

2020 Green Plan

Draft for Public Consultation

City of Fremantle

September 2015

ACKNOWLEDGEMENTS

The City of Fremantle thanks the Green Plan Working Group in helping drive and create the Plan and in providing valuable time, expertise and passion to the project.

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EXECUTIVE SUMMARY

There is increasing research and evidence to show open and green spaces have a positive effect on community sociability, local economy and ecology. These spaces are particularly important in city urban environments, where people live, work and recreate.

Green spaces and places are important to our community and have been identified as valued assets through the Fremantle 2029 Community Visioning process as “... a City that values its environment and heritage and the protection and enhancing the natural environment, green spaces and heritage features”.

To achieve this vision, the 2020 Green Plan strategy has six focus areas to maintain and enhance green spaces, increase quality and distribution of green spaces, increasing and improving biodiversity, water efficiency and encouraging the greening of private property. The 2020 Green Plan provides the background, rationale and framework to deliver projects and programs over the next five years. Key initiatives and targets include:

- Every resident and worker to be within walkable distance to public open space.
- Progressively increase tree canopy across the city to achieve up to 20% by 2020.
- Design adaptable open space that allows for future flexibility as the community and open space function and needs change over time.
- Planning for future water security to identify opportunities for best available water sources for existing and new open space.
- Develop links that increase the amount of flora/vegetation and increase habitats for native fauna and encourage their movement between green spaces and to increase and improve biodiversity areas.

Key projects over the next five years include:

- Investigation and identification for accessing public open space in the priority areas of Hilton, O’Connor, White Gum Valley and Beaconsfield.
- Investigation and identify options to improve and/or expand public open space in proximity to future high density areas.
- Undertaking an Urban Forest Strategy to manage and guide tree and vegetation population across the public and private realm, to increase canopy and biodiversity and to mitigate the Urban Heat Island Effect.
- Undertaking water demand modelling to inform future fit for purpose water supply options.
- Prepare landscape concept plans for green links and develop a biodiversity plan.

The six focus area objectives and action plan is the culmination of the development of the 2020 Green Plan through the City and the Green Plan Working Group.

2020 GREEN PLAN

A PLAN TO INFORM, GUIDE AND IMPLEMENT A GREENER CITY

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PART 1 - BACKGROUND

1.1 CITATION

This 2020 Green Plan (the 'Plan') is adopted as a Corporate Strategy to support delivery of the Council's Strategic Plan. It replaces the 2001 Green Plan for the City of Fremantle (the 'City').

1.2 INTRODUCTION

There is increasing research and evidence to show open and green spaces have a positive effect on community sociability, local economy and ecology. These spaces are particularly important in city urban environments, where people live, work and recreate.

Green spaces and infrastructure are important – trees, natural areas, exotic gardens and grass as they all play a part in;

- Filtering extreme weather conditions from heat, cold, rain and wind;
- Humidifying the air;
- Taking up carbon;
- Improving soil and air quality;
- Controlling erosion (wind and water);
- Protecting groundwater resources (nutrient management and salinity controls);
- Amenity and landscape relief;
- Sense of place, heritage and culture;
- Enhancing biodiversity;
- Increasing fauna habitat as a shelter and food source;
- Social values;
- Increasing pedestrian and other transport comfort;
- Extending hard infrastructure asset life; and
- Health and wellbeing of people and their pets.

Green spaces and places are important to our community and have been identified as valued assets through the Fremantle 2029 Community Visioning process:

"... a City that values its environment and heritage and the protection and enhancing the natural environment, green spaces and heritage features".

How we manage and develop our Public Open Space (POS) and other green spaces, particularly in a drying climate, is a key focus for the future. The 2001 Green Plan sought to define how we manage and develop public and private owned green spaces to:

1. Ensure canopy and POS catchment targets are met;
2. Investigate and implement ways to encourage, support and promote greening initiatives on private land;
3. Align streetscape, infrastructure and land use planning to provide functional green spaces and links for existing and future communities;

4. Engage and support the community in green space development and environmental initiatives; and
5. Identify opportunities for innovative ways to use water effectively and sustainably for our green spaces.

In June 2014, the Council initiated the review of the 2001 Green Plan. A working group was formed consisting of elected members, City staff and community members with professional backgrounds in the delivery of parks, green space, nature play and environmental/biodiversity management. The Green Plan Working Group has been integral in reviewing and developing the new Plan.

1.3 2001 GREEN PLAN

The 2001 Green Plan was initiated as a result of community feedback on the need to;

- Improve and increase existing POS: and
- Develop ecological and recreational linkages across the city.

Its development involved extensive community involvement and research, culminating in the adoption of the City's first Green Plan in April 2001.

Mapping to support the development of the 2001 Green Plan was undertaken in 1999. The mapping identified (by land area) the city (public and private land) comprised of 28% tree and vegetation cover, 8.3% irrigated grass (on public opens space) 30.3% "other" open areas (including verges, bare ground and unirrigated grass) 9.3% roads and 24.1% buildings

The 2001 Green Plan identified these key objectives:

- Maintain and enhance green spaces in the City;
- Increase the quantity and improve the distribution of green spaces in City;
- Increase and improve linkages between green spaces;
- Increase the amount of flora/vegetation cover and increase habitats for native fauna and encourage their movement between green spaces; and
- Protect existing vegetation and encourage the greening of private property.

The 2001 Green Plan has been reviewed as part of the work to prepare the new Plan and as part of the actions identified in the One Planet strategy (Land Use and Wildlife). The 2001 Green Plan objectives have been included and built on through the development of key focus areas, objectives and actions identified in Part 2 of this document.

What's been achieved since 2001?

Since 2001 there has been a range of development, programs and projects resulting from and related to the Green Plan 2001.

Green Plan 2001	Action Undertaken
Leighton Marshalling Yards site	Revegetation and additional planting has been undertaken through the Leighton development
Apace Site and North Fremantle Wetland	Revegetation (approximately 4000 native plants) access improvement, weeding and foreshore stabilisation of "Prawn Bay" in 2009 through the Swan River Trust Riverbank Grant Scheme and City of Fremantle. Ongoing maintenance.
Fremantle Artillery Barracks and Cantonment Hill	A master plan and detailed concept plans including landscape improvements for Cantonment Hill have been prepared which includes revegetation and tree planting to be implemented. Some revegetation was undertaken in 2014.
Former Water Corporation land (Knutsford Street, Fremantle)	Now being developed and will include public open space, landscaping and street tree planting as development progresses (located in Development Area 1 of the Local Planning Scheme).
Land adjacent to Stevens Reserve	Located in Development Area 4 of the Local Planning Scheme No. 4 the land has a Council approved structure plan and includes retention and restoration of Stevens Street vegetation and 1 hectare of public open space with additional park and street tree planting. Final approval from the WA Planning Commission is still pending.
Lefroy Road (former quarry site)	Part of this area has been developed as residential and includes a 1280sqm public open space with tree planting (Sardelic Park, located in Development Area 7 of the Local Planning Scheme). The quarry site has had an approved structure plan (Lefroy Road Quarry Structure Plan) and includes 4.05 hectares of public open space.
Westrail Land	Now privately and City owned land, part has been developed as residential as part of the South Beach redevelopment and includes public open space and street tree planting. The remainder forms the Hollis Park open space area.
New developed open space	New open space has been provided through residential and other development including; Naylor Reserve, Sardelic Park, Salentina Ridge, Booyeembara Park and the formalisation of the Kim Beazley redevelopment site .
Revegetation Programs	Revegetation of Arthur Head, railway link, and coastal reserves, ongoing tree planting program, ongoing street tree program, ongoing natural area protection and restoration
Approved New Open Space	Through the structure planning process of the City's redevelopment areas, approximately 5 hectares of new public open space will be provided as development occurs through the subdivision process.
Planning Scheme and Policy provisions	Range of Scheme and Policy requirements to retain and encourage retention of vegetation and mature trees on developable land
Verge Beautification Program	Encourages residents to develop native verge gardens, supplemented with access to free mulch and subsidised plants.
Annual Street Tree and Planting Program	Minimum 1000 trees per year

1.4 STRATEGY AND POLICY CONTEXT

The Plan is not a standalone document and it has been informed by the Fremantle 2029 Community Visioning Project and its key theme for Fremantle to be:

“...a liveable city that services its resident’s needs; a City that values its environment and heritage and the protection and enhancing of the natural environment, green spaces and heritage features.”

The Plan also relates and integrates with the Council’s Strategic Plan and Corporate Strategies, including One Planet which has the following vision:

“The City aims to become Perth’s most sustainable local government – a place where we foster community in a way that supports quality of life, while respecting the limits of the planet on which we live.”

Other related strategies, plans and policies are listed below.

STATE GOVERNMENT FRAMEWORK

DRAFT PERTH AND PEEL @3.5 MILLION

PLANNING AND DEVELOPMENT ACT

ENVIRONMENT AND PROTECTION ACT

SWAN AND CANNING RIVERS MANAGEMENT ACT

STATE PLANNING POLICY RESIDENTIAL DESIGN CODES

STATE PLANNING POLICY BUSH FOREVER

LIVEABLE NEIGHBOURHOODS GUIDE

DEPARTMENT OF SPORT AND RECREATION SD5

PUBLIC PARKLAND PLANNING AND DESIGN GUIDE

LOCAL STRATEGIC FRAMEWORK

ONE PLANET STRATEGY

INTEGRATED TRANSPORT STRATEGY

WATER CONSERVATION STRATEGY

CLIMATE CHANGE ADAPTATION PLAN

LOCAL PLANNING STRATEGY

STRATEGIC RECREATION PLAN

PLAY SPACES PLAN

ASSET MANAGEMENT STRATEGY

LOCAL STATUTORY FRAMEWORK

LOCAL PLANNING STRATEGY

LOCAL PLANNING SCHEME

STRUCTURE PLANS

LOCAL PLANNING POLICIES

DESIGN GUIDELINES

MANAGEMENT PLANS AND STRATEGIES

RESERVE AND PARK MASTER PLANS

RESERVE AND PARK MANAGEMENT PLANS

URBAN DESIGN PLANS

INFRASTRUCTURE PLANS

COMMUNITY ENGAGEMENT PLANS

LTFP AND CAPITAL WORKS PROGRAM

OPERATIONAL PLANS

1.5 FUTURE CHALLENGES AND OPPORTUNITIES

Given the context of a highly urbanised strategic metropolitan centre, the Plan needs to consider competing functions and interests for existing and new green spaces. This includes providing space for pedestrians, cycle ways, road reserves, recreation and other activities, with competition for space for utilities and other urban infrastructure.

Population Growth

In 2001 the city had a population of approximately 24,200 which has grown to 30,883 in 2014 and is projected to continue to grow to 36,263 in 2031¹. Increasing urbanisation to match population growth means more “hard” space in the form of roofs and roads and intensifying the use of existing green spaces. This presents the challenge of;

- Mitigating the social and economic effects of the built form e.g. increased heat and increased water runoff and water pollution
- Safeguarding existing POS and other green spaces from development
- Creating new, usable POS through structure planning and subdivision process to meet the needs of the existing and future community.
- Developing innovative collaborations on how other urban land can be used by the community where structure planning and subdivision process mechanisms do not apply.

In a highly urbanised area such as the city, existing POS, particularly large land parcels such as those used for organised sport, are essential to the local and wider community and must be retained and enhanced.

Detailed mapping was undertaken in March 2015 to determine the type and percentage of tree canopy cover, POS function and walkable catchments to inform future recreation, amenity and linkage opportunities. Tree canopy cover is important as it provides shade to reduce heat and improve amenity as well as important habitats for fauna. In a growing population, the provision of trees and their associated canopy is important as they provide aesthetic value, economic and environmental benefits, reduce stormwater runoff, improve energy conservation, improve air quality and enhance community vitality.

The March 2015 vegetation mapping identified the city (as a whole) has 25.2% of total vegetation (485ha) with 12% of the city area of trees 3 metres and over in height (230.6ha). The total City land area includes Fremantle Ports land area.

Services

Careful consideration and design is required where landscaping impacts on utility services such as gas, power, water and sewerage. Services located both above (e.g. power lines and poles) and below the ground can restrict

¹ South West Group population and capacity forecasts August 2015

planting and growing space, particularly for trees with large root systems or canopies.

Opportunities exist to ensure that important services are not impacted by poor planting choices. Tree species selection such as those whose height can provide shade and not interfere with overhead power lines provides an opportunity to green the City in a cost effective way whilst not impacting on services. A balance needs to be obtained between the provision of essential services and the benefits that trees provide. Other opportunities such as the roll out of underground power across Perth will allow for the planting of tree species with higher and greater canopies in the future.

Private Land

There is existing state and City planning and development controls for the provision of POS, to encourage the retention of large trees and to maintain significant vegetation on private land. Development and redevelopment will result in the loss of large trees. The challenge is how the City can educate, encourage and regulate to ensure large trees are retained and functional open space is provided across the City. Large trees are important on private lands in providing shade, wind protection, character and a sense of place. Large trees provide vertical relief in building design, provide a cultural connection to a place and can be used to scale and balance the built form. There is also recent research in the health and economic benefits in providing and maintaining trees in public and private spaces including property values.²

The City has adopted a number of mechanisms to retain large trees on private land including Planning Policy 2.10 *Landscaping for Development and Existing Vegetation on Development Sites*. The challenge now is how to allow for larger trees for canopy cover on increasingly smaller lots and in apartment developments. Good planting outcomes must be in balance with achieving other sustainability targets, compliance with State government planning requirements and the City's density targets.

In addition to private development controls the City will also work with key agencies such as Fremantle Ports, Main Roads WA, LandCorp, Swan River Trust and Public Transport Authority to promote and advocate for greening initiatives on land within their control.

Urban Form and Public Land

Planting of trees and other vegetation is influenced by a variety of factors and management within an urban environment such as the City Centre. Design factors such as historic and streetscape vistas, safety sightlines, soil and microclimate conditions, universal access requirements, land use and water availability all influence the location and type of tree planting and landscaping in an urban area.

There are established controls for POS and landscaping requirements through subdivision and structure planning processes. The challenge lies in

² Neighbourhood green space and health in a large urban centre, O. Kardan et al July 2015

how to provide green space in areas of high density or where there are gaps in our existing network outside of structure plan areas. Opportunities lie in how to use local and State government land in innovative ways to provide new and functional green spaces, for example better use of road reserves or unoccupied land.

PART 2 – 2020 GREEN PLAN

2.1 PLAN FOCUS AREAS AND OBJECTIVES

The principal objective of the 2001 Green Plan is to *“increase the quality and distribution of green areas in City, while improving the linkages, vegetation and the quantity of flora and fauna”*. This objective is supported and enhanced by six new Focus Areas which relate to:

- Maintaining and enhancing green areas;
- Increasing the quality and distribution of green spaces;
- Increasing flora cover, diversity and fauna habitats;
- Improving links between green spaces; and
- Encouraging the greening of private property

The 2020 Green Plan Focus Areas are:

FOCUS AREA 1 - GREEN SPACE TYPES AND USE

Knowing what we have, how it functions and where the gaps are for future consideration in planning and development.

FOCUS AREA 2 - GREEN SPACE DESIGN

Best practice public and private land development that ensures quality open space design for consolidating green spaces and green links.

FOCUS AREA 3 - COMMUNITY INVOLVEMENT

How the City can engage and support the community in planning, design and implementation of green space plans that contribute to the restoration of natural areas and green links.

FOCUS AREA 4 - URBAN FOREST

To manage and develop the urban forest of the City in an integrated way, across the public and private realm of the City.

FOCUS AREA 5 - WATER SECURITY

Ensuring that green space design reflects fit for purpose water resources and optimum water use efficiencies, considering all water sources available.

FOCUS AREA 6 - NATURAL LANDSCAPES, BIODIVERSITY AND LINKAGES

To protect and enhance natural landscapes and ecosystems by identifying opportunities to expand/increase natural plant communities to improve biodiversity and their links.

2.2 GREEN SPACE TYPES AND USE

Understanding how POS and other green spaces are used is important to enable planning for redevelopment of existing POS and where the provision of new POS will be required in the future. The mapping and analysis identifies:

- Existing POS and its form and function;
- Where new POS has been approved and will be provided in the future;
- Where there are increases in population density for future planning of POS provision and enhancement opportunities; and
- Where there are gaps in POS provision (using a 400m walkable catchment area).

The 400 m walkable catchment target is derived from the basic building block of walkable neighbourhood design. The idea is the community has access to open space within a five (5) minute walk, which is around 400 m.

POS terminology in the mapping has been applied to reflect form and function in the City's coastal and river environment setting.

Recreation Space	These parks provide a setting for informal play and physical activity, relaxation and social interaction.
Coastal Recreation	These parks are located adjacent to / on the river or coastal foreshore, these spaces provide a setting for informal play and physical activity, relaxation and social interaction (does not include natural areas).
Coastal Natural	Located adjacent to / on the river or coastal foreshore, these spaces provide a setting where people can enjoy nearby nature and protect local biodiversity and natural area values.
Sports	Sport spaces provide a venue for formal structured sporting activities such as team competitions, physical skill development and training. These spaces also function for informal recreation such as dog walking, running, walking etc.
Natural	Provide a setting where people can enjoy nearby nature and protect local biodiversity and natural area values. May provide opportunity for low-impact recreational activities, such as walking, cycling, picnicking, playing, watching or exploring natural features. Natural spaces may include bushland, coastal areas, wetlands and riparian habitats, and geological and natural features. Sites are managed to enable recreational access while protecting local ecological and biodiversity values.

The mapping analysis includes the identification of future POS opportunities that have been identified through the structure plan development process. This new term identifies POS/green spaces that are yet to be constructed;

“Potential New Green Spaces - Parks and open space opportunities identified for future development through the planning process.”

Map 1 provides the location and form and function of the POS throughout the city.

There is a gap in POS within a 400m walkable catchment in areas of Beaconsfield, White Gum Valley (east), Hilton (north and east) Samson (west) and the O’Connor industrial area (see Map 2).

POS gaps could be addressed as part of any comprehensive redevelopment proposal and structure planning process, for example opportunities may exist under the Lefroy Road structure plan (see Map 3).

Informal use of school ovals increases the amount of green space available for the community but due to school locations, does not significantly address the walkable catchment gaps, however school ovals can still be considered for informal and formal community use, in consultation with the Department of Education and the schools (see Map 3).

Further analysis of POS access provision indicates that, generally the community has good access to POS, under the state planning policy of hectares per resident provision model. The suburb of Fremantle has the largest amount of POS area at 131 hectares. The residential suburbs of White Gum Valley and Hilton – O’Connor have the lowest amount of POS at 1.12 hectares and 3.7 hectares respectively (see Map 4).

The current standard of POS provision through state planning policy is 3.36 hectares per 1000 residents. The city currently has a higher provision at 3.5 hectares per 1000 residents.

Projected population growth indicates the provision of a POS ratio may be reduced to 3.28 hectares per 1000 residents by 2031. This could result in a potential shortfall of 0.22 hectares across the city, which could be addressed through structure planning and subdivision processes. Map 5 identifies the current redevelopment areas and areas of high density)

Alternative and innovative methods such public access to private open space and creative use of verges, road reserves, and car parks could assist in taking up this shortfall.

OBJECTIVES

Every resident and worker is to have access to POS within a 400m walkable catchment.

Ensure POS mapping informs the planning and development of land and infrastructure across the city.

ACTIONS

- 1.1. Investigate and identify options for accessing functional POS in the priority areas of Beaconsfield, Hilton, O'Connor and White Gum Valley.
- 1.2. Investigate and identify options to improve the quality and/or expand functional POS within 400m of future high density (R60 or above) development.



2.3 GREEN SPACE DESIGN

POS and other green spaces are used in a variety of ways in urban and suburban areas, namely:

- The protection of remnant flora and fauna;
- Play spaces;
- Organised sports;
- Contemplation, relaxation and recreation;
- Buffers to streets and service corridors;
- Festivals and events;
- Culture and heritage;
- Stormwater retention; and
- Fitness and social connection.

These areas also function as community hubs and are often co-located with other services and land uses.

Applying best practice design principles for POS and other green spaces is important to ensure these spaces are functional for the community. It is also important to ensure the provision of good quality POS, through its purpose, design, location, management and maintenance.

Design guidelines such as the Healthy Spaces and Places Manual and the Public Parkland Planning and Design Guide (WA) developed by the Heart Foundation, Department of Sport and Recreation, Department of Water and Western Australian Planning Commission and Healthy Active by Design guidelines are helpful tools in POS design and provision. Additionally, new

types of play elements such as “nature play” are being applied in POS to cater for changing community need for active healthy development.

Development Areas

Areas designated for (re)development under the City’s Local Planning Scheme No. 4 often nominate higher density provisions. POS and green spaces in development areas are delivered through structure planning and subdivision processes. The City works with developers as part of the planning approval process in the design and provision of POS. Up to five (5) hectares of new POS has been allowed for in future development through this process.

Public Land

There is a great potential in greening incidental public land such as street verges and unused road reserves. Verge beautification with native species, verge vegetable gardens and larger community gardens that are managed by the community are encouraged. Guidelines are being updated/prepared to assist with these initiatives. It is recognised these types of initiatives provide positive outcomes by increased public ownership, improved visual amenity, water efficiencies and, community food production. The City can assist the community in greening initiatives on public land. The City’s Verge Beautification Guidelines and Community Gardens Policy provide information on how the City can empower the community to undertake these initiatives.

OBJECTIVES

Design adaptable POS and other green space infrastructure that allows for future flexibility as the community and POS function and needs change over time, e.g. changes in age demographics and trends in recreation and sports use.

Design safe and comfortable POS and other green spaces in accordance with Crime Prevention through Environmental Design (CPTED) principles

Apply the Public Parkland Planning and Design Guide (WA) principles in the design of POS. New and redeveloped POS and other green spaces shall adhere to the best practice principles of these guidelines.

ACTIONS

- 2.1 Develop guidelines for landowners and developers on the City's requirements for open space, water sensitive urban design and landscaping.
- 2.2 Pending the outcome of Action 1.1 design and construct new POS and/or open space in the priority areas of Beaconsfield, Hilton, O'Connor and White Gum Valley.
- 2.3 Provide direction, advice and support in the design and implementation of public reserves and public/private open spaces to encourage and support community uses.

RELEVANT PLANS AND POLICIES

ONE PLANET

COMMUNITY GROUPS AND VOLUNTEERS

COMMUNITY GARDENS POLICY AND GUIDELINES

PLAY SPACES PLAN

RECREATION STRATEGY

MASTER PLANS AND CONCEPT PLANS

**COMMUNITY ENGAGEMENT FRAMEWORK AND
POLICY**

**VERGE BEAUTIFICATION GUIDELINES AND
PROGRAM**

2.4 COMMUNITY INVOLVEMENT

Community feedback through the Fremantle 2029 Community Visioning Project indicated the local community is keen to participate in community gardens, natural area maintenance/regeneration and the care and development of our parklands and verges. The City recognises there are social capital benefits for ongoing participation by the community in these activities.

There are a variety of ways the City currently supports community greening initiatives:

- Providing space for community gardens such as a roof top garden at the Administration Centre and White Gum Valley Orchard;
- Volunteer support in revegetation and landscaping including coastal planting, natural areas weed management and replanting;
- Greening Policy and Guidelines support;
- Annual community participation and well-being grants; and
- Community sponsorship rounds.

The City encourages community involvement in the design and development of our green spaces. Community and City partnership models include the community driven redevelopment of the Gold Street Park in South Fremantle. This project provided for community project management and sponsorship as an alternative method of park redevelopment. This process promotes genuine community collaboration for development ownership and ongoing care of parks.

OBJECTIVES

Meaningful engagement with community for optimum green space outcomes across community gardens, community led greening projects and supported volunteer initiatives.

Continuous development of partnerships with the community for the design and implementation of redeveloped and/or new green space.

Support the work of volunteers in enhancing the greening of the urban landscape through social/community lead initiatives.

ACTIONS

- 3.1 Review and develop management plans and programs for community group participation in design, implementation and ongoing management of POS and other green spaces.
- 3.2 Provide and promote grant opportunities for community partnering projects.
- 3.3 Develop the City's capacity to assist "Friends of" and other groups for the implementation of enhancement plans.

RELEVANT PLANS AND POLICIES

ONE PLANET

COMMUNITY ENGAGEMENT POLICY

COMMUNITY GARDENS POLICY

PLAY SPACES PLAN

RECREATION STRATEGY

MASTER PLANS AND CONCEPT PLANS

2.5 URBAN FOREST

State government planning documents such as *Liveable Neighbourhoods*³ and *The Urban Forest of Perth and Peel*⁴ detail urban forests provide:

- Reduction in air pollution
- Control of storm water
- Mitigation of wind and noise
- Improved biodiversity
- Reduced UV exposure
- Reduced heat island effect and energy demand
- Enhanced sense of place and wellbeing
- Increased property values
- Encouragement of outdoor activity

Across the world, extreme temperatures associated with global warming, deforestation and urban development are significantly impacting our cities and their inhabitants' health and wellbeing⁵. The Urban Heat Island Effect (UHIE) is contributing to higher temperatures in our cities and is defined as an urban area being hotter (sometimes by several degrees) than surrounding rural areas.

UHIE is caused by heat energy being absorbed into the thermal mass of hard surfaces such as buildings and roads, which is then radiated back into the urban environment. This not only means our cities are becoming hotter, they are also becoming drier. Thermal currents generated by UHIE can force rain clouds away thus further reducing a vital cooling mechanism.

An effective way of combating UHIE is to promote the greening of our cities, particularly through tree cover which provides shade and an evapotranspiration cooling effect.

An urban forest is the total percentage cover of trees and vegetation above three metres in height in an urban environment, taken as a whole across the public and private realm. Managing an urban forest effectively can help address and assist with mitigating against negative environmental factors such as UHIE. Urban Forest Strategies are being undertaken by local governments across Australia to manage, conserve and develop trees and vegetation.

Other mitigating actions are to reduce the amount of hard surfaces under the sun's influence and to reduce the heat absorption properties of those surfaces. Typically this can be done through planning policies and reducing the area of at-grade car-parking.

³ Western Australian Planning Commission publication 2009

⁴ Western Australian Planning Commission and CSIRO publication 2009

⁵ Shaoni Bhattacharya 2003, European Heatwave Causes 35,000 deaths. New Scientist

The need for more tree cover is acknowledged in the City's strategies and plans. However actions related to such cover are limited to a commitment to plant 1,000 trees per annum and general aims to be a more sustainable city. There needs to be a more coordinated approach, including development and adoption of an Urban Forest Strategy and review of relevant the urban planning and building policies to address UHIE.

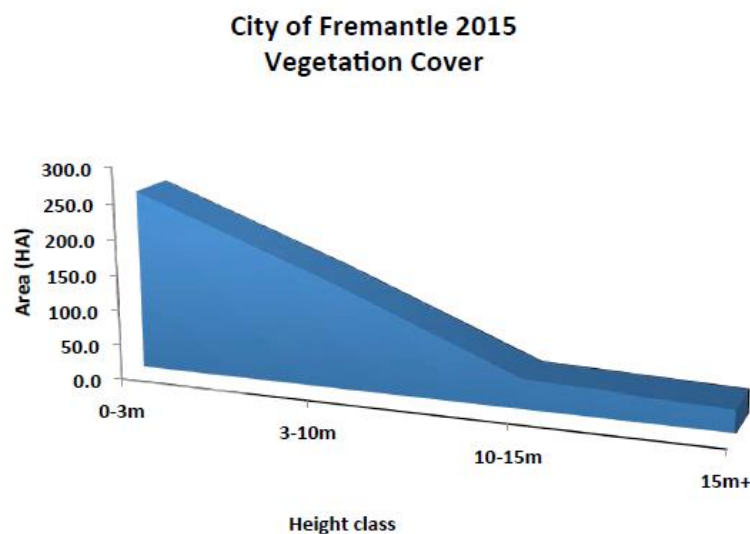
A review of nine international, national and state Urban Forest Strategies has informed this Plan. All documents reviewed were unequivocal about the advantages of increasing tree cover⁶.

Canopy Mapping

Detailed canopy mapping was undertaken in March 2015. This mapping provides a current base line that will inform the analysis for an Urban Forest Strategy. It includes the Fremantle Ports area to reflect the city wide vegetation and canopy cover (see figures below and Map 6).

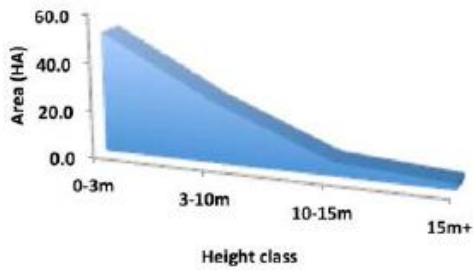
Mapping and analysis included a breakdown of vegetation in height class from 0-3 metres, 3-10 metres, 10-15 metres and plus 15 metres:

- The city has a total of vegetation cover of 25.2%.
- The city has a total of 12% vegetation three metres high or greater.
- The greatest area of vegetation is in the 0-3 metre height class; grass, shrubs and low trees.
- The suburb of Fremantle has the greatest total cover of vegetation (170.7ha) and greatest cover of vegetation taller than three metres.
- O'Connor has the lowest cover of vegetation (19.0ha) due to the industrial area.
- North Fremantle has the lowest percentage cover of vegetation over three metres in height 4.9% due to Fremantle Ports and other industrial land use.

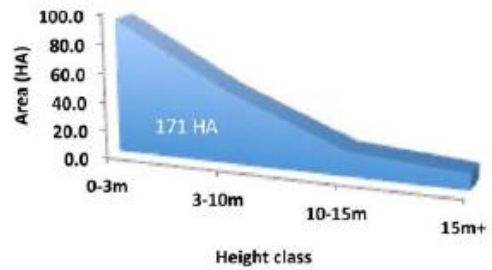


⁶ J. Strachan 2014; A desktop review of Urban Forest Strategies and guidelines.

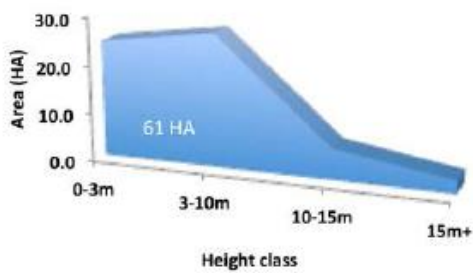
**Beaconsfield 2015
Vegetation Cover**



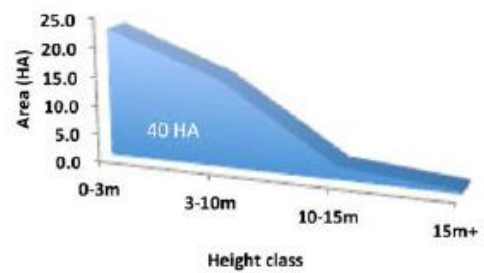
**Fremantle 2015
Vegetation Cover**



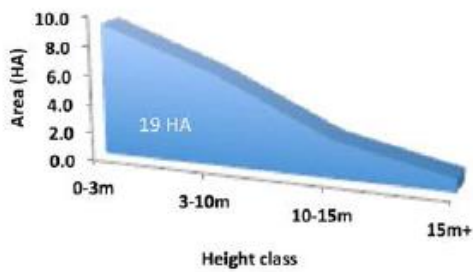
**Hilton 2015
Vegetation Cover**



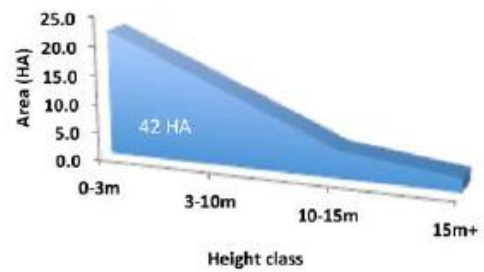
**North Fremantle 2015
Vegetation Cover**



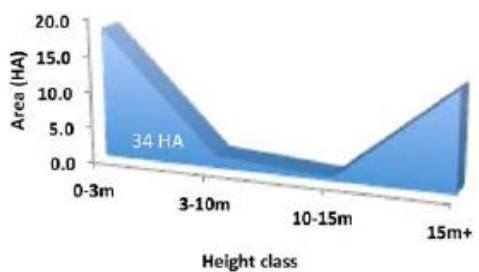
**O'Connor 2015
Vegetation Cover**



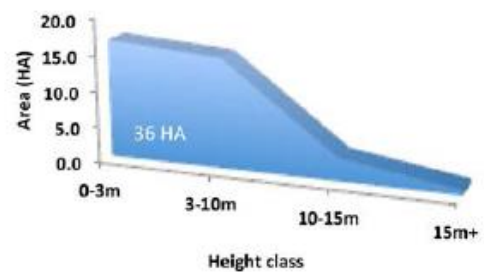
**Samson 2015
Vegetation Cover**



**South Fremantle 2015
Vegetation Cover**



**White Gum Valley 2015
Vegetation Cover**



In people's front and back yards there are a great number and variety of trees and vegetation that contribute to the overall environmental and social benefits of having green areas. There are several ways to protect important trees on private property. These vary from state to state but include Tree Preservation Orders, Significant Tree registers, planning controls, incentive programs and education.

The City's Local Planning Scheme No. 4 and associated planning policies encourage the retention of trees and/or significant vegetation. A Significant Tree Register and trees listed under the Heritage Register also help identify and preserve important and large trees in our community. The Plan seeks to investigate and implement the best fit option to enable the retention of trees on private land as part of the development of an Urban Forest Strategy.

OBJECTIVES

Progressively increase tree canopy cover across the city to achieve up to 20% coverage by 2020.

Support greening initiatives that mitigate the environmental impacts and associated effects of the UHIE.

Apply a coordinated approach through the City's strategies, policy, plans and development applications to target a reduction in UHIE.

Encourage the retention of vegetation on private land.

Encourage the greening of exposed heat sink and winter cold urban hard surfaces such as car parks.

ACTIONS

- 4.1 Undertake thermal mapping to identify areas within the city susceptible to UHIE to inform the Urban Forest Strategy.
- 4.2 Prepare and implement an Urban Forest Strategy for the City including best practice/effective options to retain vegetation and trees on private land.
- 4.3 Develop operational policy and management practice for the identification, management and population of the Significant Tree Register.
- 4.4 Collaborate with major landowners and operators to help them reduce the impact of UHIE on their land through landscaping, particularly the planting of large tree species.

RELEVANT PLANS AND POLICIES

SG28 TREE PLANTING AND PRESERVATION POLICY

**2.10 LANDSCAPING OR DEVELOPMENT AND EXISTING
VEGETATION ON DEVELOPMENT SITES**

**2.12 PLANNING APPLICATIONS IMPACTING ON VERGE
INFRASTRUCTURE AND VERGE TREES**

2.9 RESIDENTIAL STREETScape

**LP.P 2.2 SPLIT DENSITY CODES AND ENERGY EFFICIENCY
AND SUSTAINABILITY SCHEDULE**

LP.P 2.13 SUSTAINABLE BUILDINGS DESIGN REQUIREMENTS

FORESHORE RESERVES AND MANAGEMENT PLANS

LOCAL PLANNING SCHEME No. 4

LOCAL AREA DESIGN POLICIES & URBAN DESIGN

VERGE BEAUTIFICATION PROGRAM

2.6 WATER SECURITY

The City takes seriously its duty to manage irrigation water responsibly. It is important for the City to consider ways in which water for green spaces will be managed in light of reduced rainfall, finite groundwater resources, a drying climate, atmospheric moisture deficits and increasing water demand. In 2013 the City adopted a Water Conservation Strategy to manage our water resources, which includes:

- Incentives for residents to reduce water consumption;
- Implementing staged water management actions for all City properties and recreation facilities; and
- Set clear targets for reduced water usage and improved water health in accordance with the State Water Strategy (Water Forever).

Options to use water efficiently in the City's green spaces have been explored, including;

- Water requirement investigation for future urban trees, open space and vegetation;
- Opportunities for water re-use and savings;
- Water Sensitive Urban Design street planting infrastructure; and
- Overview analysis of water use and water cycles.

As part of the One Planet Fremantle Strategy, the City is committed to implementing the actions identified in the Water Conservation Strategy including investigating viable alternative water source opportunities and implementing best practice water efficiencies.

The City is undertaking a water audit and re-use feasibility study for the Fremantle Leisure Centre to build on the energy efficiencies achieved with the recent pool heating system upgrade. Investigations into the capture and re-use of grey water in City assets are also underway.

Water efficiency and re-use opportunities are highlighted as part of the (re)development of land under Local Planning Scheme No.4. Further, the business case for the Knutsford East Structure Plan redevelopment area considers objectives of incorporating zero carbon/sustainability development, of which water re-use forms a part.

OBJECTIVES

Green spaces are managed for optimum function, amenity, fit for purpose water resource and water efficiency.

The City plans for future water security to identify opportunities for best available water sources for existing and new open space.

Water Sensitive Urban Design and best water efficiency practice and principles for achieving optimum green space outcomes are a primary criteria for meeting community fit for purpose green spaces.

ACTIONS

- 5.1 Finalise water requirement demand modelling for existing and future open space and tree planting to inform feasibility studies and planting staging plans for effective water re - use and alternative water supply options.
- 5.2 Develop an assessment matrix tool for alternative water supply options and/or supply combinations for the City to apply to green site planning and other City planting regimes.
- 5.3 Undertake assessment and feasibility of fit for purpose water supply options as identified in the Water Security Investigation and their application for existing and future green spaces and planting regimes in conjunction with the Water Conservation Strategy (e.g. grey water re-use, sewer mining, commercial waste water re-use).

RELEVANT PLANS AND POLICIES

ONE PLANET - SUSTAINABLE WATER

WATER CONSERVATION STRATEGY

CLIMATE CHANGE ADAPTATION PLAN

2.7 NATURAL LANDSCAPES, BIODIVERSITY AND LINKAGES

The city has landscape areas that, although historically have been modified, provide a natural habitat for flora and fauna. These areas include river foreshores, coastal areas and urban bushland such as Cantonment Hill and Samson Park. These areas are important to provide a connection to nature in an urban setting and areas to protect and enhance biodiversity. Links between these areas are important to allow for fauna movement, increase flora biodiversity and improve amenity to encourage walking, cycling and other transport modes across the city.

Natural Landscapes

Appropriate management and maintenance is required to enhance these ecological systems for current and future generations. The City has ten (10) natural Reserves under its management:

1. Bathers Beach*
2. Port Beach*
3. Leighton Beach*
4. South Beach*
5. Booyeembara Park
6. Cantonment Hill
7. Prawn Bay*
8. Rocky Bay*
9. Swan River Foreshore*
10. Sir Frederick Samson Park

* Part of the regional Reserve system and are managed in conjunction with the State government and include management orders and plans.

Whilst not currently under City management, the Plan identifies Main Roads WA property of Clontarf Hill as a natural space which also forms a link through to South Beach.

The majority of these reserves have been altered through historic land use practices. Subsequently they are regenerated landscapes that emulate, as far as practical, the original native environment. Some of the reserves such as Samson Park are remnant bushland containing endemic species. Samson Park and a section of Cantonment Hill are Bush Forever sites and are protected under state planning controls.

The remnant bushland reserves are comparatively small and require active management to maintain their integrity. They are protected by management plans which include re-vegetation, maintenance and improvement programs.

Biodiversity

Biodiversity is the variety of all life forms - the different plants, animals and micro-organisms and the ecosystems of which they are a part. Whilst the city is a highly urbanised and developed environment, there are habitats and ecosystems that retain biodiversity. There are opportunities to enhance and improve these areas and biodiversity links within and across the city.

The City took part in the Western Australian Local Government Association Local Biodiversity Program as a member council of the South West Group which began in 1999 with the culmination of various guidelines, strategy methodologies and detailed mapping and statistical data in 2014. The Program was established to guide the development and implementation of the 2013 Regional Natural Resource Management Strategy (NRMS). As part of the program, mapping and analysis was undertaken at a regional level to identify biological areas and links.

This program identified eight (8) areas in the city as Areas of Priority Conservation Action. These areas reflect the City's natural area reserves currently under management, with the exception of Clontarf Hill and the Hollis Park area (see Map 7).

Biodiversity includes the retention and enhancement of habitat areas for local flora and fauna. Local flora and fauna habitat creation is encouraged on private and public land. Through the South West Group, the City actively engages with other local governments, State government and non-government organisations on opportunities and programs to retain and attract local flora and fauna to the area.

Linkages

As part of the Plan the City is working with the South West Group (SWG) to determine how best to protect and enhance natural landscapes and biodiversity linkages to create fauna and flora habitats at a local and regional scale. The Local Biodiversity Program mapping identifies one (1) main Regional Ecological link and three (3) Local Linkages across the city. These links are identified in the local Green Links identified by this Plan, which provide an ecological and biodiversity function (see Maps 7 and 8).

As well as performing an environmental function, the links identified in the Plan also function to connect green spaces and POS across the city and to encourage walking and cycling to and from commercial, community and recreation activity nodes.

OBJECTIVES

Develop links that increase the amount of flora/vegetation cover and increase habitats for native fauna and encourage their movement between green spaces.

Increase and improve linkages between green spaces and areas of biodiversity.

Ensure biodiversity areas and links are protected and/or managed and integrated into development so as to maintain function and integrity.

Provide connectivity and encourage walking and cycling between green areas and POS and between activity nodes and centres.

ACTIONS

- 6.1 Develop road reserves to enhance and link natural areas for retaining ecosystems, reducing water use and beautification.
- 6.2 Prepare landscape concept plans for green links as identified in Map 8 including design factors such as biodiversity links and other City strategy objectives such as the Integrated Transport Strategy and Bike Plan to encourage connectivity and walking/cycling between activity centres.
- 6.3 Continue active participation in the SWG and assist delivery of NRMS i.e. NRM facilitator and Coast Care facilitator network.
- 6.4 Develop a biodiversity plan which identifies critical ecological communities with recommendations for protection and enhancement.

RELEVANT PLANS AND POLICIES

ONE PLANET - LAND USE AND WILDLIFE

TRAILS STRATEGY

RESERVE MANAGEMENT PLANS

VERGE BEAUTIFICATION GUIDELINES

MASTER PLANS AND CONCEPT PLANS

STRUCTURE PLANS/REDEVELOPMENT AREAS

ANNUAL TREE PLANTING PROGRAM

VOLUNTEER POLICY

2.8 IMPLEMENTATION AND REVIEW

The Plan is a five year plan that will be implemented from the 2015/16 financial year through to the 2019/20 financial year. Projects arising from the actions identified under each focus area (refer section 2.2-2.7) will be implemented in accordance with the table below.

Progress reporting of the Plan to the Executive, Committee and/or Council will be determined as part of project planning. At the end of the five year program the Plan will be reviewed and mapping will be undertaken to ascertain if the targets have been met.

FOCUS AREA	ACTION	SHORT TERM		MEDIUM TERM		LONG TERM
		2015/16	2016/17	2017/18	2018/19	2019/20
1.0	GREEN SPACE TYPES AND USE					
1.1	Investigate and identify options for accessing functional POS in the priority areas of Beaconsfield, Hilton, O'Connor and White Gum Valley.	✓	✓			
1.2	Investigate and identify options to improve the quality and/or expand functional POS within 400m of future high density (R60 or above) development.		✓			

FOCUS AREA	ACTION	SHORT TERM		MEDIUM TERM		LONG TERM
		2015/16	2016/17	2017/18	2018/19	2019/20
2.0	GREEN SPACE DESIGN					
2.1	Develop guidelines for landowners and developers on the City's requirements for open space, water sensitive urban design and landscaping.	✓				
2.2	Pending the outcome of Action 1.1 design and construct new POS and/or open space in the priority areas of Hilton, O'Connor and White Gum Valley.		✓	✓		
2.3	Provide direction, advice and support in the design and implementation of public reserves and public/private open spaces to encourage and support community uses.	✓	✓	✓		

FOCUS AREA	ACTION	SHORT TERM		MEDIUM TERM		LONG TERM
3.0	COMMUNITY INVOLVMENT	2015/16	2016/17	2017/18	2018/19	2019/20
3.1	Review and develop management plans and programs for community group participation, design, implementation and ongoing management of POS and other green spaces.		✓	✓		
3.2	Provide and promote grant opportunities for community partnering projects.	✓	✓	✓	✓	✓
3.3	Develop the City's capacity to assist "Friends of" and other groups for the implementation of enhancement plans.	✓	✓	✓		

FOCUS AREA	ACTION	SHORT TERM		MEDIUM TERM		LONG TERM
4.0	URBAN FOREST	2015/16	2016/17	2017/18	2018/19	2019/20
4.1	Undertake thermal mapping to identify areas within the city susceptible to UHIE to inform the Urban Forest Strategy	✓				
4.2	Prepare and implement an Urban Forest Strategy for the City including best practice/effective options to retain vegetation and trees on private land	✓	✓			
4.3	Develop operational policy and management practice for the identification, management and population of the Significant Tree Register	✓				
4.4	Collaborate with major landowners and operators to help them reduce the impact of UHIE on their land through landscaping, particularly the planting of large tree species.		✓	✓	✓	✓

FOCUS AREA	ACTION	SHORT TERM		MEDIUM TERM		LONG TERM
		2015/16	2016/17	2017/18	2018/19	2019/20
5.0	WATER SECURITY					
5.1	Finalise water requirement demand modelling for existing and future open space and tree planting to inform feasibility studies for effective water re-use and alternative water supply options	✓	✓			
5.2	Develop an assessment matrix tool for alternative water supply options and/or supply combinations for the City to apply to green site planning and other City planting regimes.	✓				
5.3	Undertake assessment and feasibility of fit for purpose water supply options as identified in the Water Security Investigation and their application for existing and future green spaces and planting regimes in conjunction with the Water Conservation Strategy (e.g. grey water re-use, sewer mining, commercial waste water re-use).		✓	✓		

FOCUS AREA	ACTION	SHORT TERM		MEDIUM TERM		LONG TERM
		2015/16	2016/17	2017/18	2018/19	2019/20
6.0	NATURAL LANDSCAPES, BIODIVERSITY AND LINKS					
6.1	Develop road reserves to enhance and link natural areas for retaining ecosystems, reducing water use and beautification	✓	✓	✓	✓	✓
6.2	Prepare landscape concept plans for green links as identified in Map 5 including design factors such as biodiversity links and other City strategy objectives such as the Integrated Transport Strategy and Bike Plan to encourage connectivity and walking/cycling between activity centres.	✓	✓	✓	✓	✓
6.3	Continue active participation in the SWG and assist delivery of NRMS i.e. NRM facilitator and Coast Care facilitator network.	✓	✓	✓	✓	✓
6.4	Develop a biodiversity plan which identifies critical		✓	✓		

	ecological communities with recommendations for protection and enhancement					
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MAPS

DEFINITIONS

City of Fremantle (City)	The local government organisation of the City of Fremantle.
City of Fremantle (city)	The local government area of the City of Fremantle, including all suburbs.
Council	The Council of the City of Fremantle local government
Green space	Open spaces other than formal designated Public Open Space which can be accessed by the public.
Canopy	Tree canopy.
Vegetation	All plants, including grass, shrubs and trees.
Landscaped areas	Areas of land that are formally planted with vegetation, mainly in urban and suburban areas.
Public Open Space	Publicly accessible land that serves a function (areas under local government control and/or management) and includes open areas set aside for sport, recreation and community purposes and include parklands, sporting fields, playgrounds, bushland and built areas such as civic squares and plazas.
Open Space	Generic term for any open space in an urban and suburban environment; includes POS, Functional POS, road reserves, drainage areas, private open space, verges, public and private open space accessible to the community (developer or undeveloped).
Higher Density	Includes development areas zoned City Centre, Development and Mixed Use as identified in the City's Local Planning Scheme No. 4.

REFERENCES

WATER RE-USE CASE STUDIES

Shire of Augusta - Margaret River; Waste Water re-use for sporting field irrigation

Bold Park Aquatic Centre Grey water Reuse, Rainwater Harvesting and Landscape Water Efficiency: Prepared by Josh Byrne and Associates for the Water Corporation
September 2011

City of Vincent Hyde Park Sewer Mining Feasibility Study

Pennant Hills Golf Club – sewer mining case study

http://www.permeate.com.au/index.php?option=com_content&view=article&id=19&Itemid=146

New design package is helping local councils produce adaptable streetscape rain gardens and tree pits for sustainable stormwater management. By Matt van der Peet, Ashley Roberts and Vaughn Grey

http://www.wme.com.au/categories/water/july5_2014.php

RESEARCH AND BEST PRACTICE

In undertaking the review of the 2001 Green Plan, the Green Plan Working Group undertook research on other initiatives and best practice in open space provision, development and irrigation across Australia. Where not directly referenced, the following documents were researched to obtain ideas and guidance;

Green Plans and Urban Forest Documents

City of Sydney, Greening Sydney Plan 2012

City of Melbourne Urban Forest Strategy 2013

City of Burnside (draft) Urban Tree Strategy 2013

City of Armadale Urban Forest Strategy 2014

Cool Communities; Urban Trees, Climate and Health, Helen Brown Dianne

Katscherian, May Carter, Jeff Spickett (Curtin University)

Greening Port Phillip- An Urban Forest Approach 2010

Sydney Urban Forest Strategy 2013

Trees In Hard Landscapes – A Guide for Delivery, Trees and Design Action Group

Trees in the Townscape – A Guide for Decision makers, Trees and Design Action Group

Assessing Urban Forest Effects and Values: Toronto's Urban Forest,

David J. Nowak, Robert E. Hoehn III, Allison R. Bodine, Eric J. Greenfield, Alexis Ellis,

Theodore A. Endreny, Yang Yang, Tian Zhou, Ruthanne Henry (United States Department of Agriculture) 2012

The Urban Forest of Perth and Peel – A Statistical Report, CSIRO 2009 Urban Monitor

Benchmarking Australia's Urban Tree Canopy: An i-Tree Assessment, University of

Technology Sydney for Horticulture Australia Limited, 2014

Urban Heat

City of Port Phillip and Geelong urban heat initiative

http://www.thefifthestate.com.au/education/city-of-port-phillip-and-geelong-tackling-urban-heat/70630?utm_source=The+Fifth+Estate+-+newsletter&utm_campaign=f9411e1953-18_December_2014&utm_medium=email&utm_term=0_5009254e4c-f9411e1953-44048181

|

Heat Vulnerability mapping;

http://www.nccarf.edu.au/business/sites/www.nccarf.edu.au.business/files/attached_files_publications/Loughnan-ExtremeHeatEventsinAustralianCapitalCities-HighRes.pdf

The Fremantle region has an ageing population that means there will be increased risk of health emergencies during extended hot periods. It shows a high number of ambulance call outs at present, and an anticipated increase of 7 - 8% increase in the percentage of people aged over 65 in the Fremantle region

Improved Pedestrian Thermal Comfort Through Urban Design, Jennifer Love - Master of Urban and Environmental Planning – Professional Project May 2009

Play Space Design

Play Space Guide (Nature Play WA)

What Makes a Good Play Area for Children? (Nature Play WA)

What are the 7 senses? (www.7senses.org.au)

Sensory Issues in Autism, East Sussex County Council, 2007

Play Space Guide – Creating Valuable Places to Play and Learn Outdoors in Western Australian Schools

Go OUT and play!, Daily Mail article 8 July

Playground safety gives way to fun, The Sydney Morning Herald article

APPENDICIES