOUR

Street	Character	# trees
Secret Harbour Boulevard (La Spezia Dr to Villa Do Porto Cr)	C	100
Surf Drive	C	50
Warnbro Sound Avenue (south of Anstey Rd)	C	170
Bancoura Parkway	C	50
Total street trees		**370**

Public Open Space	Character	# trees
1. Anvils Circle	C	10
2. Bonaparte	C	10
3. Bramstone Reserve	C	10
4. Coffs Bend	C	10
5. Greeson Reserve	C	10
6. Lennox Reserve	C	160
7. Malabar Reserve	C	10
8. Surf Reserve	C	90
9. Swanbourne Reserve	C	10
10. Three Bears Loop Reserve	C	30
11. Torquay Reserve	C	10
12. Yampi Vale	C	10
Total POS trees		**370**
SECRET HARBOUR TOTAL		**740**

SHOALWATER

Street	Character	# trees
Penguin Road	C	30
Safety Bay Road	C	50
Total street trees		**80**

Public Open Space	Character	# trees
1. Apex Reserve	C	50
2. Waterfront Parkway	C	30
Total POS trees		**80**
SHOALWATER TOTAL		**160**

CHARACTER ZONES: (C) Coastal (F) Foreshore (I) Industrial (R) Rural (RB) Residential Baldivis

SINGLETON

Street	Character	# trees
Bight Reefs Road	C	20
Cavender Street	C	20
Dorado Street	C	30
Federation Drive	C	10
Naval Avenue	C	10
Singleton Beach Road	C	10
Total street trees		**100**

Public Open Space	Character	# trees
1. Brownrigg Reserve	C	20
2. Harmony Park	C	70
3. Laurie Stanford Reserve	C	10
Total POS trees		**100**
SINGLETON TOTAL		**200**

WAIKIKI

Street	Character	# trees
Charthouse Road	C	50
Chalmers Avenue	C	40
Fendam Street	C	30
Gascoyne Way	C	70
Gnangara Drive	C	100
Goongarrie Drive	C	50
Hokin Street	C	20
Investigator Drive	C	30
Rand Avenue	C	60
Safety Bay Road	C	90
Read Street	C	50
Willmott Drive	C	70
Ennis Avenue	C	110
Total street trees		**770**

Public Open Space	Character	# trees
1. Blair Court Reserve	C	60
2. Bonaire Reserve	C	60
3. Buckle Court Reserve	C	10
4. Centenary Park - Waikiki	C	30
5. Charnley	C	130
6. Fairview Reserve	C	50
7. Fantasy Park	C	170
8. Gidgi Way Reserve	C	10
9. Java Park	C	10
10. Lakemba Reserve	C	70
11. Mornington Reserve	C	10
12. Santa Monica	C	20
13. Seahaven Reserve	C	140
Total POS trees		**770**
WAIKIKI TOTAL		**1,540**

WARNBRO

Street	Character	# trees
Coronata Drive	C	90
Currie Street	C	140
Fendam Street	C	90
Grand Ocean Boulevard	C	10
Hokin Street	C	10
Holcombe Road	C	40
Royal Palm Drive	C	100
Safety Bay Road (Tuarts between the Lakes)	C	50
The Avenue	C	100
Torbay Mews	C	20
Warnbro Sound Avenue	C	230
Total street trees		**880**

Public Open Space	Character	# trees
1. Axminster Reserve	C	30
2. Balaka Reserve	C	40
3. Cannes Place Reserve	C	30
4. Dress Circle	C	40
5. Eva Lynch Park	C	50
6. Indigo Reserve	C	40
7. Koorana Park	C	190
8. Monterey Crescent	C	40
9. The Avenue Reserve	C	70
10. Torbay Mews Reserve	C	160
11. Torcross Reserve	C	70

WARNBRO

Public Open Space	Character	# trees
12. Turner Street Reserve	C	10
13. Warnbro Parklands	C	70
14. Welch Way Reserve	C	40
Total POS trees		**880**
WARNBRO TOTAL		**1,760**

TOTAL

GRAND TOTAL over 5 years	**15,000**

CHARACTER ZONES: (C) Coastal (F) Foreshore (I) Industrial (R) Rural (RB) Residential Baldivis

9.1 Implementation costs

The costs of planting tree vary significantly depending on the size of the tree, the location and maintenance requirements. For example, if a tree is requested as part of the Winter Street Tree Planting Program, there is an expectation that the property owner will maintain the tree. Where trees have been planted on key roads or in high profile parks, the City may maintain and water trees for up to two summers.

The costs of supplying trees increase relative to size. For fast growing *Eucalyptus spp.*, planting a 35/45L tree may more cost effective. For slow growing species such as Jacarandas, planting a 200L tree might be preferred for an instant effect. Workability and ease of installation also needs to be considered, for example a team may be able to plant 100 smaller trees in a day, but might only be able to plant 20 large trees.

Table 4 below provides an indication of the varying costs associated with the supply, install and maintenance of public trees.

Table 4: Indicative cost schedule

Supply and install	
Tree size	**Estimated cost per tree**
15L	$50
35/45L (Industry standard)	$150
70L	$175
100L	$350
200L	$450
500L	$600
Supply, install and maintain for 2-3 summers	
35/45L	$500-600

The costs associated with implementing the management actions outlined in this Plan will be met through Parks Services operational budgets, which will be reviewed annually according to individual site requirements.

9.2 Responsibilities

Responsibilities and timing for delivery of all other actions detail in Section 7 are provided below.

Table 5: Green Goal One

Green Goal One			
	Actions	**Resp.**	**Timing**
i.	Plant at least 15,000 trees over the next five years within streetscapes and POS (implementation outlined in Section 9.1).	PS	Annually
ii.	Investigate appropriate planning mechanisms to protect individual trees on private property through the development of an Environmental Planning Strategy.	SPE	2017/18
iii. iv.	Local Planning Strategy and Town Planning Scheme are to effectively prioritise and provide for the protection of the City's environmentally significant areas on private land.	SPE, SP	Ongoing
v.	New trees planted in accordance with this Plan must also account for necessary maintenance to support establishment of trees, including the use of a watering truck and mulch.	PS	Ongoing
vi.	Continue the establishment and maintenance of a range of garden beds and turfed areas which collectively contribute to the City's total area of green space.	PS, LDI	Ongoing
vii.	Investigate suitable mechanisms to support the provision of a street tree for every lot in new developments.	SPE	2017/18
viii.	Develop a Public Open Space Strategy outlining the City's expectations for tree retention and provision in POS.	SPE	2017/18
ix.	Investigate suitable policies and procedures to support retention of trees on private landholdings.	SPE	2017/18
x.	Identify and plant existing arbors within City managed parkland.	PS	2018/19

Legend

PS: Parks Services
SPE: Strategic Planning and Environment
SP: Statutory Planning
LDI: Land and Development Infrastructure
ES: Engineering Services

Table 6: Green Goal Two

Green Goal Two		
Actions	**Resp.**	**Timing**
i. Update the City's website regularly to enable the community to access information relating to the Greening Plan.	SPE	Ongoing
ii. Promote the existing Winter Street Tree Planting Program.	PS	Annually
iii. Liaise with residents regarding suitable tree planting relative to their location and verge size.	PS	Ongoing
iv. Update the City's Street Tree Planting List for character zone consistency.	PS, SPE	2017/18
v. Establish a Native Gardens Program, whereby the City provides free native plants to residents to establish low maintenance and water wise green spaces in their gardens.	PS, SPE	2017/18
vi. Promote urban greening programs and initiatives through vii. the City's Facebook page, City Chronicle and Community Libraries.	PS, SPE	Ongoing

Table 7: Green Goal Three

Green Goal Three		
Actions	**Resp.**	**Timing**
i. Investigate suitable mechanisms to ensure existing street and parkland trees are protected from damage as a result of construction and other works in the City.	PS	2018/19
ii. Investigate appropriate planning mechanisms to protect individual trees on private property through the development of an Environmental Planning Strategy.	SPE	2017/18
iii. Local Planning Strategy and Town Planning Scheme are to effectively prioritise and provide for the protection of the City's environmentally significant areas on private land.	SPE, PE	Ongoing
iv. Plan for the gradual and timely replacement of street and parkland trees as they reach the end of their Useful Life Expectancy, prioritising areas where there are large number of trees expected to reach the end of their lifespan in the same timeframe, or where loss of trees will have a significant impact on amenity, such as in key parkland areas and streetscapes.	PS	Annually
vi. Where appropriate, ensure that any public tree removed is replaced like for like within 12 months, consistent with Greening Principle 9.	PS	Ongoing
vii. Update the City's GIS database to establish a Tree Inventory.	SPE	2017/18
viii. Maintain the City's Tree Inventory to record and monitor tree maintenance and management activities.	PS	Ongoing
ix. All street and parkland trees planted in new developments are to be recorded on the database.	SPE	Ongoing
x. Undertake regular audits of public trees to improve database accuracy.	SPE	As required

Table 8: Green Goal Four

Green Goal Four		
Actions	**Resp.**	**Timing**
i. All tree planting must be undertaken with consideration for the Greening Principles.	PS	Ongoing
ii. Undertake an annual review of tree planting relative to the implementation schedule in this Plan and discuss lessons learnt with regard to tree selection and observed planting success.	SPE, PS	Annually, Autumn
iii. Ensure tree planting opportunities are integrated during urban water management planning in accordance with Water Sensitive Urban Design best management practices and principles.	LDI	Ongoing

Table 9: Green Goal Five

Green Goal Five		
Actions	**Resp.**	**Timing**
i. Undertake an annual review of tree species planted by both Parks Services and developers to determine if the City is effectively working towards this goal.	SPE, PS	Annually, Autumn
ii. Undertake a detailed inventory of public tree species to provide a more accurate baseline against which species diversity targets may be monitored.	SPE	2017/18
iii. Review the Greening Plan implementation schedule as required following the Local Biodiversity Assessments being undertaken to inform the development of the Local Planning Strategy, particularly with regard to priority ecological linkages and opportunities to improve ecosystem services in an urban setting.	SPE	2017/18

Legend

PS: Parks Services

SPE: Strategic Planning and Environment

SP: Statutory Planning

LDI: Land and Development Infrastructure

ES: Engineering Services

10

Measuring our success

a) Annually:
The City's Parks Services and Strategic Planning and Environment teams will meet before the end of each calendar year to discuss and review:

- The number of trees planted in the preceding winter relative to the implementation schedule
- The delivery of other actions identified to achieve the Green Goals
- The survival rates of previous tree plantings
- Lessons learnt and potential improvements for the following year.

Implementation progress will be reported annually in the Environmental Sustainability Report.

b) After 5 years:
As part of the 5 year review of the Greening Plan, the City will undertake an analysis with the same methodology (iTree software and NDVI) to measure changes in canopy cover and determine if the City is on track to achieving the Green Goals.

c) After 25 years:
The City will undertake an analysis with the same methodology to determine if the City has effectively improved the trajectory of the City's green cover in accordance with the 25 year targets established in this Plan.

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Appendices

Appendix A - Recommend public tree species list

This species list is not intended to be prescriptive, but rather provide guidance on common and suitable species with favourable characteristics and previous success. Species selection must be site specific and undertaken in accordance with the Greening Principles.

Note: Corresponding images relative to plate numbers can be viewed in Appendix B.

Scientific name	Common name	Plate no.	Origin	Size	Canopy	Height	Shape	Evergreen	Deciduous	Foreshore	Coastal	Industrial	Urban Centre	Residential Baldivis	Rural
*Acacia saligna**	Orange Wattle	1.	WA*	S	2	6		●			●				
Acer platanoides 'Columnare'	Norway Maple	2.	Europe	M	4	10			●				●		
*Agonis flexuosa**	WA Peppermint	3.	WA	M	6	8		●		●	●				
Allocasuarina fraseriana	Common Sheoak	4.	WA	M	8	8		●		●	●				
Angophora costata	Smooth Barked Apple	5.	ES	L	12	20		●			●	●		●	
Araucaria columnaris	Cook Island Pine	6.	ES	L	5	30		●		●	●				
*Araucaria heterophylla**	Norfolk Island Pine	7.	ES	L	10	50		●		●	●				
*Banksia attenuata**	Candlestick Banksia	8.	WA	M	8	10		●				●		●	●

SCIENTIFIC NAME: (*) Carnaby's Black Cockatoo habitat **ORIGIN:** (ES) Eastern States (NA) Northern Australia (WA) Western Australia (*) Indigenous to City of Rockingham

Scientific name	Common name	Plate no.	Origin	Size	Canopy	Height	Shape	Evergreen	Deciduous	Foreshore	Coastal	Industrial	Urban Centre	Residential Baldivis	Rural
*Banksia grandis**	Bull Banksia	9.	WA	M	5	12		●				●		●	●
*Banksia ilicifolia**	Holly-Leaf Banksia	10.	WA	M	8	10		●				●		●	●
Banksia integrifolia	Coast Banksia	11.	ES	M	8	10		●		●	●				
*Banskia menziesii**	Firewood Banksia	12.	WA*	M	5	7		●				●		●	●
*Banksia prionotes**	Acorn Banksia	13.	WA	M	4	10		●				●		●	●
*Callistemon Kings Park Special**	Bottlebrush	14.	WA	S	3	5		●			●			●	
*Callitris preisii**	Rottnest Island Pine	15.	WA*	M	6	12		●		●	●				
Casuarina equisetifolia	Coast Sheoak	16.	ES, NA	M	6	9		●		●	●				
Casuarina obesa	Swamp Sheoak	17.	WA*	M	6	9		●						●	
*Corymbia calophylla**	Marri	18.	WA*	L	15	40		●						●	●

SIZE: (S) Small (M) Medium (L) Large

Scientific name	Common name	Plate no.	Origin	Size	Canopy	Height	Shape	Evergreen	Deciduous	Foreshore	Coastal	Industrial	Urban Centre	Residential Baldivis	Rural
*Corymbia citriodora**	Lemon Scented Gum	19.	ES	L	15	50		●			●			●	
Corymbia citriodora 'Scentuous'	Scentuous	20.	ES	M	5	8		●			●		●	●	
*Corymbia ficifolia**	Red Flowering Gum	21.	WA	M	5	10		●			●	●		●	
*Corymbia maculata**	Spotted Gum	22.	ES	L	10	30		●				●		●	
Erythrina indica	Coral Tree	23.	AS	M	3	10			●	●	●				
*Eucalyptus camaldulensis**	River Red Gum	24.	ES	L	15	30		●						●	●
Eucalyptus erythrocorys	Illyarrie	25.	WA	S	4	6		●				●		●	
Eucalyptus forrestiana	Fuschia Gum	26.	WA	S	4	6		●			●	●	●	●	
*Eucalyptus gomphocephala**	Tuart	27.	WA*	L	15	40		●		●	●	●	●	●	●
*Eucalyptus grandis**	Rose Gum	28.	ES	L	15	50		●						●	

SCIENTIFIC NAME: (*) Carnaby's Black Cockatoo habitat **ORIGIN:** (ES) Eastern States (NA) Northern Australia (WA) Western Australia (*) Indigenous to City of Rockingham

Scientific name	Common name	Plate no.	Origin	Size	Canopy	Height	Shape	Evergreen	Deciduous	Foreshore	Coastal	Industrial	Urban Centre	Residential Baldivis	Rural
Eucalyptus lehmannii	Bushy Yate	29.	WA	S	4	6		●			●				
Eucalyptus leucoxylon 'rosea'	Pink Flowering Gum	30.	ES	M	7	20		●			●	●		●	
Eucalytpus macrandra	Long Flowered Marlock	31.	WA	S	4	6		●			●				
Eucalyptus mannifera	Brittle Gum	32.	ES	L	10	20		●			●	●	●	●	
*Eucalyptus marginata**	Jarrah	33.	WA*	L	15	40		●				●		●	●
Eucalyptus nicholii	Willow Peppermint	34.	ES	M	4	12		●			●			●	
*Eucalyptus rudis**	Flooded Gum	35.	WA*	L	10	20		●						●	●
*Eucalyptus salmonophloia**	Salmon Gum	36.	WA	L	10	25		●				●		●	
Eucalyptus sideroxylon	Ironbark	37.	ES	L	8	25		●			●	●		●	
Eucalyptus torquata	Coral Gum	38.	WA	M	5	10		●				●		●	

SIZE: (S) Small (M) Medium (L) Large

Scientific name	Common name	Plate no.	Origin	Size	Canopy	Height	Shape	Evergreen	Deciduous	Foreshore	Coastal	Industrial	Urban Centre	Residential Baldivis	Rural
Eucalyptus utilis	Platypus	39.	WA	M	5	8		●		●	●				
Eucalyptus victrix	Little Ghost Gum	40.	WA	M	4	8		●							
*Ficus hillii**	Hills Fig	41.	ES	M	8	15		●					●		
*Ficus rubiginosa**	Port Jackson Fig	42.	ES	L	20	30		●					●		
*Jacaranda mimisifolia**	Jacaranda	43.	S. America	M	8	15			●				●	●	
*Liquidambar styraciflua**	Liquid Amber	44.	US	M	10	15			●				●		
Melaleuca lanceolata	Rottnest Island Teatree	45.	WA*	M	5	8		●		●	●				
Melaleuca quinquenervia	Broad-leaved Paper Bark	46.	ES	L	15	20		●			●		●		
Melaleuca raphiophylla	Swamp Paper Bark	47.	WA*	M	3	10		●				●		●	
Metrosideros excelsa	New Zealand Christmas Tree	48.	New Zealand	M	8	15		●		●	●				

SCIENTIFIC NAME: (*) Carnaby's Black Cockatoo habitat **ORIGIN:** (ES) Eastern States (NA) Northern Australia (WA) Western Australia (*) Indigenous to City of Rockingham

Scientific name	Common name	Plate no.	Origin	Size	Canopy	Height	Shape	Evergreen	Deciduous	Foreshore	Coastal	Industrial	Urban Centre	Residential Baldivis	Rural
*Pheonix canariensis**	Canary Island Date Palm	49.	Canary Is.	L	5	20		●					●		
Pheonix dactylifera	Date Palm	50.	Middle East	L	4	20		●					●		
Platanus x acerifolia	London Plane	51.	Europe	M	10	15			●				●		
Pyrus calleryana 'Bradford'	Bradford Pear	52.	Asia	M	3	11			●				●		
Sapium sebiferum	Chinese Tallow	53.	Asia	M	6	10			●				●		
*Tipuana tipu**	Rosewood	54.	S. America	M	10	12			●				●		
Ulmus parvifolia	Chinese Elm	55.	Asia	M	10	15			●				●		

SIZE: (S) Small (M) Medium (L) Large

Appendix B - Photo library of recommended species

1. *Acacia saligna*
Orange Wattle

2. *Acer platanoides* 'Columnare'
Norway Maple

3. *Agonis flexuosa*
WA Peppermint

4. *Allocasuarina fraseriana*
Common Sheoak

5. *Angophora costata*
Smooth Barked Apple

6. *Araucaria columnaris*
Cook Island Pine

7. *Araucaria heterophylla*
Norfolk Island Pine

8. *Banksia attenuata*
Candlestick Banksia

9. *Banksia grandis*
Bull Banksia

10. *Banksia ilicifolia*
Holly-Leaf Banksia

11. *Banksia integrifolia*
Coast Banksia

12. *Banskia menziesii*
Firewood Banksia

13. Banksia prionotes
Acorn Banksia

14. *Callistemon* 'Kings Park Special'
Bottlebrush

15. *Callitris preisii*
Rottnest Island Pine

16. *Casuarina equisetifolia*
Coast Sheoak

17. *Casuarina obesa*
Swamp Sheoak

18. *Corymbia calophylla*
Marri

19. *Corymbia citriodora*
Lemon Scented Gum

20. *Corymbia citriodora* 'Scentuous'
Scentuous

21. *Corymbia ficifolia*
Red Flowering Gum

22. *Corymbia maculata*
Spotted Gum

23. *Erythrina indica*
Coral Tree

24. *Eucalyptus camaldulensis*
River Red Gum

25. *Eucalyptus erythrocorys*
Illyarrie

26. *Eucalyptus forrestiana*
Fuschia Gum

27. *Eucalyptus gomphocephala*
Tuart

28. *Eucalyptus grandis*
Rose Gum

29. *Eucalyptus lehmannii*
Bushy Yate

30. *Eucalyptus leucoxylon* 'rosea'
Pink Flowering Gum

31. *Eucalytpus macrandra*
Long Flowered Marlock

32. *Eucalyptus mannifera*
Brittle Gum

33. *Eucalyptus marginata*
Jarrah

34. *Eucalyptus nicholii*
Willow Peppermint

35. *Eucalyptus rudis*
Flooded Gum

36. *Eucalyptus salmonophloia*
Salmon Gum

37. *Eucalyptus sideroxylon*
Ironbark

38. *Eucalyptus torquata*
Coral Gum

39. *Eucalyptus utilis*
Platypus

40. *Eucalyptus victrix*
Little Ghost Gum

41. *Ficus hillii*
Hills Fig

42. *Ficus rubiginosa*
Port Jackson Fig

43. *Jacaranda mimisifolia*
Jacaranda

44. *Liquidambar styraciflua*
Liquid Amber

45. *Melaleuca lanceolata*
Rottnest Island Teatree

46. *Melaleuca quinquenervia*
Broad-leaved Paper Bark

47. *Melaleuca raphiophylla*
Swamp Paper Bark

48. *Metrosideros excelsa*
New Zealand Christmas Tree

49. *Pheonix canariensis*
Canary Island Date Palm

50. *Pheonix dactylifera*
Date Palm

51. *Platanus x acerifolia*
London Plane

52. *Pyrus calleryana* 'Bradford'
Bradford Pear

53. *Sapium sebiferum*
Chinese Tallow

54. *Tipuana tipu*
Rosewood

55. *Ulmus parvifolia*
Chinese Elm