Urban Forest Strategy

CITY OF Armadale

June 2014

Vision

The vision of the City of Armadale Urban Forest Strategy is to strengthen a diverse landscape character through allocating suitable tree diversity, to be proactive in appropriate landscape planning while showcasing the city's botanic heritage and to distinguish an expanding 'tree change' destination from the existing Perth vernacular.

Cover Image - View from the Hills of Perth skyline & Tuart Tree
Source: Flickr - Simon Cherriman, UDLA

Above: Angophora costata - Street Tree
Source: Flickr - les.butcher

Contents

City of Armadale Council Offices and surrounding established trees
Source: Google Earth

Executive Summary

An urban forest considers the cumulative benefits of an entire tree population. Examining holistically a town or cities urban forest and its associated ecosystem allows for consideration of the broader issues of climate change, urban heat island effects, fire management, population growth and planning policy that can in turn influence a community's future green infrastructure.

The City of Armadale (CoA) Urban Forest Strategy is to be prepared, implemented and managed by a collaborative process with shared input and responsibility from City stakeholders, community, cultural and city interest groups.

In the CoA Community Perspectives 2012 Survey;

> *…56% of participants felt the close to nature, country feel and natural environment was one the best aspects about living in the City of Armadale.*

The holistic benefits of a healthy urban forest are recently understood in relation to providing more than aesthetic and recreational values and include interrelated social, economic and environmental benefits. An urban forest is now understood as critical urban green infrastructure and is to be managed for health and wellbeing of community.

Particularly in the last 10-20 years there has been a sharp increase in green field development within Perth's Swan Coastal Plain. The CoA is rapidly expanding due to being situated on the central eastern fringe of this growth corridor. The social, economic and environmental pressures on 'lower cost' or 'affordable housing' has slightly increased urban infill and most notably green field development, especially within the CoA's urban fringes. Green field development within the CoA is occurring most notably on two fronts, the hills precinct and to a greater extent within the Swan Coastal Plain extending out from the CoA's commercial centres, Kelmscott and Armadale. The need for 'density' and 'low-cost housing' provides a pressure that is transforming this once rural fringe or peri-urban environment into a tightly packed residential enclave.

WA's ensuing urban outcome is seemingly void of specific planning for retaining, contributing or managing an urban forest. The trend towards large detached residential housing that has a high percentage lot footprint has developed an urban fabric that is particularly unique to WA and has been described as a sea of roofs, void of trees.

The Urban Forest Strategy recognises that trees are to be part of urban planning upfront considerations. Planning for trees is not a density issue it is an upfront design issue. It is evident that contemporary planning has left tree planning / design as an unconsidered back end constraint and more often trees, if used, are now located in left over voids. These left over spaces are frequently not adequate to provide for tree structure or future health needs, let alone add to the local or overall urban forest amenity.
"Liveable Neighbourhoods" planning policy guides urban development in Western Australia describes a hierarchy of street typologies based upon composition and scale. In this strategy "Liveable Neighbourhoods" has been used to influence tree planting from a planning level, ensuring tree planting strategy is directed towards outcomes appropriate for the main street types. By aligning with the 'Liveable Neighbourhoods' planning guideline the intention is to improve the ease of the strategies application and increase its relevance at structure planning level, as well as, ensuring practical useability for long term planning and daily operations.

Jull Street Mall, Armadale
Source: Flickr - Rainy Winter Day In Jull Street

A recently held Tree Forum that focused on the detriment of Perth's decreasing urban forest discussed that WA's reduction in the urban forest, especially within the private realm can be attributed to a number of factors. Peter Ciemitis (Senior Urban Planner) posited that;

> *…'Perth's urban tree loss has been a death by a thousand cuts. In the Perth Coastal Plain context, retention and planting of urban trees require a shift in thinking on many levels. Convincing the public to retain and plant more trees may require managing actual and perceived risks. Educating citizens on the multitude of economic, social and environmental benefits and providing planning policy directed at allowing suitable places within the private (backyard) and public spaces appropriate for tree retention, supplementation and urban forest regeneration'. (Peter Ciemitis - Urban Planner Perth Tree Forum March 2014)*

A City's urban forest requires adequate planning, implementation and management, especially as contemporary single storey detached large foot print style housing has become the trend of WA's urban infill and green field development. This contemporary style of outer suburban Australian housing is decreasing existing tree canopy and furthermore limiting the opportunity to develop a future urban forest asset. This decrease of the urban forest, sometimes in the name of fulfilling planned density targets and the pressure it places on Armadale's existing urban forest is presently typical to most Australian outer green field growth areas. Can both density targets and urban forest still coexist? Past examples of inner urban development has illustrated a smaller housing footprint style (detached townhouse) that can provide density and sufficient backyard for the development of an urban tree canopy. It begs the question does the building industry require pressure to deliver low cost two storey detached townhouse style development and equally planning mandate a plot ratio where setbacks, especially within the backyard is adequate for tree planting.

Effective urban forest strategies are required to be specific and unique to location. The CoA is diverse in landscape character and should equally be diverse in its urban forest strategy; this includes planning, implementation and management. High on the local citizen agenda is the provision of a healthy urban forest, however equally as high is the appropriate management of trees with regard to bushfire safety. Bushfire management is most relevant within CoA's historically considered bush-fire prone areas

including the Armadale Hills and urban fringes, where residents are living within and adjacent unmodified bushland.

Management of bushfires within bushland areas is perplexing as bushland conservation and bushland fire management will often yield contrasting outcomes to the perceived existing natural state. Simply stated, by virtue of human habitation the urban ecology is modified. Either bushfire is accepted as part of the risk or considerable modification or management to the bushland environment is required to occur. To further concentrate this issue within the Armadale Hills, recent urban infill has provided housing lots at close to suburban density and most housing lots have undertaken minimal clearing to fulfil their wishes of living in the bushland environment.
Within bushfire-prone areas, especially with small lots your neighbours (community) are as responsible to maintain bushfire protection and hazard zones as you are to them. Many residents are unable (or willing) to undertake appropriate contemporary fire controls as per the latest bushfire guidelines such as clearing adequate fire separation zones or in turn the costly exercise of lifting the bushfire attack level (BAL) rating of their home, to lessen the extent of bushland clearing.

In 1994 the Federal Governments Department of Environment provided a discussion and associated papers on Biodiversity and the effects and effectiveness of fire management. Jon Boura's paper discussed the contrasting priorities between conservationists and bushfire managers noting that a shared responsibility or a collaborative approach to community fire management is required to include all parties (similar to the outcomes of the M.J. Keelty June 2011 royal commission report 'A Shared Responsibility'), as follows;

> *Often bushfire managers and conservationists have different priorities in land management; however national precedence has shown that a willingness to communicate and respect the validity of the others' views, mutually acceptable management plans can be formulated. This co-operation can lead to improvements in fire protection which would not have been possible given an authoritarian approach. It is appropriate to consider bushfire mitigation and management as being a community problem, rather than just a fire control agency problem. Involving the entire community in fire protection planning puts some of the responsibility for fire safety on their shoulders, and their input can result in balanced and effective strategies. (DoE October Biodiversity and Fire: 1994)*

The CoA Urban Forest Strategy is not a Bushfire Management Plan and recommends a City wide plan be prepared to address historically considered bushfire-prone areas. The Urban Forest Strategy does consider 'firewise' landscape planning including recognising WA's latest state bushfire guidelines recommending appropriate planting within building protection zones (BPZ's) and hazard separation zones (HSZ's).

Vision

The vision of the City of Armadale Urban Forest Strategy is to strengthen a diverse landscape character through allocating suitable tree diversity, to be proactive in appropriate landscape planning while showcasing the city's botanic heritage and to distinguish an expanding 'tree change' destination from the existing Perth vernacular.

To achieve this vision, the Urban Forest Strategy process commences by understanding the unique and diverse landscape character precincts within the CoA. From the fringing bushland reserves, European botanical heritage within the hills to the rapidly expanding green field development on the Swan coastal plain, the Urban Forest Strategy aims to complement and enhance Armadale's qualities by focusing on its landscape characteristics achieved through analysis of land use, social/ heritage and environmental values.

The CoA Urban Forest Strategy broadly defines four (4) landscape character precincts including;

1. The Swan Coastal Plain;
2. The Armadale Strategic Metropolitan Centre;
3. The Kelmscott Town Centre; and,
4. The Armadale Hills.

By unifying, sometimes strengthening and mostly understanding these diverse landscape characters, there is opportunity to guide future generations to develop a resilient, safe, healthy and diverse urban forest strategy suitable to be implemented for each precinct and proactive in planning intention and management. In this way the strategy promotes shared citizen responsibility in ongoing governance of the urban forest planning, including bushfire mitigation and management.

Aims

To guide this vision, the key aims of the Urban Forest Strategy are:

1. To strengthen and manage the CoA's urban forest in recognition of the diverse landscape characters

- Inform suitable tree canopy cover for nominated landscape character precincts

- Provide diversity of tree genus and species suitable for purpose within nominated landscape character precincts

- Suggest tree species that provide longevity, appropriate for position including succession planting and able to support existing landscape character whilst acknowledging best practice 'firewise' urban forest landscape planning within Armadale's peri-urban fire prone precincts

2. Collaborate, engage and educate the local community

- Shifting reliance to a collaborative approach, that fosters and supports shared responsibility to provide appropriate urban forest for future generations

- Foster shared responsibility towards developing the CoA's 'firewise' urban forest and associated landscape planning

- Within every landscape character precinct proudly showcase the CoA's 'tree change' diversity and lifestyle

3. Coordinate urban forest planning and management into a strategic guiding document. The Urban Forest Strategy will;

- Inform planning policy, strategic and urban guidelines

- Implement / supplement and undertake succession planting appropriate to landscape character situation

- Encourage backyards and private areas to contribute to the urban forest, whilst educating and acknowledging best practice 'firewise' landscape planning with regard to urban forest implementation and management, and

- Develop shared governance and responsibility through ongoing urban forest implementation, maintenance and landscape planning management strategies

Local trees in the streetscape, Eucalyptus gomphocephala and Agonis flexuosa
Source: UDLA

‘Firewise’ Urban Forest Planning

The term ‘firewise’ refers to a proactive way of being, living, and doing what is required to be prepared for fire. It includes the knowledge and use of strategies/ procedures and sound community planning for protecting homes and lives from bushfire with emphasis on mitigation - before it starts. The term is generally consistent as applied in a National and Australian context including bushfire protection zones and the use of low-flammable tree species. The key recommendation of the Keelty Review into the Perth Hills Bushfire was:

> *...that fuel loads should be reduced around homes and other critical buildings. Evidence shows that BPZs can reduce the exposure of such assets to bushfire and thus assist in fire fighting efforts. (‘A Shared Responsibility’ M.J. Keelty June 2011)*

The Urban Forest Strategy recognises that this is not a fire management plan for the CoA, however the strategy understands the urban forest is a key component within a future plan. Therefore the strategy includes contemporary state and national best practice ‘firewise’ tree planting suggestions that would be included in a ‘firewise’ urban forest planning component of a dedicated CoA Fire Management Plan; i.e. recommended planting measures for nominated fire-prone precincts, chiefly within Building Protection and Hazard Separation zones (BPZ & HSZ) and the use of appropriate ‘firewise’ low flammable tree species for considered (historic) fire-prone precincts.

Part of the Urban Forest Strategy recommendations includes the preparation of a detailed Bushfire Management Plan specific to the CoA and one that recognises contemporary best practice ‘Firewise landscape planning’. The recommendation would include that both the CoA Urban Forest Strategy and Bushfire Management Plan would seamlessly integrate strategies including those with the State Bushfire Management Guideline and future associated planning policy’s. Contemporary best practice ‘firewise’ resources are referred to within the CoA urban forest strategy.

Liveable Neighbourhoods

“Liveable Neighbourhoods” (LN) planning policy guides urban development in Western Australia describes a hierarchy of street typologies based upon composition and scale. In this strategy “Liveable Neighbourhoods” has been used to influence tree planting from a planning level, ensuring tree planting strategy is directed towards outcomes appropriate for the main street types.
The CoA’s Urban Forest Strategy planning and mapping language aligns with ‘Liveable Neighbourhoods’, improving the ease of its application and increasing its relevance at a planning level. This approach aims to connect high level planning with practical usability, aligning long term planning with daily operations.

Towards Implementation

During implementation, strong community involvement can assist in increased education, awareness and contribution to the stewardship and management of CoA’s Urban Forest. Fostering this shared ownership, aids in the CoA showcasing its unique ‘green’ assets, be proactive in managing its bushfire risk as well as developing new opportunities for shared responsibility.

Recommendations

Recommendation	Action	Responsibility
R1 – Develop Urban Tree Planning Policy	- Prepare a document which outlines retention of existing trees within urban infill, green development and car parks. Existing tree retention should be promoted as high priority and considered in development applications. - Ensure appropriate space is made available as part of local planning policy for tree canopy development within urban infill and green field developments, particularly within rear building setbacks (backyards) in private residents. In addition, tree canopy planting allowed for within streetscapes (verges). Note: this is with regard to fire-prone 'firewise' planting best practice.	CoA, MRA, State Government
R2 – Urban Tree Asset Management Plan	- The report recommends the CoA existing tree heritage registry and Tree Preservation Order (TPO) be marketed and open to community input and expanded to cover all urban areas, including areas flagged for green field development. Unnecessary and unapproved removal of existing registered trees would induce heavy penalty.	CoA
R3 – Urban Tree Implementation Plan	- Undertake mapping to collect data on existing public and private tree asset and canopy cover and provide data to assist in developing canopy goals and to determine priority of infill planting. - Develop 5 year implementation and management plan with community consultation.	CoA, CoA community

Recommendation	Action	Responsibility
R4 – Bushfire Management Plan	- The strategy recommends a detailed Bushfire Management Plan be prepared for the CoA. A specific plan that recognises best practice 'firewise' landscape planning and refers to the State Fire Management Guideline (future fire management planning policy) including national 'best practice' for 'firewise landscape planning'. It is recommended this plan include: - Clarification of bushfire prone areas, and provision of these areas with 'firewise' education and a planning overlay for developers and community as part of planning policy to guide existing and future 'firewise' development. - Modelling of environmental factors pertaining to bushfire including; fuel loads, deciduous buffer tree planting, topographical influences, wind influences, temperature and other climatic influences. - Due to conflicting landscape values for living in a bushland environment unique Armadale Hills fire management solutions may consider early warning devices at a community level, community fire drills, and community safe zones (for example a school or sports oval, purpose built clearings or appropriate infrastructure at 800m ped sheds) for saving lives above saving houses within the bushland. - Recommend only larger bushland lots to be approved within the hills so that bushfire protection and hazard zones can be implemented effectively lessoning reliance on neighbours to achieve bushfire compliance to guidelines/policy.	CoA, MRA, State Government

Newhaven Estate, Piara Waters
Source: WA Homebuyers Centre

Introduction

Urban Design and Landscape Architecture consultants UDLA have been requested by the City of Armadale (CoA) to undertake the preparation of an Urban Forest Strategy. It is understood that the Urban Forest Strategy includes the entire jurisdiction of CoA (prior to municipality amalgamations) including streetscapes, open space, private residential, industrial and commercial areas, thus an urban forest considers the cumulative benefits of an entire tree population. Examining holistically a town or cities urban forest and its associated ecosystem allows for consideration of the broader issues of climate change, urban heat island effects, population growth and planning policy that can influence urban forest and in turn future community amenity.

The Urban Forest Strategy is to be prepared, implemented and managed by a collaborative process with shared input and responsibility from City stakeholders, community, cultural and City interest groups.

The vision of the City of Armadale Urban Forest Strategy is to strengthen a diverse landscape character through allocating suitable tree diversity, to be proactive in appropriate landscape planning while showcasing the city's botanic heritage and to distinguish an expanding 'tree change' destination from the existing Perth vernacular.

From the fringing bushland reserves, European botanical heritage within the hills to the rapidly expanding green field developments on the Swan coastal plain, the Urban Forest Strategy aims to complement and enhance Armadale's diverse landscape qualities through analysing the City's land use, environmental and social landscape. The Urban Forest Strategy recognises that Urban Forest and Trees are to be part of urban planning upfront considerations. Planning for trees is not a density issue it is an upfront design issue. It is evident that contemporary planning has left tree planning / design as an unconsidered back end constraint and more often trees, if used, are now located in left over voids. These left over spaces are frequently not adequate to provide for tree structure or future health needs, let alone add to the local or overall urban forest amenity.

"Liveable Neighbourhoods" (LN) planning policy guides urban development in Western Australia describes a hierarchy of street typologies based upon composition and scale. In this strategy "Liveable Neighbourhoods" has been used to influence tree planting from a planning level, ensuring tree planting strategy is directed towards outcomes appropriate for the main street types.

By aligning with the 'Liveable Neighbourhoods' planning guideline the purpose is to improve the ease of the strategies application and increase its relevance at structure planning level, as well as, ensuring practical usability for long term planning and daily operations.
Whilst the Urban Forest Strategy encourages the preservation of the urban forest including supplementation and additional vegetation planting where appropriate, the report is proactive in promoting best practice 'firewise' strategies.

By understanding these diverse landscape characters there is opportunity to guide future generations to develop a resilient, safe, healthy and diverse urban forest strategy suitable to be implemented for each precinct and proactive in planning intention and management. In this way the strategy promotes shared citizen responsibility in ongoing governance of the urban forest planning, including bushfire mitigation/ management.

In 1994 the Federal Governments Department of Environment provided a discussion and associated papers on the effects and effectiveness of fire management. Jon Boura's paper discussed the contrasting priorities between conservationists and bushfire managers noting that a shared responsibility or a collaborative approach to community fire management is required to include all parties as follows;

> *Often bushfire managers and conservationists have different priorities in land management; however national precedence has shown that a willingness to communicate and respect the validity of the others' views, mutually acceptable management plans can be formulated. This co-operation can lead to improvements in fire protection which would not have been possible given an authoritarian approach. It is appropriate to consider bushfire mitigation and management as being a community problem, rather than just a fire control agency problem. Involving the entire community in fire protection planning puts some of the responsibility for fire safety on their shoulders, and their input can result in balanced and effective strategies.*
>
> (DoE October Biodiversity and Fire: 1994)

The commencement of the CoA Urban Forest Strategy comprises the following four (4) sections;

A - Background and Context
Background and Context includes the CoA planning framework and urban forestry history. This section also includes definitions and contextual base mapping required for the urban forest strategy.

A1 – Background
- A1.1 - Urban Forestry Planning Framework
- A1.2 - 'Firewise' references
- A1.3 - Urban Forestry History

A2 – Definitions
- A2.1 - What is an Urban Forest?
- A2.2 - What is Urban Forestry?
- A2.3 - Defining the Urban Forest?
- A2.4 - What are the values and benefits of an Urban Forest?
- A2.5 – What is 'firewise'?
- A2.6 - What is 'firewise landscape planning'?

A3 - Context Mapping
- A3.1 - Context
- A3.2 – Cadastre - land use
- A3.3 - Topography and Hydrology
- A3.4 - Reserves & Road Hierarchy
- A3.5 - Vegetation Complexes
- A3.6 - Climatic Context
- A3.7 - European Heritage
- A3.8 - Aboriginal Heritage

B – Methodology
Methodology includes an overview of the process undertaken to prepare the CoA Urban Forest Strategy. This includes:

B1 - Vision & Aims

B2 - CoA Precincts Analysis & Objectives
- B2.1 - The Swan Coastal Plain
- B2.2 - The Armadale Strategic Metropolitan Centre
- B2.3 - The Kelmscott Town Centre
- B2.4 - The Hills

B3 - Liveable Neighbourhoods & Street Typologies
- B3.1 - Primary Distributors
- B3.2 - Integrator Arterials
- B3.3 - Neighbourhood Connectors
- B3.4 - Access Streets

B4 - 'Firewise' Urban Forest Planning
- B4.1 - Overview
- B4.2 - Tree planting in Building Protection Zones (BPZ)
- B4.3 - Tree planting in Hazard Separation Zones (HSZ)

B5 - Tree Selection Guide
- B5.1 - Determining an appropriate tree palette
- B5.2 - Local tree selection guide
- B5.3 - 'Firewise' tree selection guide
- B5.4 - Precinct tree selection guide

C – Urban Forest Strategy Application

Part C, synthesises the contextual information, philosophical intent, environmental, firewise landscape planning and social values of precinct areas. This information has been extrapolated into a hierarchy (including species palette) to suit existing / future development and streetscape typologies based on Liveable Neighbourhoods for each Precinct.

C1 Swan Coastal Plain

- C1.1 Plan to retain canopy
- C1.2 Plan to increase canopy
- C1.3 Defined road hierarchy
- C1.4 Promote 'Firewise' urban forest planning
- C1.5 Precinct tree selection guide
- C1.6 Liveable Neighbourhoods streetscapes

C2 Armadale Strategic Metropolitan Centre

- C2.1 Provide pedestrian amenity
- C2.2 Strengthen street hierarchy
- C2.3 Precinct tree selection guide
- C2.4 Liveable Neighbourhoods streetscapes

C3 Kelmscott Town Centre

- C3.1 Formalise local urban forest
- C3.2 Develop pedestrian amenity
- C3.3 Provide a unique theme
- C3.4 Precinct tree selection guide
- C3.5 Liveable Neighbourhoods streetscapes

C4 The Armadale Hills

- C4.1 Support informal tree canopy
- C4.2 Retain biodiversity and bushland character
- C4.3 Promote shared responsibility 'firewise' urban forest planning
- C4.4 Precinct tree selection guide
- C4.5 Liveable Neighbourhoods streetscapes

D – Towards Implementation

D1 Towards Implementation

Part D, summarises current initiatives undertaken by CoA, as well as precedent models from around the world.
During implementation, strong community involvement can assist in increased education, awareness and contribution to the stewardship and management of CoA's urban forest. Fostering this shared ownership, assists the CoA to showcase its urban forest asset, be proactive in managing its bushfire risk, as well as, developing new opportunities for shared responsibility.

D2 Recommendations

Part D includes recommendations to support the initiatives within the Urban Forest Strategy.

PART A – BACKGROUND AND CONTEXT

Precedent canopy cover on indicative residential street
Source: Flickr - les.butcher

STRATEGIC VISION:
City of Armadale Strategic Plan 2010 - 2014

PLANNING POLICY:
City of Armadale Town Planning Scheme No. 4 (TPS No. 4)

GUIDELINES:
Landscape Design Guidelines for Public Open Space and Streetscapes in new residential developments

STRATEGY:
City of Armadale Urban Forest Strategy

- Neighbourhood Verge Plan
- Street Tree Planting Requests
- **Total tree planting 2010** (including streetscapes residential requests, tree replacements, parklands and estates and general street trees) = **12767 trees**
- Tree Preservation Orders 2012 (40 trees)
- Ficus Replacement Program

GUIDELINES & FACTSHEETS:
Armadale Streetscapes Factsheets:

- How to prepare your verge
- What's best to plant?
- Watering your verge
- Verge policy and guidelines: What you need to think about before you start?
- Streetscape Request Form

Planning Framework Diagram
Source: UDLA

A.1 Background

A1.1 Urban Forestry Planning Framework

Key City of Armadale strategic policies and plans are summarised in the diagram (left), including their relationship to the Urban Forest Strategy.

A1.2 'Firewise' references

At the time of developing the Urban Forest Strategy a state fire management planning policy and local fire management plan had not been prepared. This Strategy is to be updated and reviewed / cross referenced when the state fire management planning policy is developed.

Relevant planning and report references include national and local best practice 'firewise' documents, as follows

Western Australia

- *'Plant Guide within the Building Protection Zone for the Swan Coastal Plain of Western Australia',* FESA (DFES) Bushfire and Environmental Protection Branch, 2011

- *'Planning for Bushfire Protection Guidelines'*, DFES/WAPC, 2010

- *WA Department of Fire & Emergency Services (DFES*), Bushfire 2014 http://www.dfes.wa.gov.au/safetyinformation/fire/bushfire

- ('A Shared Responsibility' M.J. Keelty June 2011) *'A Shared Responsibility' the report of the Perth Hills Bushfire February 2011 Review*, M.J. Keelty June 2011

National

- *'Landscaping for Bushfire',* CFA Victoria 2012

- *'Plant Selection Key',* CFA Victoria 2012

- *'Victorian Bushfires Royal Commission'*, Chapter 6 - Planning and Building Final Report, Volume 2, 2010

- *'Bushfire Penetration into Urban Areas in Australia - A Spatial Analysis'*, Risk Frontiers, for Bushfire CRC and Victorian Bushfires Royal Commission, 2010

- (NFPA 2014)*National Fire Protection Association's* http://www.firewise.org/about.aspx

- (Bill Gammage ABC July 2012) *Bill Gammage: Prevent Bushfire the Aboriginal Way ABC July 2014*, by Bill Brown http://www.abc.net.au/local/audio/2012/05/28/3512963.htm

- (DoE October 1994) *Biodiversity and Fire: The effects and effectiveness of fire management.* Australian Government Department of Environment Biodiversity series paper No. 8 October 1994 Jon Boura Risk Management Department, CFA, Victoria

A1.3 Urban Forestry History

The strategy acknowledges the extensive work already undertaken by CoA Parks and Gardens team with regard to establishing and maintaining the CoA urban forest.

Key CoA urban forestry works undertaken to date includes;

- Street tree planting program
- During the year 2010, CoA has planted a total of 12,767 trees including residential streetscape requests, tree replacements, parklands and estates and general street trees.
- Tree Preservation Order 2012
- Ficus Replacement Program
- Neighbourhood verge plan initiative
- Street tree planting request initiative

Tree canopy
Source: UDLA

A2 Definitions

A2.1 What is an urban forest?

An urban forest considers the cumulative benefits of an entire tree population. Examining holistically a town or cities urban forest and its associated ecosystem allows for consideration of the broader issues of climate change, urban heat island effects, population growth and planning policy that can influence urban forest and in turn future community amenity.

Key aspects of an Urban Forest are:

- The urban forest is made up of woody vegetation within streetscapes, open spaces, commercial, industrial and residential properties;

- The urban forest is measured by forest canopy cover, which is defined by the percentage of land area covered by vertical projection of canopy;

- The urban forest is one element of the built environment, which is also made up of people, roads, infrastructure, services, footpaths etc;

- Urban forests provide critical ecosystem services such as air and water filtration, shade, habitat, oxygen, carbon sequestration and nutrient cycling. The urban forest also provides a connection to nature that is often perceived to be missing in urban areas.

A2.2 What is Urban Forestry?

- Urban forestry is the care and management of urban forests, i.e., tree populations in urban settings for the purpose of improving the urban environment. Urban forestry advocates the role of trees as a critical part of the urban infrastructure. (Wiki Urban Forestry 2014)

- Urban forestry management is often considered a local government responsibility however frequently extends well beyond that; local communities, schools, community groups, developers, business, industry and State and Federal Government all have important roles to play. Every part of the city contributes in some way to the urban forest as a whole (CoM 2012).

Traditional Tree Management	Urban Forestry Management
Focus on single tree	Focus on an overall canopy cover and the tree population
Focus on single tree as an ornamental feature	Focus on increasing trees age and longevity
Tree as a ornamental feature with low priority	Trees are viewed as critical infrastructure and therefore have equal priority to other urban infrastructure (e.g. roads, services, footpaths)
Single tree replacement	Develop succession tree strategy to provide ongoing canopy for future generations
No economical value associated with trees	Increased understanding of the economic value of a forest (greenhouse gas benefits, water benefits, energy benefits and air quality benefits etc)
Maintenance of individual tree	Overall forest management
Trees viewed on aesthetic basis	Holistic understanding of tree canopy value (ecological, economical, social)
Property boundaries determine tree management	Urban forest seen as continuous resource regardless of ownership (private, public, institutional)

Reference: City of Sydney, Urban Forest Strategy, 2013

A2.3 Defining the Urban Forest?

Defining the urban forest for the CoA is important in determining visions for the future of the CoA and how the collective team will go about realising them. Essentially, urban forestry is the meeting of arboriculture and forestry with other disciplines such as urban planning, landscape architecture, architecture, engineering and economics (CoM 2012).

Ensuring these groups work collaboratively will be integral to a genuinely Australian concept of urban forestry. Education and engagement is essential to increase understanding of trees and the collective urban forest as critical infrastructure.

A2.4 What are the values and benefits of an urban forest?

In the CoA Community Perspectives 2012 Survey;

> *…56% of participants felt the close to nature, country feel and natural environment was one the best aspects about living in the CoA.*

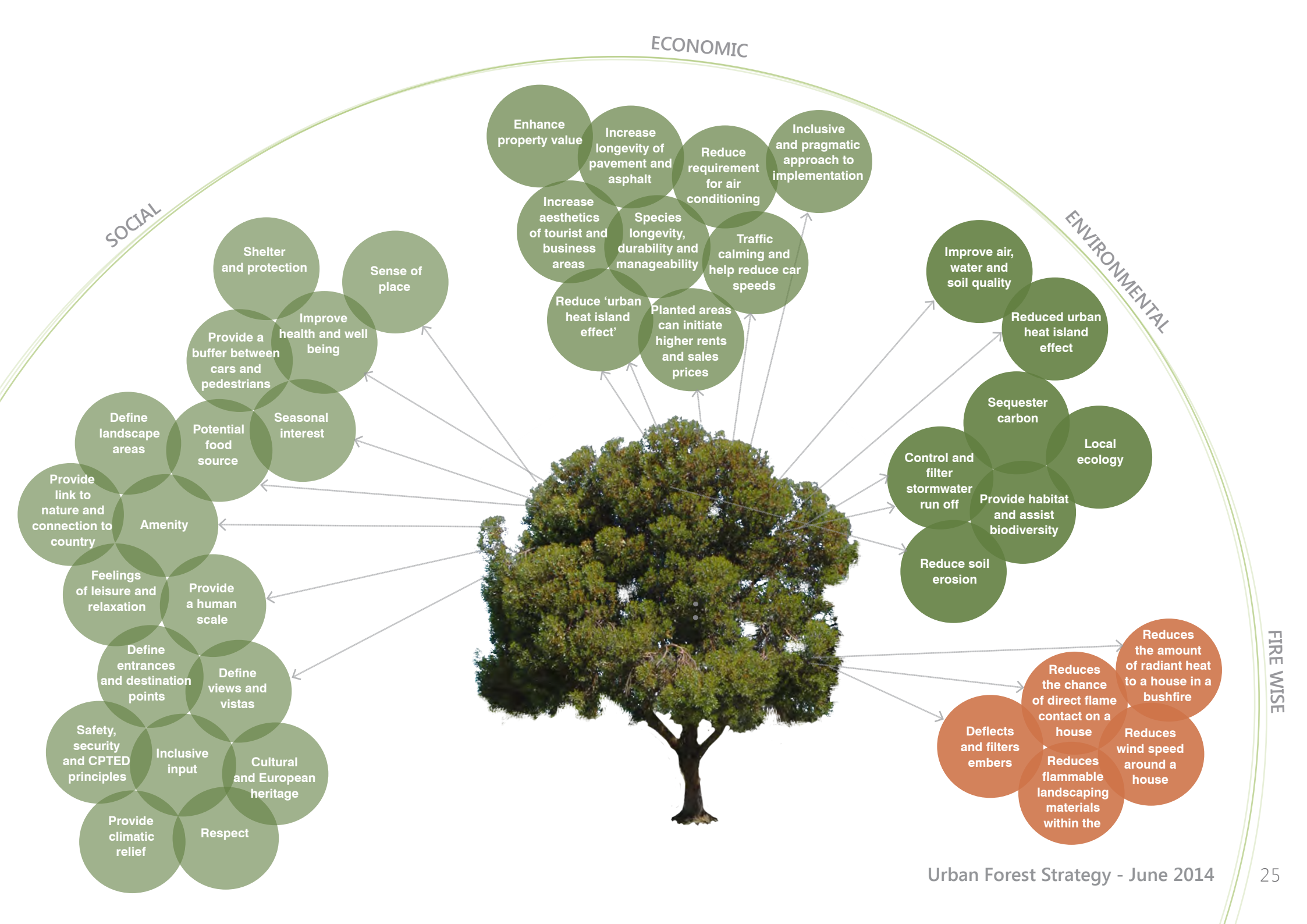
The holistic benefits of a healthy urban forest are recently understood in relation to providing more than aesthetic and recreational values and include interrelated social, economic and environmental benefits. An urban forest is now understood as critical urban infrastructure and is to be managed for health and wellbeing of community (CoS 2013).

The CoA is rapidly expanding due to urban fringe pressures on providing density and lower cost housing increasing urban infill and most notably green field development. Green field increase within the CoA is occurring mostly within the Swan Coastal Plain and transforming this urban fringe coastal plains landscape into a tightly packed, large single footprint urban enclave.

In contrast these peri-urban pressures are decreasing existing tree canopy and due to many factors limiting the establishment of an urban forest. This pressures on a municipality fringing a major capital city growth corridor is no different to most Australian peri-urban areas, however the lack of amass trees (urban forest) within Perth's growth corridor is particularly unique to WA's contemporary urban fabric and can be attributed to a number of factors. A recently held Tree Forum that focused on the detriment of Perth's decreasing urban forest had Peter Ciemitis - Urban Planner positioning;

> *…' Perth's urban tree loss as a death by a thousand cuts. In the Perth Coastal Plain context, retention and planting of urban trees require a shift in thinking on many levels. Convincing the public to retain and plant more trees may require managing actual and perceived risks. Educating citizens on the multitude of economic, social and environmental benefits and providing planning policy directed at allowing suitable places within the private (backyard) and public spaces appropriate for tree retention, supplementation and urban forest regeneration'.*

There is extensive research and general awareness of the environmental benefits of trees within urban areas. In more recent times the social and economic benefits of urban trees have been realised. The social importance of urban trees is highlighted by the diagram (right) demonstrating the high number of social benefits provided by an urban forest including connection to country, spatial feel, personal response, landscape memory, microclimate etc.


ECONOMIC
SOCIAL
ENVIRONMENTAL
FIRE WISE
Enhance property value
Increase longevity of pavement and asphalt
Reduce requirement for air conditioning
Inclusive and pragmatic approach to implementation
Increase aesthetics of tourist and business areas
Species longevity, durability and manageability
Traffic calming and help reduce car speeds
Reduce 'urban heat island effect'
Planted areas can initiate higher rents and sales prices
Shelter and protection
Sense of place
Improve health and well being
Provide a buffer between cars and pedestrians
Define landscape areas
Potential food source
Seasonal interest
Provide link to nature and connection to country
Amenity
Feelings of leisure and relaxation
Provide a human scale
Define entrances and destination points
Define views and vistas
Safety, security and CPTED principles
Inclusive input
Cultural and European heritage
Provide climatic relief
Respect
Improve air, water and soil quality
Reduced urban heat island effect
Sequester carbon
Local ecology
Control and filter stormwater run off
Provide habitat and assist biodiversity
Reduce soil erosion
Reduces the amount of radiant heat to a house in a bushfire
Reduces the chance of direct flame contact on a house
Deflects and filters embers
Reduces wind speed around a house
Reduces flammable landscaping materials within the

Bushfire in the Perth hills region 14th January 2014
Source: SBS News www.sbs.com.au

A2.5 What is 'firewise'?

The term 'firewise' refers to a proactive way of being, living and responding to what is required to be prepared for fire. It includes the knowledge and use of strategies/ procedures and sound community planning for protecting homes and lives from bushfire with emphasis on mitigation - before it starts.

A 'firewise community' is a term used for an international initiative designed to move beyond the public fire services and include shared responsibility; i.e. involve homeowners, community leaders, landscape planners, town planners, developers, and others in the effort to protect homes and businesses from the dangers of bushfire.

A 'firewise home' is characterized by fire-resistant construction, access, defensible space, hardscape, managed and fire-resistant landscaping, greenbelt, and water supply.

The 'firewise' term most likely originated from the National Fire Protection Association's (NFPA). The NFPA is recognised as a worldwide leader in fire, electrical, building and life safety. The mission of the international non-profit organisation founded in 1896 is to reduce the worldwide burden of fire and other hazards on the quality of life by providing and advocating consensus codes and standards, research, training, and education (NFPA 2014).

Firewise is now used extensively within the Australian States and Territories, especially the rural fire associations including the NSW Rural Fire Service (RFS), the Victorian Country Fire Association (CFA) and Western Australia's Department of Fire and Emergency Services (DFES). In Australia the term 'firewise' is generally consistent with the meaning of the term as described and applied in the 2012 Victorian CFA "Landscaping for Bushfire" and various low-flammable plant selection resources. These and other contemporary best practice resources shall be referred to within the CoA Urban Forest Strategy.

A2.6 What is 'firewise landscape planning' and how does this relate to the CoA Urban Forest Strategy?

A landscape that provides communities with the best chance for surviving a bushfire is one that provides a defensible space. Fires need fuel, oxygen and heat to burn. Defensible space landscapes are low in fuel, keeping the fire far enough away that people and services have a chance to defend their homes and assets. 'Firewise landscape planning' explores and allows for opportunities within the peri-urban condition to provide this fire defensible space.

Throughout Australia's Southwest, and in much of the rest of the country, fires in the urban interface are becoming more common as people choose to live in previously undeveloped areas on the edges of cities. The vegetation in these areas usually consists of highly flammable trees, shrubs, and grasses. Fire is often a natural, integral part of the landscape in these interface areas. But when people move-in and build homes, a minor fire that might burn a few trees and shrubs can become a major disaster.

Bill Gammage's ABC presentation on 'Preventing bushfire the Aboriginal way' explores how the landscape that Europeans discovered was not a natural one, but instead it was a landscape that had been made and managed by Aboriginal people.

> *...There was systematic burning forest in order to create open grassland, and then using fire to maintain and refresh that grassland. Many conservationist would say pristine wilderness is devoid of fire management, and oppose burn-offs to reduce fuel load as a bushfire prevention method. However Bill Gammage says that Aboriginal people from 1788 or earlier would see the same land as dirty country that has been let run wild. He says that in pre-European times Aboriginal people would have managed the land as grassland, with the dense forests being confined to mountainous country. Early explorers frequently recorded finding open country with scattered trees, like a park, where it was very easy to gallop a horse. Early paintings and sketches often present the land as 'park like' but art historians explained it away as European artists 'stylising' the landscape to a European look. Go to the location of those paintings and sketches now and the same sites may be covered with dense forest.*

Gammage says that Aboriginal people created grassland as habitat for game, often up to a line of forest from which they could hunt, based upon a deep knowledge of how to control fire and especially how to generate 'cool fires'. (Bill Gammage ABC July 2012)

Reconciling fire protection and conservation issues at the urban-forest interface was discussed in a paper produced by the Australian Government Department of Environment where the conclusions noted:

> *Environmental issues are becoming increasingly important to sections of the community, and to government; so their significance in fire protection planning is also growing. Whilst fire protection works may have a generally negative impact on the environment, the fire hazard of much of the urban-forest interface justifies the conducting of well planned works. Fire brigades and conservationists have different priorities in land management, but several recent collaborative projects have shown that, if each side is willing to communicate and respect the validity of the others' views, mutually acceptable management plans can be formulated. This co-operation can lead to improvements in fire protection which*

would not have been possible given an authoritarian approach. It is important to recognise bushfire as being a community problem, rather than just a fire control agency problem. Involving the entire community in fire protection planning puts some of the responsibility for fire safety on their shoulders, and their input can result in balanced and effective strategies. The key to reconciling fire protection and conservation issues is communication. (DoE October 1994)

Management of bushfires within bushland areas is perplexing as bushland conservation and bushland fire management will often yield contrasting outcomes to the perceived existing natural state. Simply stated, by virtue of human habitation the urban ecology is modified. Either bushfire is accepted as part of the risk or considerable modification or management to the bushland environment has to occur. To further concentrate this issue within the Armadale Hills, recent urban infill has provided housing lots at close to suburban density and most housing lots have undertaken minimal clearing to fulfil the wishes of living in the bushland environment. Within these areas and with small lots your neighbours (community) are as responsible to maintain bushfire protection and hazard zones as you are to them. Many residents are unable (or willing) to undertake appropriate contemporary fire controls as per the latest bushfire guidelines such as clearing adequate fire separation zones or in turn the costly exercise of lifting the bushfire attack level (BAL) rating of their home, to lessen the extent of bushland clearing.

The strategy recognises if people are going to live in fire-prone areas, it is the responsibility of those people, their communities and associated authorities to share responsibility and reduce the risk of fire. Building design and materials, landscape design and maintenance, fire fighting infrastructure (roads, equipment, water supply) and accessibility all affect this risk.

Effective urban forest strategies are required to be specific and unique to location. The COA is diverse in landscape character and should equally be diverse in urban forest implementation and management. High on the local citizen agenda is the provision of a healthy urban forest, however equally as high is the appropriate management of trees with regard to bushfire safety. Bushfire management is most relevant within the recognised fire prone Armadale Foothills and Hills Precincts. The Swan Coastal Plains bushfire management is relevant in the peri-urban condition where adjacent to unmodified bushland reserves.

The CoA Urban Forest Strategy recognises that this is not a fire management plan for the CoA, however the strategy understands the urban forest is a key component within such a plan. Therefore the strategy includes contemporary state and national best practice 'firewise' tree planting suggestions that would be included in a 'firewise' urban forest planning component of a dedicated CoA Fire Management Plan; i.e. recommended planting measures for nominated fire-prone precincts, chiefly within Building Protection and Hazard Separation zones (BPZ & HSZ) and the use of appropriate 'firewise' low flammable tree species for fire-prone precincts.

Part of the Urban Forest Strategy recommendations includes the preparation of a detailed bushfire management plan specific to the CoA and one that recognises contemporary best practice 'Firewise landscape planning'. The recommendation would include that both the CoA Urban Forest Strategy and bushfire management plan would seamlessly integrate strategies including the State bushfire management guideline/policy.

A3 Context Mapping

Urban forest contextual mapping includes determining the CoA's unique landscape character by understanding:

A3.1 - Context
A3.2 – Cadastre - land use
A3.3 - Topography and Hydrology
A3.4 - Reserves & Road Hierarchy
A3.5 - Vegetation Complexes
A3.6 - Climatic Context
A3.7 - European Heritage
A3.8 - Aboriginal Heritage

In order to understand the existing fabric, environmental and landscape values of the CoA the following contextual information and mapping has been prepared and broadly analysed.

Note: The Urban Forest Strategy recommends detail mapping of all factors pertaining to bushfire is undertaken as part of a CoA Bushfire Management Plan including indication of fire-prone areas.

A3.1 CoA context

The CoA is located on the urban-fringe of Perth Metropolitan Area, 28km only 30 minutes south east of the CBD, the CoA is a growing regional centre at the heart of a bustling urban community that offers a relaxed lifestyle with all the conveniences of modern day living.

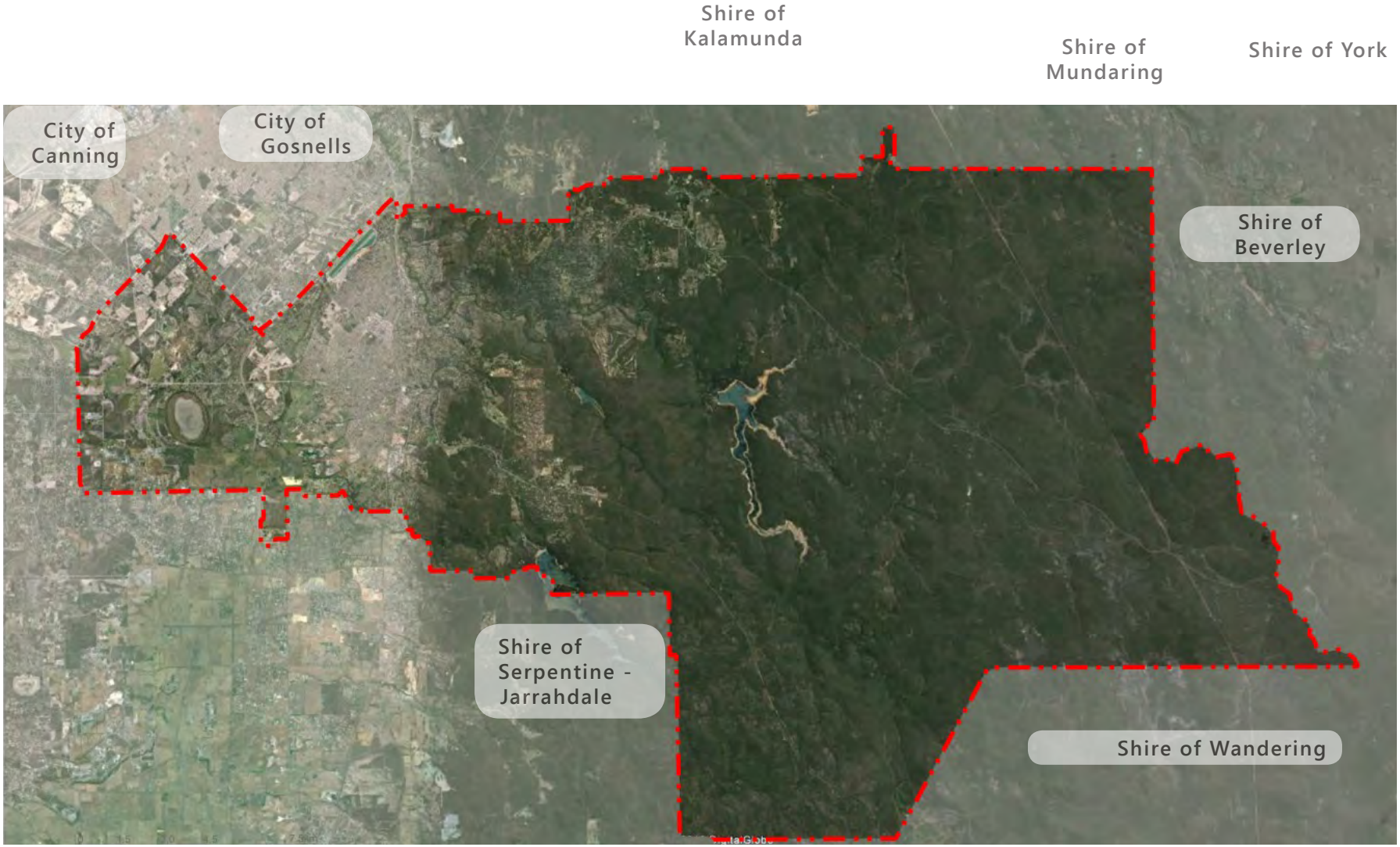
The Armadale City Centre is conveniently located at Perth's major gateway crossroads of Albany and South Western Highways and Armadale Road. Perth's rail network directly links Armadale to the Perth CBD (just 28 km away) and to all other centres on the expanding rail network.

Boasting a modern city centre nestled amongst scenic parks, undulating hills and picturesque valleys, the CoA takes great pride in its cultural heritage and acknowledges the strong links its Aboriginal community has to the land. The area now known as the CoA was originally occupied by the Noongar Aborigines many thousands of years before European settlement.

The Noongar people were close to the land. Their survival depended on a thorough understanding of the environment and the plants and creatures in it.

Since Kelmscott was declared a town in 1830 through until today, the CoA has undergone dramatic and exciting changes. The CoA is now experiencing rapid growth and estimates its population will increase from 55,000 to 85,000 over the next ten years. The recent extension of the Tonkin Highway and the future development of an international rowing facility and white water park at Champion Lakes are catalysts for the City's future growth.

Extract from the CoA website – About Armadale 2014
http://www.armadale.wa.gov.au/Home/About_Armadale



Context Map
Source: Google Earth

A3.2 Cadastre – Land Use

The CoA cadastre clearly indicates four (4) areas of land use which can be categorised by density and location. For the purpose of broad categorisation the land use areas include;

1 - Reserves/state forest;
2 - Urban fringe / peri-urban development;
3 - Suburban; and,
4 - Two distinct urban centres.

The four land use areas can be broadly described as follows;

1 - Reserves/State Forest:

This land use sits mostly within the eastern greater part of the City that includes State Forest and drinking water catchments for the Canning and Wongong reservoirs.

2 - Urban fringe:

The urban fringe is situated on two main fronts within the CoA. The western front within the Swan Coastal Plain urban fringe where green field development are rapidly on the rise, with districts including Champion Lakes, Piara Waters and Forrestdale.

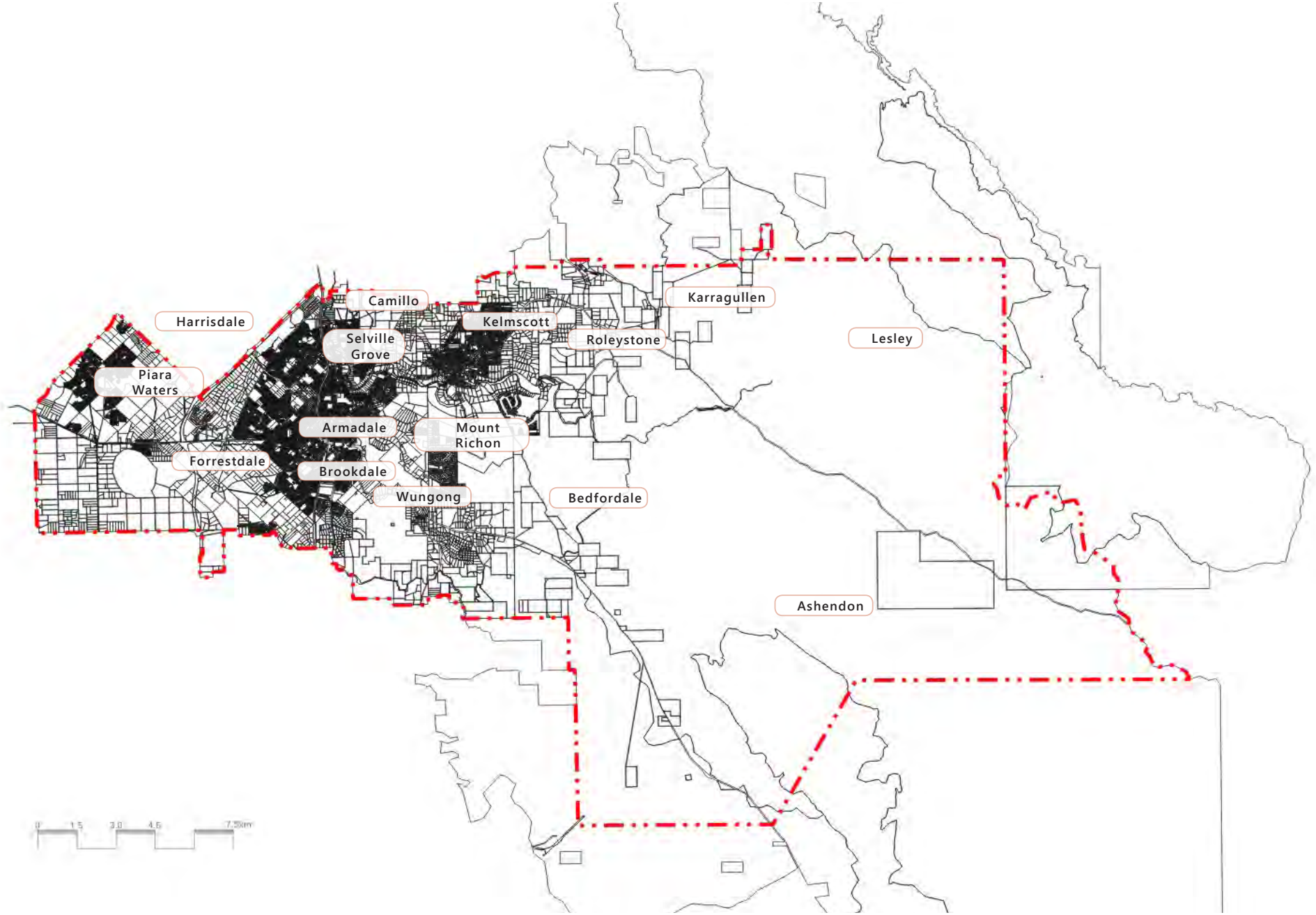
The other urban fringe is on the eastern front with urban infill of suburbs such as Bedfordale, Roleystone and Karragullen. This area even though situated well up the side of the Darling Scarp would be considered as the urban fringe experiencing infill densities relative to typical Perth suburban. This includes open rural lots and valleys that have agricultural and possible light grazing. Orchards provide seasonal colour in valleys and the District areas mainly include Lesley and Ashendon.

3 - Suburban:

Situated closer to the urban centres of Kelmscott and Armadale are the older more established suburban land use density areas. This land use includes suburbs on the swan coastal plain including Harrisdale, Camillo, Seville Grove, Brookdale, Haynes and Hilbert. Situated within the foot hills, and sometimes bounded by steep terrain are the equally established suburbs of Kelmscott, Mount Richon and Mount Nasura.

4 - Urban Centres:

There are two (2) recognised urban centres within the CoA being the Armadale strategic metropolitan centre and the Kelmscott Town Centre.



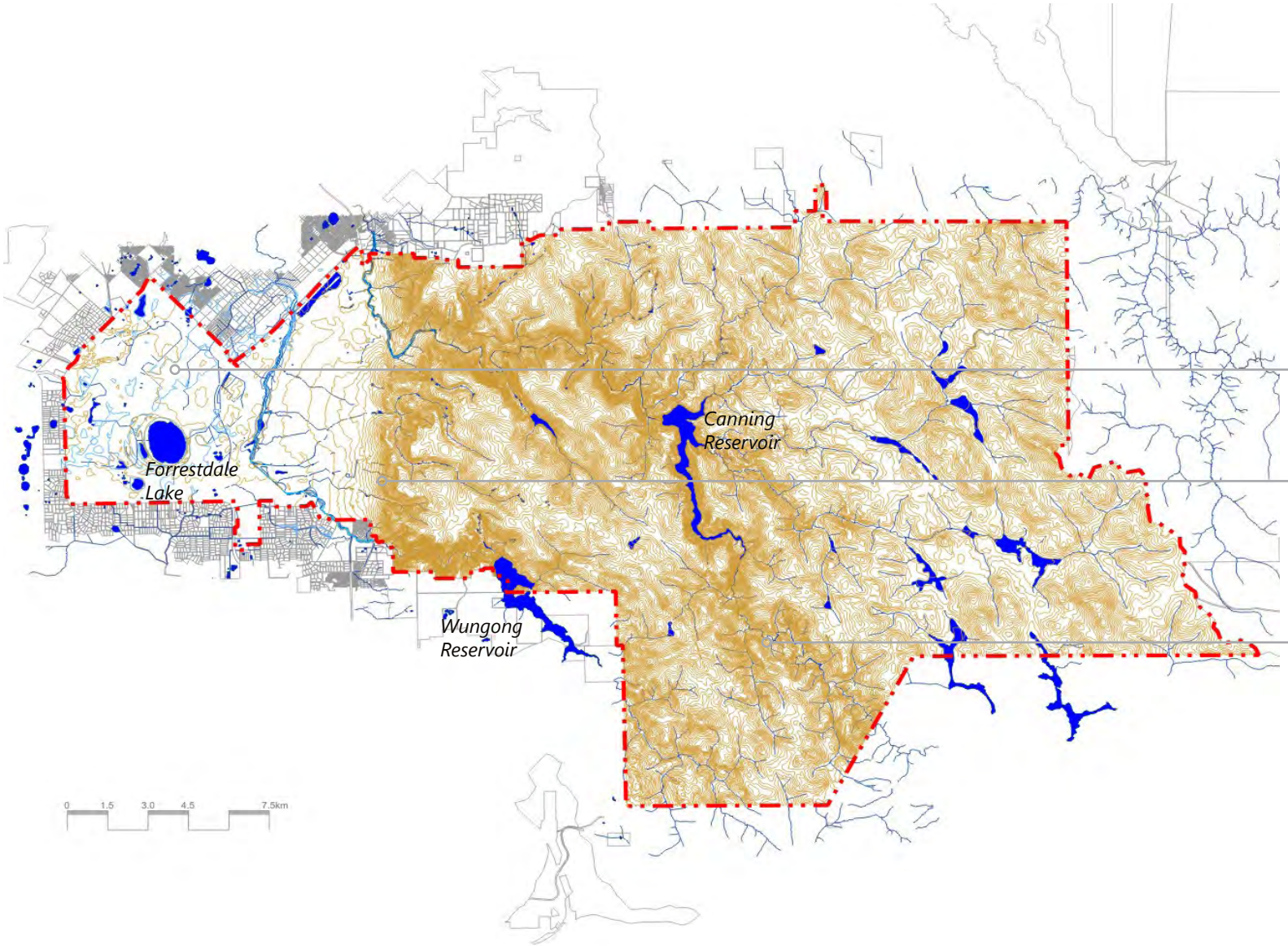
Land Use Plan
Source: Google Earth

A3.3 Topography and Hydrology

CoA features a diverse typography, from flat undulating rural wetland plains in the east to a dramatic incline up the Darling Scarp. Aligning east west the relatively steep sided valleys of the Canning and Wungong Rivers follow the lower foothill precincts into the picturesque wooded peaks and more narrow valleys of the hills district before reaching the top of the Scarp , from here being mostly endemic state forest bushland.

This diverse characteristic is also noticeable in hydrology, with wetlands and low lying water table forming part of the Swan Coastal Plain. The Hill precincts have relatively steep sided valleys and peaks with perennial rivers forming key catchments for the Canning and Churchman Brook Reservoirs. The Churchman Brook (1925) and Canning Dams (1940) have continuously supplied Perth with hills catchment water since their early 20th century construction.

See diagram page 37.



Hydrology and Contours
Source: Google Earth

A3.4 Reserves and Road Hierarchy

This CoA Reserve mapping demonstrates the vast eastern hill portion made up of State Forest. It also acknowledges the dotted reserves as fingers (ridgelines) into the peri-urban hills and a large reserve within the lower wetland catchment of the Swan Plain.

The municipality has a clear road hierarchy. Albany and the South Western Highway is a distinct North South connection also signifying a separation between the Hills and the Swan Coastal Plain.

Nicholson Road is a central north south distributor for the Swan Coastal Plain precinct and the Brookton and extension of the Albany highway are the only east west valley based distributors for the Hill precincts.

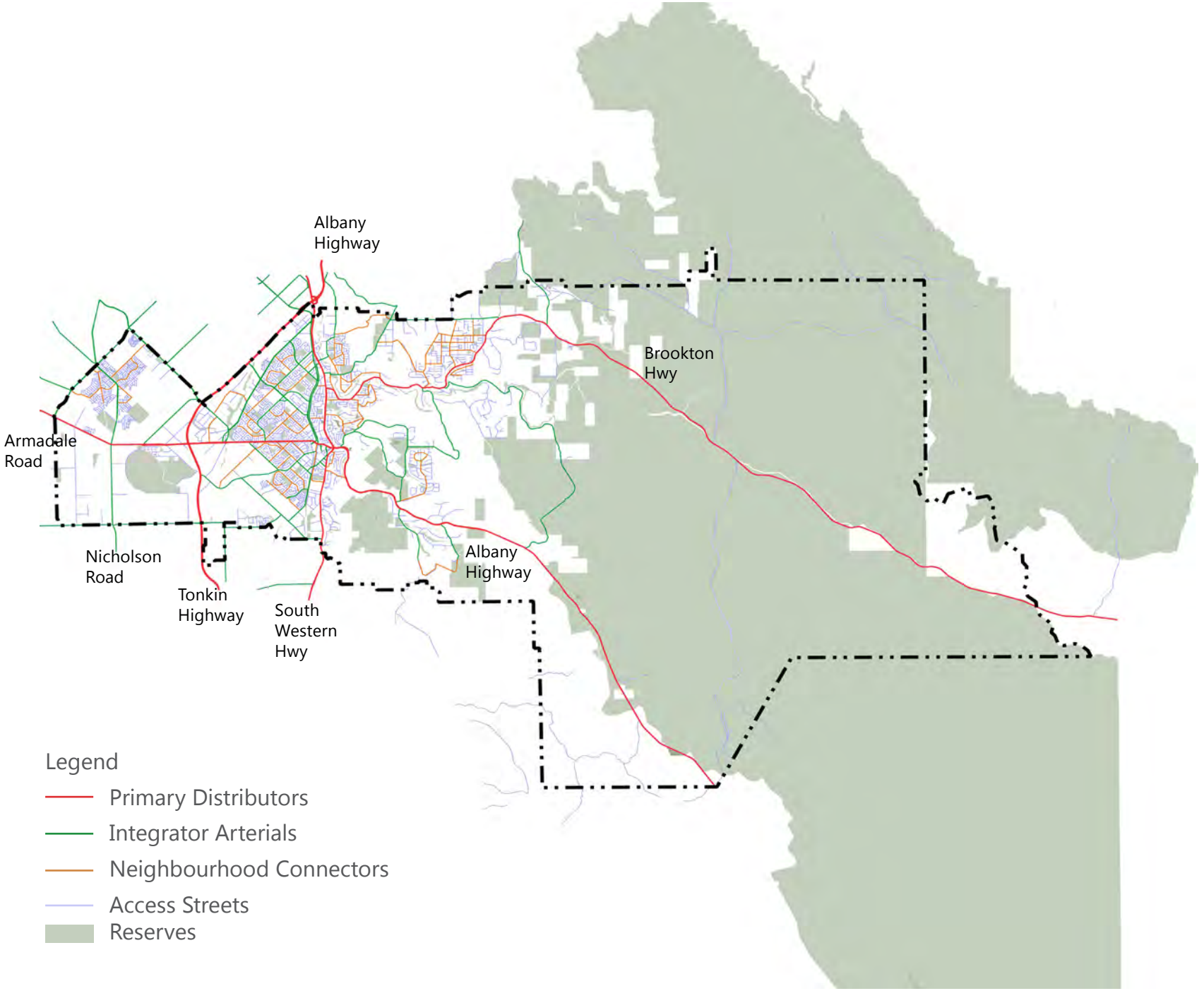
See diagram page 39.

A3.5 Vegetation Complexes

To provide a point of reference the Urban Forest Strategy has mapped the natural occuring CoA vegetation complexes. Vegetation complex mapping illustrates local natural (not necessary endemic) occurring patterns of vegetation at a regional scale and are associated with soils, hydrology, landform and climate. Local natural tree species in these ecological communities have coevolved to form strong relationships and mutual dependencies with the flora and fauna of the community and have adapted to suit the specifics of the local physical environment.

This point of reference of mapping the vegetation complex provides an opportunity for the CoA Urban Forest Strategy to suggest local tree species, which are naturally suitable to the location and are to be used where suitable (note firewise suitability in the urban/peri-urban setting). This will enhance local sense of place including European and Aboriginal cultural heritage values.

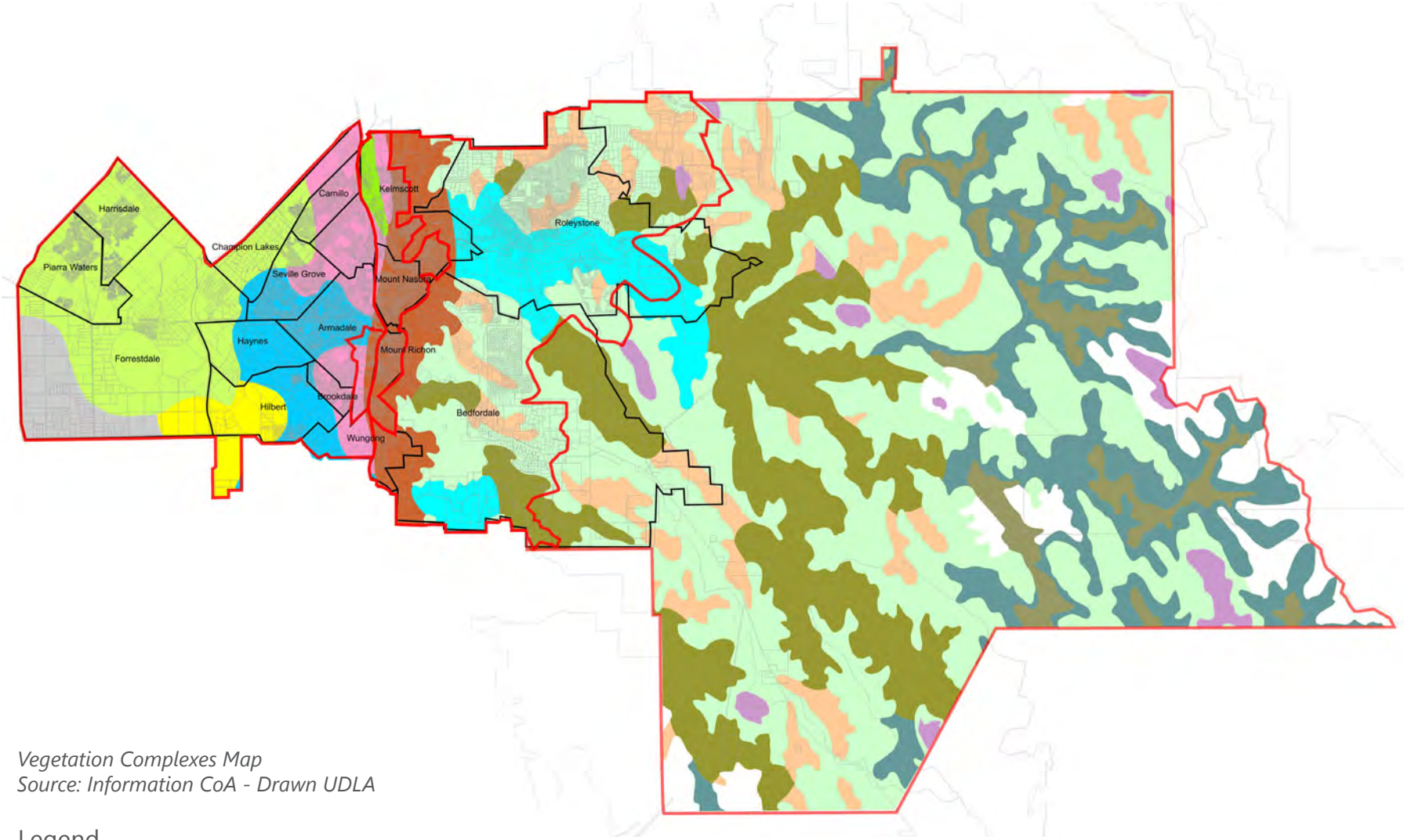
See page 39 and 40 for Local Tree Table and Local Trees Map



Reserves and Road Hierarchy
Source: Google Earth

	The Swan Coastal Plain					The Town and foothills		The Hills	
	Bassendean swamps (Southern River)	Bermullah	Bassendean	Guildford	Forrestfield	Swan	Darling Scarp	Darling Valleys (Murray, Helena, Yargil min swamp)	Darling Plateau Laterite (Dwellingup)
Acacia saligna									
Eucalyptus rudis									
Melaleuca preissiana									
Melaleuca rhaphiophylla									
Banksia littoralis									
Acacia rostellifera									
Banksia attenuata									
Banksia menziesii									
Casuarina obesa									
Corymbia calophylla									
Eucalyptus todtiana									
Allocasuarina fraseriana									
Banksia grandis									
Eucalyptus marginata									
Eucalyptus lane-poolei									
Eucalyptus wandoo									
Agonis Flexuosa									
Eucalyptus gomphocephala									
Melaleuca cuticularis									
Allocasuarina huegeliana									
Corymbia haematoxylon									
Eucalyptus accedens									
Eucalyptus laeliae									
Eucalyptus patens									
Acacia acuminata									
Eucalyptus loxophleba									
Eucalyptus megacarpa									
	Champion Lakes Forrestdale Harrisdale Piara Waters	Hilbert	Forrestdale	Haynes Armadale Seville Grove	Camillo Wungong Brookdale	Kelmscott river road area	Armadale Town Kelmscott Mount Nasura Mount Richon	Roleystone Bedfordale	Roleystone Bedfordale

Local Tree Table
Source: Information CoA - Drawn UDLA



Vegetation Complexes Map
Source: Information CoA - Drawn UDLA

Legend

- Southern River Complex
- Bassendean Complex - Central & South
- Beermullah Complex
- Guildford Complex
- Forrestfield Complex
- Swan Complex
- Darling Scarp Complex
- Helena Complex
- Yarragil Complex - Min
- Dwellingup and Hester Complex
- Murray Complex
- Cook Complex
- Goonaping Complex
- Yarragil Complex - Max
- Swamp Complex

Dead tree in Swan Coastal Plain provides habitat for wildlife and contributes to rural character
Source: Panoramio Steve111

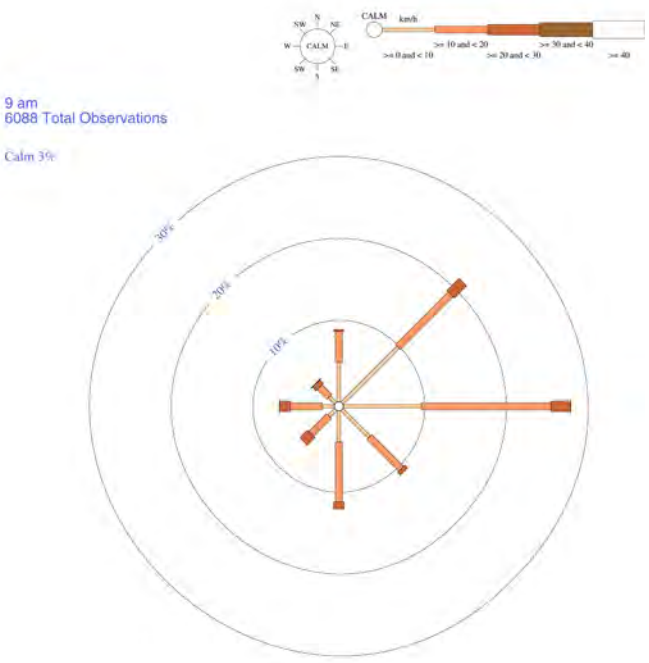
A3.6 Climate

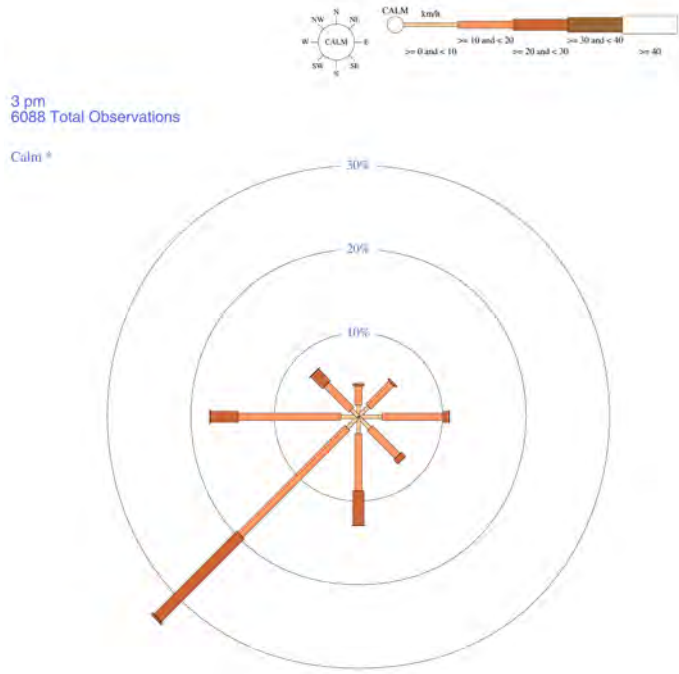
Climate mapping provides mean temperature rainfall and long term averages.

The Perth long term average wind speed & direction rose notes at 9am the predominate winds are east, north easterlies and through the day turn opposite direction towards predominate south westerlies.

Note: The Urban Forest Strategy recommends local wind regime modelling to occur within the recommended Bushfire Management Plan to determine effects of prevailing easterly winds, potential downhill or katabatic wind conditions on CoA Hills precinct fire paths. The modelling would also determine potential opportunities to slow or deflect these winds using low-flammable buffer planting.

Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Years	
Mean minimum temperature (°C)	18.1	18.3	16.5	13.8	10.5	8.6	7.6	8.0	9.4	11.4	14.2	16.4	12.7	19	1994 2013
Rainfall															
Mean rainfall (mm)	15.3	8.2	21.3	36.2	87.6	129.5	146.4	123.5	90.2	39.6	23.8	10.4	730.5	21	1993 2014
Decile 5 (median) rainfall (mm)	1.8	3.2	9.2	25.4	88.6	140.8	142.0	124.8	90.8	38.3	23.6	5.0	741.2	21	1993 2014
Mean number of days of rain ≥ 1 mm	1.5	1.0	2.3	4.4	8.6	12.3	14.3	13.0	11.5	5.1	3.9	2.1	80.0	21	1993 2014





Climate Information
Source: http://www.bom.gov.au/climate/averages/tables/cw_009225.shtml

A3.7 European Heritage

From an outpost at Kelmscott in the 1830s, the CoA is now part of Perth's growth corridor, an eastern urban fringe with its heart being the established Armadale Strategic Metropolitan Centre.

The Armadale Hills have a long agricultural history of orchards, market gardens and semi-rural pursuits. Today these semi rural pursuits continue however the pressure of urban infill is providing smaller bush lots mixing suburban type densities with fringing semi-rural lots and unmodified bushland.

Timeline since European Settlement

1830 - The Township of Kelmscott was gazetted and declared to be at latitude 32 degrees 7'S and longitude 116 degrees 2'E. Initially the townsite served as a military outpost to protect the early settlers and explorers. The Canning River locality provided the early Settlers with fertile soils and a vital water supply

1851 - Work commenced on the Perth to Kelmscott Road

1853 - he original Narrogin Inn established at the corner of Albany Highway and South West Highway for travellers venturing southwards towards Albany. This establishment signalled the beginnings of the township of Armadale

1855 - First policeman in Kelmscott - Constable Cronin

1866 - The first saw mill was built by Thomas Buckingham at Roleystone

1871 - Road District Boards were formed by the Government

1871 - St Mary's Church in Kelmscott was built

1880s -Timber had become an important industry in Kelmscott and Roleystone with the milling of jarrah ('West Australian Mahogany'), Red Gum and Sheoak. This timber was used to construct railway sleepers, the first bridge over the Swan River, the Rockingham Jetty, the Bunbury telegraph line, and bridges over the Canning River in Kelmscott

1889 - Railway line from Perth to Armadale was completed and Armadale mushroomed into a vital and prosperous settlement with houses, roads and shops clustering around the station. Settlers were now able to send all their produce more quickly to Perth by rail. This included eggs, fruit, vegetables, dairy produce, milk, livestock, timber and bricks. The routing of the railway line through Armadale was an important step in the town's history

1894 - The Kelmscott Road Board was created

1895 - First District Town Hall was built

1898 - Opening of the Post and Telegraph Office in Jull Street, Armadale

1900 - Original Armadale Primary School was built

1902 - The Armadale Brick Works was opened occupying the area where Dale Cottages now stand

1903 - Original Roads Board Office was built

1907 -Armadale to Fremantle Railway Line constructed

1909 - Gazettal of Armadale Townsite on 26 February

1910 - The Kelmscott Roads Board was renamed the Armadale Kelmscott Roads Board

1911 - Public street lighting was introduced

1924 - Power lines were installed

1925 - Official opening of the Churchman's Brook Dam

1928 - Opening of the first Armadale Kelmscott Hospital

1930 - Araluen Park was officially opened Araluen Botanic Park was established in 1929 as a holiday camp, purchase by the

state government in 1990 and transferred to DPaW in 2010 and is now recognised as a premier botanical hills retreat for metropolitan Perth

1940 - Official opening of the Canning Dam. The Churchman Brook and Canning Dams have continuously supplied Perth district with hills catchment water since 1925

1950-1952 - Gwynne Park Oval was upgraded, Construction of the Armadale Brickworks on South West Highway

1953 - Opening of the Armadale Senior High School (officially opened in 1955)

1957 - Opening of Dale Cottages Retirement Village - the first retirement village in the City of Armadale

1958 - First Armadale Library Opened

1959 - First meeting of the Armadale Kelmscott Seniors Group

1960 - Following the proclamation of the Local Government Act in 1960 the Roads Board was officially designated the Shire of Armadale Kelmscott in 1961, First Kelmscott Library Opened

1964 - Opening of Armadale Kelmscott Memorial Hospital, Albany Highway

1967 - The new Armadale Kelmscott Council Chambers and Administrative Offices opened in Orchard Avenue

1972 - Armadale Square Shopping City Opened, New Armadale Library Opened in Orchard Avenue

1973 - Morgan Park Opened

1974 - Creyk Park Opened

1976 - History House Municipal Museum was officially opened off Jull Street, Armadale

1977 - Byford Ward becomes part of the Shire of Serpentine Jarrahdale, Opening of the Elizabethan Village - Canns Road

1979 - The Town of Armadale was proclaimed, Wungong Dam opening and opening of the Armadale Recreation Centre

1980 - Opening of Pioneer World

1984 - Armadale Shopping City Opened

1985 - The City of Armadale was proclaimed

1985 -New Armadale Council Chambers and Administrative Offices opened

1987 - Minnawarra Park was established

1987- 1988 - New Armadale Primary School was built

1990 - Opening of Seville Grove Library

1990 - City population reaches 50,000

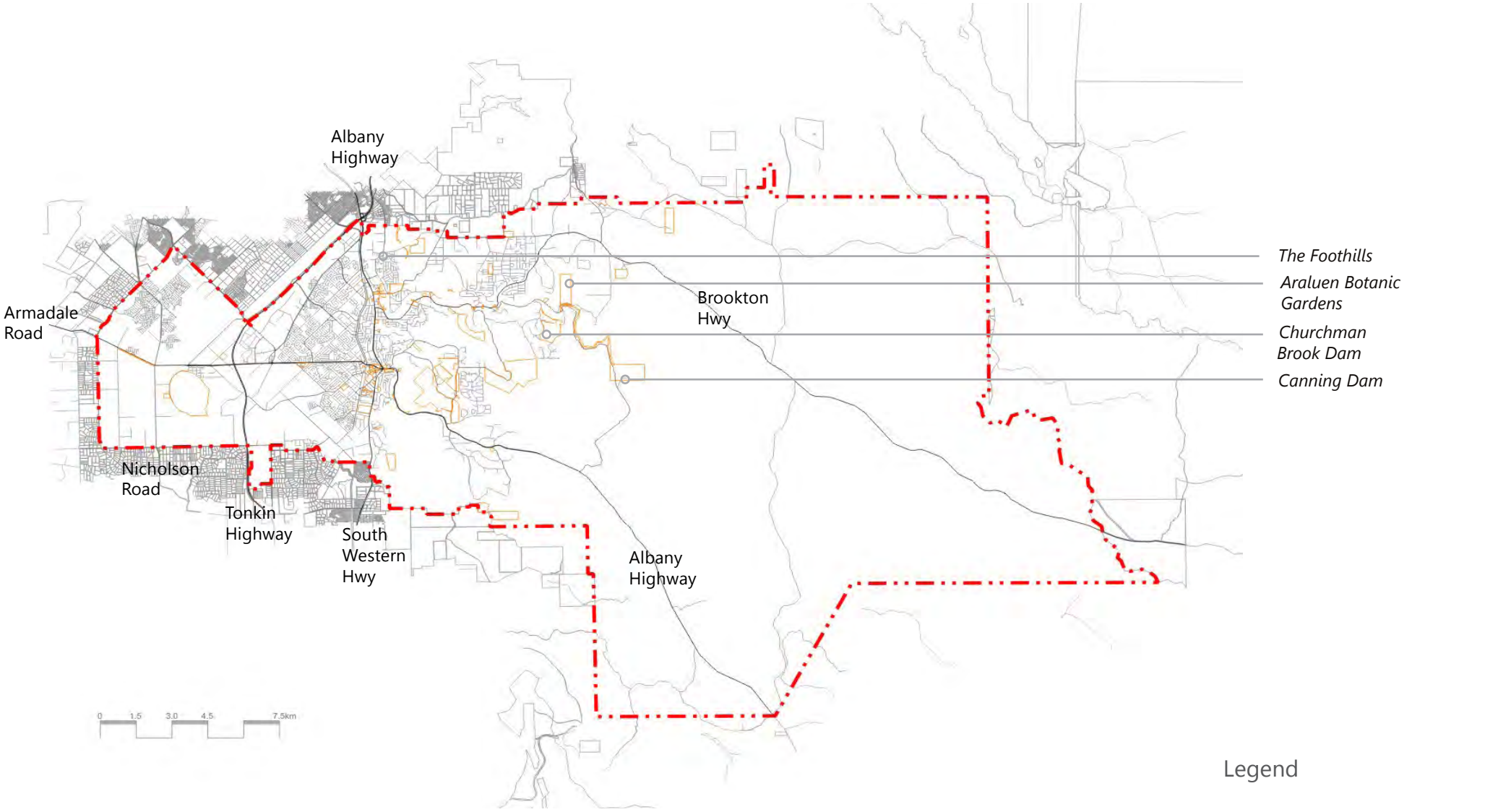
1991 - Electrification of Perth to Armadale railway

2001 - Creation of the Armadale Redevelopment Authority with proposed 10 year life span to assist and facilitate the development of the district

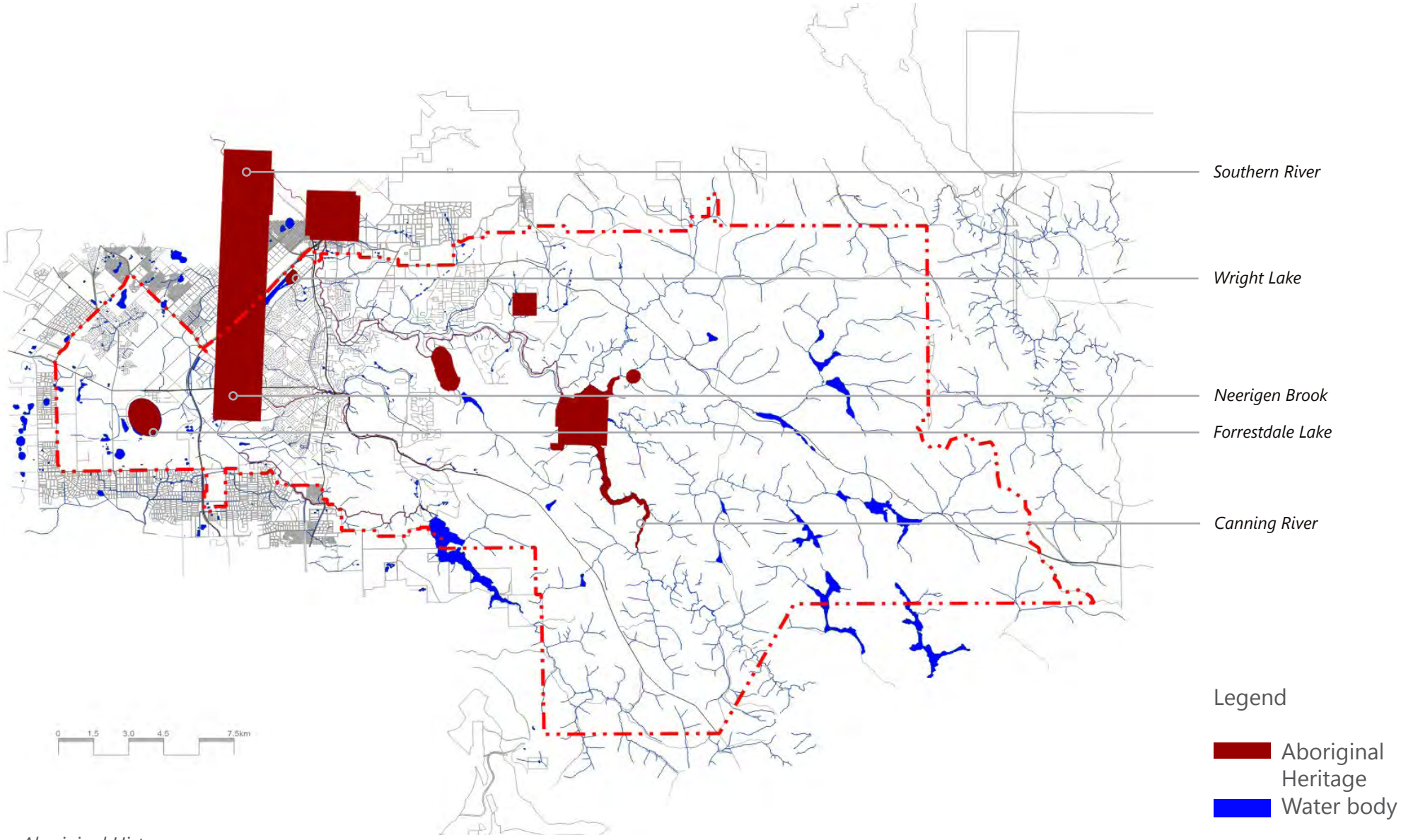
2003 - Official Opening of Birtwistle Local Studies Library on 20 June

Source: City of Armadale Website http://www.armadale.wa.gov.au/Home/About_Armadale/History/Timeline_Since_Settlement

In the CoA there are (17) seventeen present day centres/suburbs, as follows; Armadale, Bedfordale, Brookdale, Camillo, Champion Lakes, Forrestdale, Harrisdale, Haynes, Hilbert, Karragullen, Kelmscott, Mount Nasura, Mount Richon, Piara Waters, Roleystone, Seville Grove and Wungong



European History
Source: Information CoA - Drawn UDLA



Aboriginal History
Source: Information CoA - Drawn UDLA

A3.8 Aboriginal Heritage

The Noongar People

Archaeological evidence from Perth and Albany suggests that the Noongar people have lived in the area for at least 45,000 years. There are even some caves at Devil's Lair amongst the hills of Margaret River dating back 47,000 years.

The Noongar people lived in balance with the natural environment. Their social structure was focused on the family with Noongar family groups occupying distinct areas of Noongar Country.

For the Noongar People in the Perth area the main source of food came from the sea, the Swan River and the extensive system of freshwater lakes that once lay between the coast and the Darling Escarpment. Further south and east the Noongar people lived off the resources of the Karri and Jarrah forests. In the southern coastal area around Albany the Noongar people built fish traps and hunted turtle. To the north and east Noongar people lived in the semi arid regions of what is now the wheat belt.

It is known that Noongars travelled within their country to trade with other families. What is now the Albany Highway was once a Noongar track between families in Perth and Albany. Other trade routes existed in the south west and representatives could often travel for hundreds of kilometres on foot between each family group.

Since Colonisation

Despite a colonised history of oppression and marginalisation Noongar people have continued to assert their rights and identity. They have a unique, vibrant, identifiable and strong culture existing as one of the largest Aboriginal cultural blocs in Australia. This is no doubt due to the immense strength, support and dynamism of Noongar family groups most of which can trace their lineage back to the early 1800s. In fact most contemporary Noongar people know their ancestry and vast family groups to an astonishing degree.

Source SWALSC http://www.noongar.org.au/noongar-people-history.php

Registered Aboriginal sites

Registered Aboriginal sites include; Southern River, Neerigen Brook, Canning River, Forrestdale Lake, Wright Lake. These waterways are listed as having mythological significance and are traditional camping and hunting grounds of Indigenous people.

European heritage associated with pastoral / farming. Wungong masterplan identifies scarred trees with potential indigenous significance.

Numerous archaeological sites exist in close vicinity to the Wungong Brook water course which runs through the suburbs of Wungong, Forrestdale and Brookdale suggesting this plain was heavily used by Noongar people.

Aboriginal Interpretive Centre, Armadale
The Champion Lakes Aboriginal Interpretive Centre enables many facets of local Aboriginal culture to be displayed and interpreted for the indigenous and non-indigenous communities alike. The centre opened in March 2011 and provides a public outdoor amphitheatre with change rooms, an interpretive trail which includes bush tucker and medicine plants and a prominent canopy of Noongar artworks.

Bushland and Fire Management
As mentioned earlier within the Urban Forest Strategy Bill Gammage's explored how the landscape that Europeans discovered was not a natural one, but instead it was a landscape that had been altered and managed by Aboriginal people.

> *…There was systematic burning forest in order to create open grassland, and then using fire to maintain and refresh that grassland. …Once Aboriginal people were no longer able to tend their country, it became overgrown and vulnerable to the hugely damaging bushfires…*

Gammage says that Aboriginal people have a deep knowledge of how to control fire and especially and how to generate 'cool fires'. (Bill Gammage ABC July 2012)

PART B – METHODOLOGY

Tree canopy
Source: UDLA

The Hills
Source: Flickr Borocca

Methodology

The CoA Urban Forest Strategy methodology includes:

1. An overview of the vision and aims
2. From context analysis divide the CoA into four (4) collective precincts recognising similar land use, social/heritage and environmental factors
3. Analyse the urban forest existing condition for each of the four (4) precincts
4. From analysis provide findings/objectives for each of the four (4) precincts
5. Apply a street tree guide to the Liveable Neighbourhoods street typology for each precinct
6. Apply 'firewise' urban forest planning principles in recognition of potential fire-prone areas within CoA
7. Determine urban forest tree selection guide for each precinct from precinct analysis. The Urban Forest Tree Selection Guide is to acknowledge local environmental conditions, form, performance/longevity, 'firewise' (low-flammable) requirements for and ongoing maintenance including disease susceptibility

A listed summary of the methodology is as follows:

B1 - Vision & Aims

B2 - CoA Precincts, Analysis & Objectives

- B2.1 - Swan Coastal Plain
- B2.2 - Armadale Strategic Metropolitan Centre
- B2.3 - Kelmscott Townsite Centre
- B2.4 - The Armadale Hills

B3 - Liveable Neighbourhoods & Street Typologies

- B3.1 - Primary Distributors
- B3.2 - Integrator Arterials
- B3.3 - Neighbourhood Connectors
- B3.4 - Access Streets

B4 - 'Firewise' Urban Forest Planning

- B4.1 - Overview
- B4.2 - Tree Planting in Building Protection Zones (BPZ)
- B4.3 - Tree Planting in Hazard Separation Zones (HSZ)

B5 - Tree Selection Guide

- B5.1 - Determining an appropriate tree palette
- B5.2 - Local Tree Selection Guide
- B5.3 - 'Firewise' Tree Selection Guide
- B5.4 – Precinct Tree Selection Guide

B1 Vision and Aims

The vision of the City of Armadale Urban Forest Strategy is to strengthen a diverse landscape character through allocating suitable tree diversity, to be proactive in appropriate landscape planning while showcasing the city's botanic heritage and to distinguish an expanding 'tree change' destination from the existing Perth vernacular.

To guide this vision, the key aims of the Urban Forest Strategy are:

1. To strengthen and manage the CoA's urban forest in recognition of the diverse landscape characters

- Inform suitable tree canopy cover for nominated landscape character precincts,
- Provide diversity of tree genus and species suitable for purpose within nominated landscape character precincts,
- Suggest tree species that provide longevity, appropriate for position including succession planting and able to support existing landscape character whilst acknowledging best practice 'firewise' urban forest landscape planning within Armadale's peri-urban fire-prone precincts.

2. Collaborate, engage and educate the local community

- Shifting reliance to a collaborative approach, that fosters and supports shared responsibility to provide appropriate urban forest for future generations,
- Foster shared responsibility towards best practice 'firewise' urban forest landscape planning,
- Within every landscape character precinct proudly showcase the CoA's 'tree change' diversity and lifestyle.

3. Coordinate urban forest planning and management into a strategic guiding document. The Urban Forest Strategy aims to;

- Inform planning policy, strategic and urban guidelines;
- Implement / supplement and undertake succession planting appropriate to landscape character situation;
- Encourage backyards and private areas to contribute to the urban forest, whilst educating and acknowledging best practice 'firewise' landscape planning with regard to urban forest implementation and management; and;
- Develop shared governance and responsibility through ongoing urban forest implementation, maintenance and landscape planning management strategies.

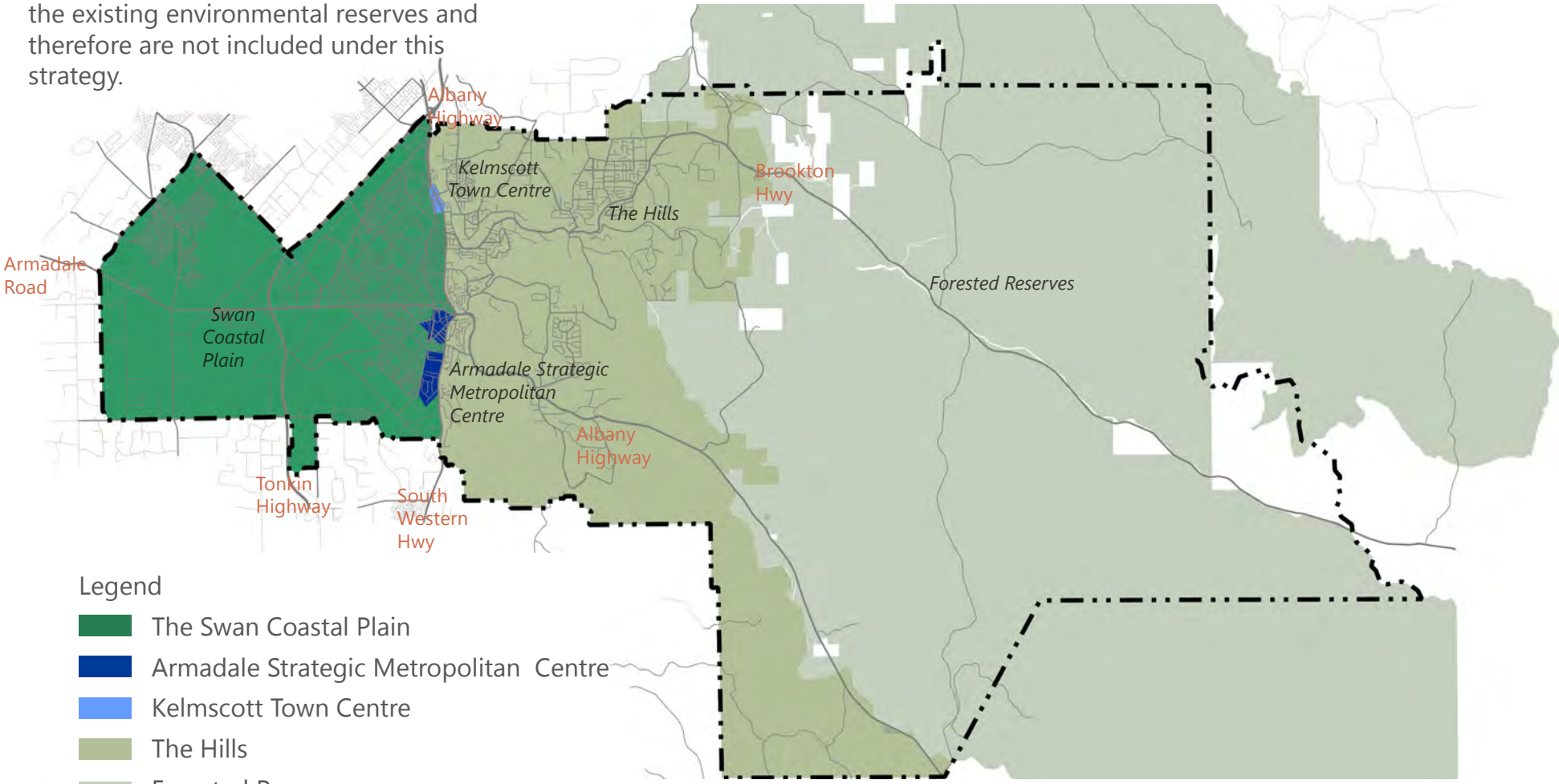
B2 CoA Precincts Analysis & Objectives

To maximise and strengthen the diverse landscape character the municipality has been divided into five (5) urban forest precincts based on collective land use, environmental and social/heritage settings.

Please note, for the purposes of this report the 'Forested Reserves' acknowledges the existing environmental reserves and therefore are not included under this strategy.

Thus, the following section individually analyses each of the four (4) precincts, and from the analysis provides findings/ objectives/recommendations for each precinct.

The individual precincts include;
B2.1 – The Swan Coastal Plain
B2.2 – The Armadale Strategic Metropolitan Centre
B2.3 – The Kelmscott Commercial/ Community Centre
B2.4 - The Armadale Hills



B2.1 The Swan Coastal Plain

Precinct Analysis

Environment:

- The Swan Coastal Plains Precinct is a large relatively flat area of land falling from 32 mAHD in the east to 22 mAHD in the west.

- The dominant bushland community for this area was *Banksia* and *Melaleuca* woodland, with stands of Marri (*C. callophylla*), Jarrah (*E. marginata*) and Flooded Gum (*E. rudis*). Flooded Gums occur closer to creek lines with Marri and Jarrah occurring closer to the foothills and higher ground. Some remnant trees and stands still remain within open rural lots and within the Forrestdale Lake Nature Reserve.

- This plain is crossed by the watercourses of Southern River, Wungong Brook and Canning River whose flows are regulated by upstream potable water reservoirs.

- Numerous swamps and lakes exist on the plain with high ecological significance including migratory birdlife, for example Forrestdale Lake is a RAMSAR listed wetland and the third most significant area in SW Australia, regularly supporting more than 10, 000 waterbirds.

- The water table is very close to the ground surface across the plain and drainage channels have been cut to draw water into the streams and brooks, creating artificial water courses.

Social/Heritage:

- European heritage associated with pastoral / farming. Wungong masterplan identifies scarred trees with potential indigenous significance.

- Registered Aboriginal sites include; Southern River, Neerigen Brook, Canning River, Forrestdale Lake, Wright Lake, these waterways are listed as having mytholgical significance and are traditional camping and hunting grounds of Indigenous people.

- Numerous archaeological sites exist in close vicinity to the Wungong Brook water course which runs through the suburbs of Wungong, Forrestdale and Brookdale suggesting this plain was heavily used by Aboriginal people.

Land-use:

- Suburbs include: Armadale, Camillo, Champion Lakes, Brookdale, Forrestdale, Harrisdale, Haynes, Hilbert, Piara Waters, Seville Grove and Wungong.

- Large expanse of pastoral land re-zoned into low density residential suburbs.

- Earlier low density residential development (1960 - 2007) in suburbs such as Armadale, Brookdale, Forrestdale, Seville Grove, and Camillo with recent infill development.

- Current / recent low density residential development (2008 - 2014) in suburbs such as Piara Waters and Harrisdale.

- Future MRA developments; Wungong Urban Water Redevelopment Scheme, Armadale Redevelopment Scheme (Champion Drive and Champion Lakes, Forrestdale Business Park).

Findings/Objectives

There is a clear opportunity to influence the retention and development of the urban forest within CoA's Swan Coastal Plain Precinct while allowing for 'firewise' considerations adjacent to natural bushland reserves. The development of the urban forest can be achieved through recommendations from the Urban Forest Strategy and dedicated CoA urban forest guidelines / planning policy.

B2.2 The Armadale Strategic Metropolitan Centre

Precinct Analysis
Environment

- Armadale Strategic Metropolitan Centre is situated at the base of the Darling scarp
- The dominant bushland community for this area is Marri and Jarrah woodland and some remnant trees still remain
- One feature example of these existing trees is known as "The Old Jarrah Tree" and has been dated to between 400 and 800 years old and is one of three trees in WA to be heritage listed

Social/Heritage

- This important Strategic Metropolitan Centre services the wider residents of the City of Armadale.
- The City of Armadale has a long history and is the site of some of the earliest land grants in the Swan River Colony
- Armadale is located at the junction of the historic routes from Perth to Albany and Bunbury. The Albany highway is situated on an original Aboriginal trading route
- The Narrogin Inn was built at this road junction in 1852 (rebuilt 1936) and the town developed around it.
- The large shopping centres (Armadale Central and Armadale Shopping City) are a dominant presence in the town centre and provides an internal meeting place and shopping experience
- Street shopping/retail exists mainly along Jull Street, Third Road and Fourth Road, and includes a pedestrian mall on Jull Street

Land use

- The City of Armadale is described as a Strategic Metropolitan Centre consisting of commercial, industrial, institutional, civic, residential and government services
- For the purpose of the Urban Forest Strategy the city centre is bounded by Armadale Road (north), South Western Hwy (East) and the rail corridor (west) and John Street to the South.
- The centre is a major transport/train station hub providing public transport connection to Perth city and the surrounding metropolitan area
- The civic area consists of council offices, library, courthouse etc.
- The civic area is characterised by a number of civic buildings connected by a large carpark under a canopy of large trees (*C. citriodoria*, and *C. maculata*)

Findings/Objectives

The Armadale Strategic Metropolitan Centre has a relatively well established urban forest structure. The key opportunities within the City Centre is to provide further pedestrian amenity, including canopy planting that reinforces the City's identity and considers strengthening the street hierarchy and way finding attributes.

Commerce Avenue, Armadale
Source: Google Earth

B2.3 The Kelmscott Town Centre

Environment

- The Kelmscott Town Centre is situated at the base of the Darling Escarpment bounded to the west by the Armadale-Perth railway corridor - Streich Avenue and east by the Picturesque and strongly tree lined Canning River, Page Road.

- The dominant local bushland community for this area is Marri (*C. Callophylla*) and Flooded Gum (*E. rudis*) and many remnant trees still remain within the river corridor and along streets (Church Street) leading to the Town Centre.

- Heritage deciduous trees are also dominate along Canning River and include Ash's, Elms, Liquidambar, Oaks, Maples and Jacaranda's providing contrasting seasonal colour against the blue-grey local foliage.

- The Town Centre is situated on Albany Highway with the urban forest canopy cover irregular and sparse due to minimal street or median trees leading up to the centre wide four laned highway, frontage retail parking and minimal side street tree planting leading onto Albany Highway.

- The main street has been more recently planted with Ash's (Claret Ash) to most likely pick up on the seasonal colour change evident along the river and hills precincts and to provide some formality to the main street.

Social/Heritage

- In 1830 the township of Kelmscott was gazetted and initially served as a military outpost to protect the early settlers an explorers in the district.

- The Canning River provided early settlers with a water supply and fertile soils for agricultural pursuits.

- The township has numerous heritage buildings situated on the outskirts of the town centre and not immediately within the town centre precinct.

- The centre would be presently used as a local commercial hub and for passing highway convenience.

Land use

- Kelmscott Town Centre is presently a second commercial centre for CoA and is in the process of revitalisation by the MRA due to recognised underutilised land.

- The Town Centre has an opportunity to borrow from its heritage past and provide a more street based local community centre.

- Existing land uses accepted within the Kelmscott Town Centre include; amusement parlour, home office, betting agency, home store, caretakers dwelling, hotel, child care premises, local shop, civic use, lunch bar, club premises, market, commercial hall, medical centre, community purpose, motel, consulting, rooms, multiple dwelling, convenience store, office, dwelling, place of worship, educational establishment, reception centre, exhibition centre, restaurant, family day care, shop, fast food outlet, showroom, grouped dwelling, tavern, home business, veterinary centre and home occupation.

Findings/Objectives

In contrast to the Armadale Strategic Metropolitan Centre, the Kelmscott Town Centre has an undeveloped urban forest. Therefore, the key urban forest opportunities within this centre is to further formalise and supplement the existing urban forest to provide pedestrian amenity and develop a unique theme that corresponds to the broader towns heritage and local sense of place as a 'tree change' destination and northern gateway to the CoA.

Kelmscott Hills
Source: Google Earth

B2.4 The Hills

Environment

- The Darling Escarpment and Plateau form significant regional landforms and are defining character features of the City of Armadale.

- 'The Hills' urban precinct rises up the Darling Escarpment from the Swan Coastal Plain until reaching a north south plateau. The elevation is approximately 30m to 240m AHD.

- The two (2) most urbanised valleys follow the Canning River (Brookton Highway) and Neerigen Brook (Albany Highway). The valleys leading down from the escarpment plateau are generally aligned east west.

- The urban lots situated within 'The Hills' precinct exist on diverse topography, from moderate sloping valley floors with moderate spur lines (Kelmscott, Mount Nasura, Mount Richon), to more steeply sided valley topography leading up to the plateau (Roleystone, Karragullen and Bedfordale).

- The urban fringe of 'The Hills' precinct penetrate like fingers into the existing bushland that include endemic reserves such as the; Lloyd Hughes Park, Darling Range Regional Park, Gosnells Regional Open Space, Jarrahdale State Forest, Stinton Cascades Nature Reserve, Wungong Regional Park, Churchman State Forest, Bungendore Park and the Darling Range Regional Park.

- Within 'The Hills' urban fabric there is a strong presence of local tree canopy that reflects the transition between the Swan Coastal Plain and the Darling Plateau vegetation communities including; Jarrah (*E. marginata*), Flooded Gum (*E. rudis*) in the valleys to the higher steeper slopes including; *E. patens, C. calyphylla, E. lane-poolei, E. laeliae* and *Allocasuarina huegeliana*.

- 'The Hills' have a history of bushfires and therefore would be considered a fire-prone area.

- The natural bush and topography is the attraction that draws people to the area, many seeking a "tree change."

- 'The Hills' precinct has a strong local urban forest with majority remnant species and some imported native trees. Private residences, even those within close quarters (suburban densities) to each other are often screened by local bushland, including trees, shrubs and groundcovers.

- There is an informal aesthetic to the urban streetscape with most road easements either containing remnant tree planting or planting that has continued from the adjoining property onto the verge.

- Some verges are cleared and appear asymmetrical due to overhead wires limiting or removing the surrounding tree canopy.

- Introduced trees along the valley floors and along the rivers and adjacent orchards include many deciduous species that provide autumn colour and seasonal change including; Ash's, Elms, Liquidambars, Oaks, Maples and Jacaranda's. In some cases deciduous trees planted in strong rows have historically been understood and providing a summer bushfire protection buffer, protection from ember attack and associated wind buffers. The benefits of this planting while historically evident requires modelling as part of a specific CoA Bushfire Management Plan

- Rivers: The foothills are intersected by three rivers; Canning River, Neerigen Brook and Wungong River

Social/Heritage

- 'The Hills' have been seen as a European heritage precinct due to The Canning River providing early settlers with a water supply and fertile soils for agricultural pursuits that continue to present day.

- Heritage buildings and landscapes are dotted up the Canning and Wungong Rivers.

- The Churchman Brook and Canning Dams have continuously supplied Perth with water since 1925 and 1940 respectively.

- Araluen Botanic Park was established in 1929 as a holiday camp and now a recognised state botanic attraction, a major State and tourist getaway.

Aboriginal Heritage

- Darling Scarp and Plateau are of cultural significance and include mythological and ceremonial sites, artefacts and scatters. While all land is significant to Aboriginal people the recognised more significant sites include: Djarlgarro Beelier (Canning River), sites associated with the Waugal including Wungong River, path of Neerigen Brook, alongside Albany Highway.

Land use

- Present day orchards and other agricultural properties provide 'The Hills' precinct with a bucolic landscape character

- 'The Hills' precinct includes the suburban / semi-rural (peri-urban) settlements of Kelmscott, Mount Nasura, Mount Richon, Bedfordale, Roleystone and Karragullen
- Many of suburbs while fringing native bushland experience densities similar to suburban Perth

- The precincts urban fringe often gives away to semi-rural valleys used for market farming, orchards (citrus, stone fruits, grapevines etc) and other small farming pursuits

Findings/Objectives

The underlying key principle is to preserve and maintain the unique character, ecology and biodiversity of 'The Hills'. 'The Hills' urban forest is predominantly local planting with mixed exotic species relating to the European settlement and ongoing small agricultural and orchard farms. In contrast to the Kelmscott Town Centre the Strategy supports the informal streetscape and neighbourhood planting, especially within the neighbourhood and lower order streetscapes.

Similar to the Kelmscott Town Centre the Strategy supports areas of strong deciduous planting within 'The Hills' primary distributors road network, considering local autumn colour theming and opportunity for possible fire buffering. The Urban Forest Strategy recommends 'The Hills' precinct tree canopy planting to be robustly considered in relation to 'firewise' urban forest planning principles. The Armadale Hills are historically considered a fire-prone area and require detailed fire management considerations including 'firewise' urban forest planning with regard to tree selection and planting within the Building Protection and Hazard Separation Zones (BPZ & HSZ). There is an opportunity to strategically plant trees to provide sense of place, theming, way finding and potential fire buffer planting.

Hills vegetation, Wungong Catchment
Source: Water corporation

B3 Liveable Neighbourhoods & Street Typologies

The Urban Forest Strategy recognises that trees are to be part of urban planning upfront considerations. Planning for trees is not a density issue it is an upfront design issue. It is evident that contemporary planning has left tree planning / design as an unconsidered back end constraint and more often trees, if used are now located in left over voids. These left over spaces are frequently not adequate to provide for tree structure or future health needs, let alone add to the local or overall urban forest amenity.

"Liveable Neighbourhoods" (LN) planning policy guides urban development in Western Australia describes a hierarchy of street typologies based upon composition and scale. In this strategy LN has been used to influence tree planting from a planning level, ensuring tree planting strategy is directed towards outcomes appropriate for the main street types.

While LN considers tree planning within streetscapes there is a considerable conflict with service corridors, civil services (kerbs, drainage) and streetscape amenity including paths and furniture. Habitually the only provision or space left over for trees in streetscape is sharing the street light corridor in-between street lights.

To allow for horticultural requirements with regard to tree structure and ongoing health, the planting area required for trees is required to be greater than the areas indicated within LN verges, particularly considering the number of required contemporary services (that are not common or under pavement trenched), footpaths and streetscape furniture.

Trees can coexist with increased density as is proven within city precedents nationally and across the globe. Poor urban forest outcomes experienced in contemporary urban development is due to conflict from poor planning / design and not allowing adequate tree space within the streetscape to coincide with increased crossovers, narrower verges, demand for parking spaces and the increased underground services, (common or under pavement trenching).

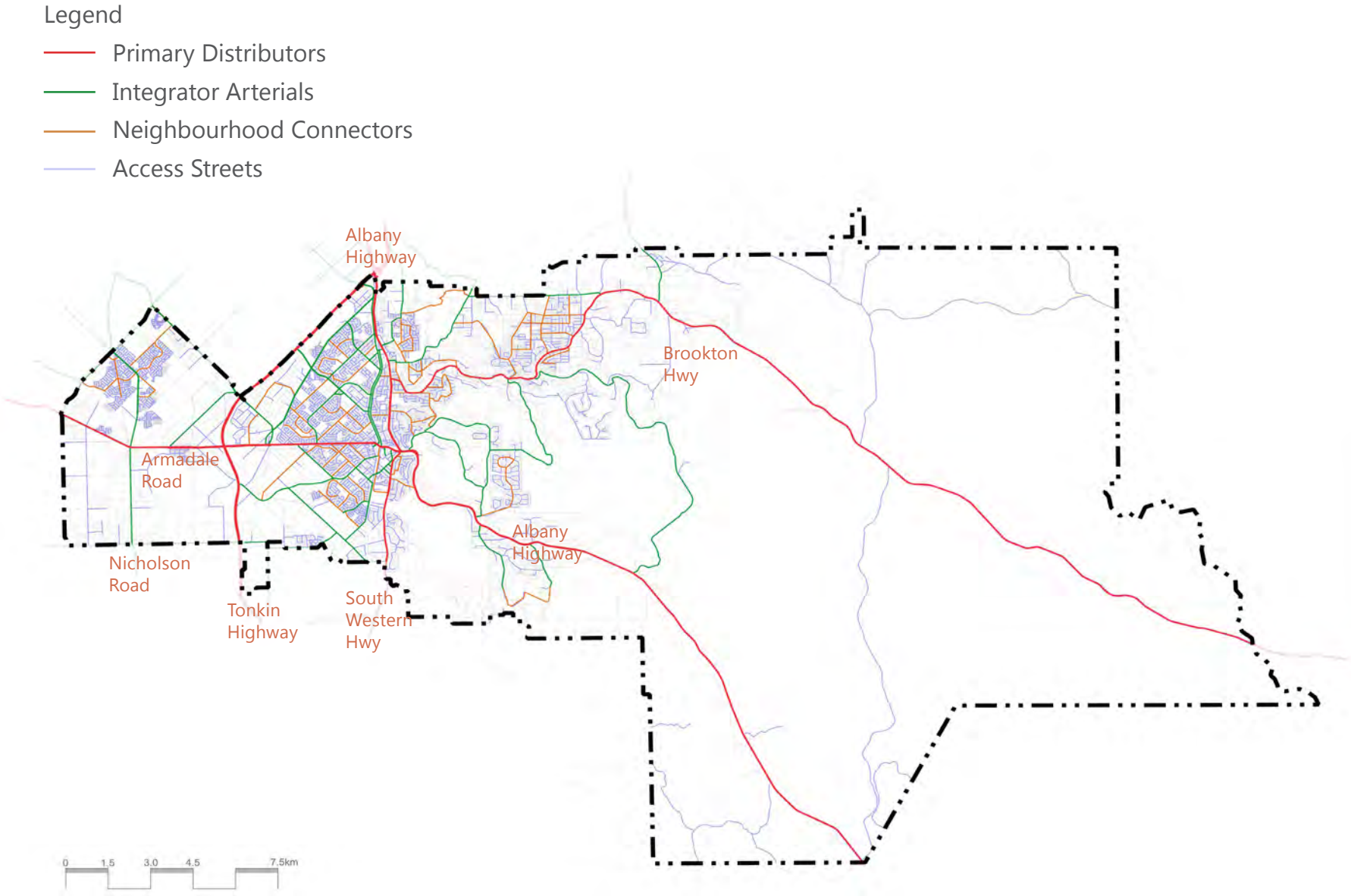
Therefore, retention of existing trees and the provision of space for the planting of trees is a multidiscipline early planning / design requirement.

Street typologies

"Liveable Neighbourhoods" planning policy guides urban development in Western Australia and can be used as a source to help distinguish different urban typologies. This policy defines four main urban street typologies:

B3.1 - Primary Distributors
B3.2 - Integrator Arterials
B3.3 - Neighbourhood Connectors
B3.4 - Access Streets

The streets within the CoA have been categorised according to these typologies with a street tree hierarchy applied to enhance the Urban Forest for each typology. (Refer to Part C – Urban Forest Strategy Application)


Legend
Primary Distributors
Integrator Arterials
Neighbourhood Connectors
Access Streets
Albany Highway
Brookton Hwy
Armadale Road
Albany Highway
Nicholson Road
Tonkin Highway
South Western Hwy
0
1.5
3.0
4.5
7.5km

B3.1 Primary Distributors

Primary Distributors link The CoA to the rest of the metropolitan region and beyond and include highways and major truck routes. The large scale of this urban typology requires large trees (maximum height 20m+) to form its urban forest to spatially balance the urban form.

The associated wide verges and medians provide opportunities for large and extensive tree planting. An important role of the urban forest in these areas is to soften these harsh environments improving the experience of occupying them and consequentially improving commercial opportunity. Finally these streets are high profile locations that give an impression of the wider region or city to those who are passing through and are important in conveying the distinct.

Map of Primary Distributors Across the City of Armadale

Opportunity to strengthen entrance and showcase CoA as 'tree change destination'

Connection to hills in backdrop

Large scaler requires large trees (max height 20m)

Limited existing canopy - opportunity to soften harsh environment

Existing Condition of a Primary Distributor - Albany Highway
Source: Google Earth

Supplement and complement existing planting

Opportunity to strengthen central median planting

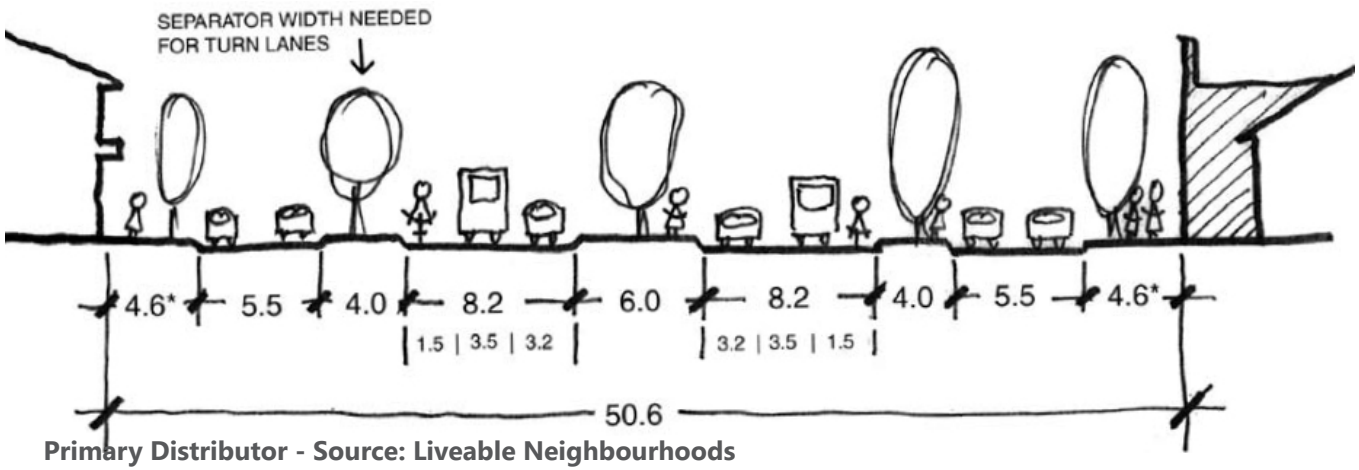
Wide verges allow for extensive planting

Existing Condition of a Primary Distributor - Armadale Road and Seventh Road
Source: Google Earth

Good example of median and verge planting

Vegetation softens road and associated infrastructure

Precedent Example of Primary Distributor - Armadale Road and Tait Street
Source: Google Earth



Primary Distributor - Source: Liveable Neighbourhoods

Existing condition of a Primary Distributor - Armadale Road near Seventh Road

Potential condition of a Primary Distributor - Armadale Road near Seventh Road

**Site by site assesment required for implementation potential*

B3.2 Integrator Arterials

Integrator Arterials draw traffic from the Primary Distributors into residential suburbs and connect neighbouring suburbs. The scale of the urban form of Integrator Arterials is reduced and therefore requires medium sized trees (maximum height 15-20m). These typologies have moderately sized verges and medians that allow space for medium sized trees. These streets are often shared spaces and meeting places for the community adjacent to POS and local shops.

The associated high pedestrian usage requires an urban forest to enhance the pedestrian experience through shade, visual interest and softening of hardscape. These streets provide a sense of arrival into a neighbourhood and give visitors their first impression of the neighbourhood with associated impacts upon neighbourhood wide property prices.

Map of Integrator Arterials across the City of Armadale

Support and supplement existing planting

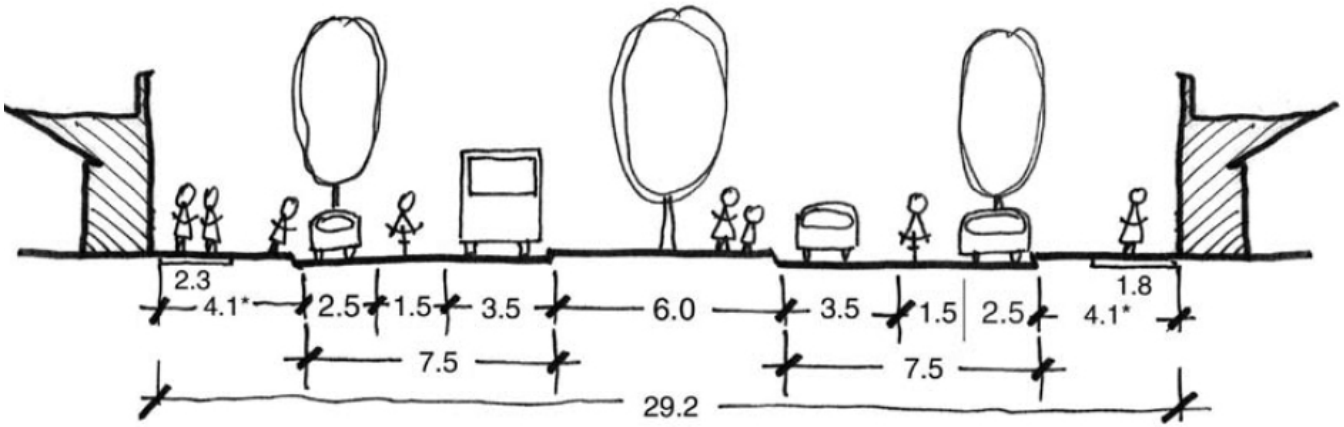
Increase verge planting to soften built form and provide a pedestrian scale

Existing photo of Integrator Arterial - Nicholson Road
Source: Google Earth

Good canopy vegetation in medians and verge areas offering climatic protection and pedestrian scale

Medium sized tree (max height 15 - 20m)

Precedent Example of Primary Distributor - Forrest Road near Sixth Avenue
Source: Google Earth



Integrator Arterials - Source: Liveable Neighbourhoods

Existing condition of an indicative Integrator Arterial - Nicholson Road

Potential condition of an indicative Integrator Arterial - Nicholson Road

**Site by site assesment required for implementation potential*

B3.3 Neighbourhood Connectors

Traverse neighbourhoods creating linkages within the neighbourhood and are mainly fronted with residential properties. A further decrease in scale of the urban form occurs and therefore a decrease in the scale of the trees comprising the urban forest corresponds (Maximum height 10-15m). Medians are rare and small when present and provide restricted tree planting opportunity. However, the verges are often spacious and provide residents with a buffer from traffic, allowing good tree planting opportunities. These streets still form the route to specific destination points and therefore have a strong influence upon the character of a suburb to visitors and residents.

Map of Neighbourhood Connectors across the City of Armadale

Supplement and enhance private planting

Opportunity to transform verge areas from turf to planting

Existing photo of Neighbourhood Connector - Connell Avenue
Source: Google Earth

Backyard and private planting

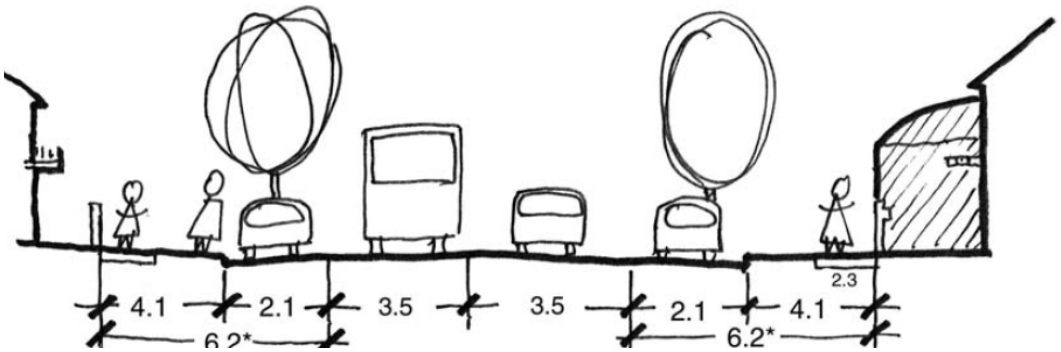
Planting reflects a decrease in urban form scale

Housing is buffered by planting

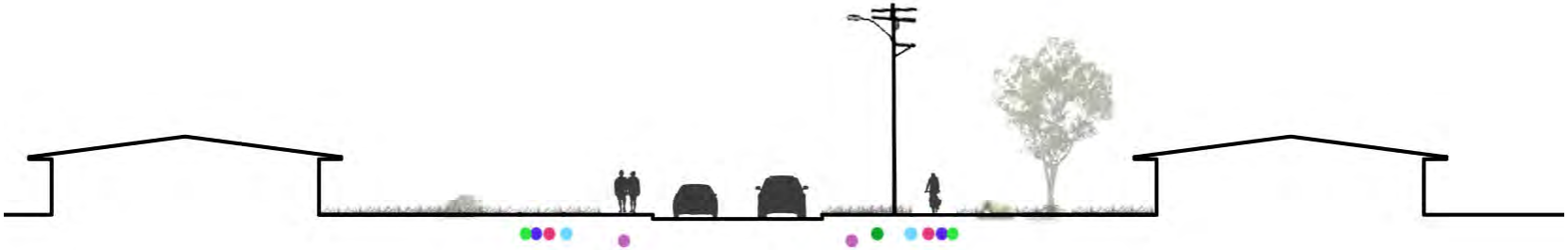
Unique landscape character

Shading of footpaths and roads

Precedent photo of Neighbourhood Connector - Seventh Road near Wungong Road
Source: Google Earth



Neighbourhood Connector - Source: Liveable Neighbourhoods



Existing condition of a Neighbourhood Connector - Connell Avenue

Potential condition of a Neighbourhood Connector - Connell Avenue

**Site by site assesment required for implementation potential*

B3.4 Access Streets

Access Streets comprise fine grain of the transport network and are often final destination points for traffic. These streets provide a sense of 'home' to residents and can have strong personal association and sentiment.

The intimate scale of the streets requires smaller trees in the urban forest and enhances opportunity for the appreciation of the ornamental features of trees e.g. flowers, trunk, leaf colour etc. There is restricted opportunity on public land (small verges with services) therefore opportunity exists to encourage the contribution of private landowners to the urban forest by planting trees on their land.

Map of Access Streets across the City of Armadale

Intimate scale of street requires smaller trees

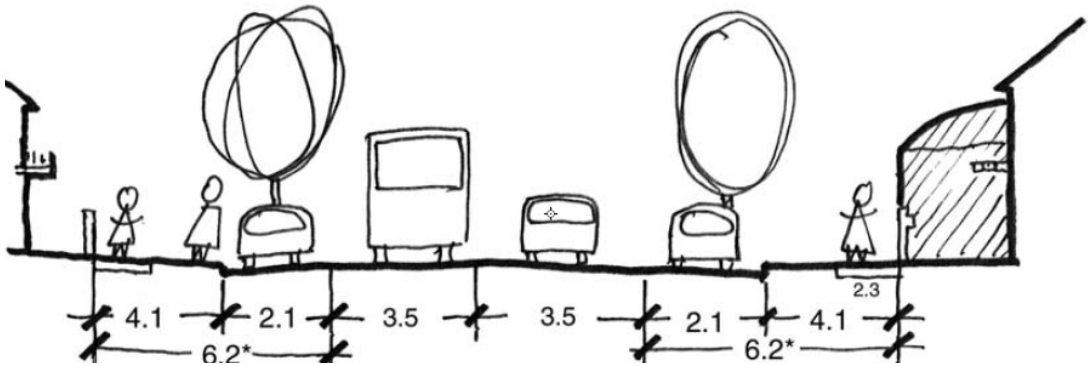
Limited street trees and overhead canopy due to small verges and services

Existing photo of Access Street - Hookway Cresent
Source: Google Earth

Planting screens built form and blends in natural environment

Planting setback off road allows clear vehicular visibility and view lines

Precedent photo of Access Street - Stepney Road & Avonlee Road
Source: Google Earth



Access Street - Source: Liveable Neighbourhoods

Existing condition of an Access Street - Hookway Cresent

Potential condition of an Access Street - Hookway Cresent

**Site by site assesment required for implementation potential*

B4 'Firewise' Urban Forest Planning

B4.1 Overview

The Urban Forest Strategy notes that often bushfire management and local biodiversity or conservation bush management can include contrasting management outcomes. To further concentrate this issue within the Armadale Hills, recent urban infill has provided housing lots at close to suburban density and most housing lots have undertaken minimal clearing to fulfil the wishes of living in the bushland environment. Within these areas and with small lots your neighbours (community) are as responsible to maintain bushfire protection and hazard zones as you are to them. Many residents are unable (or willing) to undertake appropriate contemporary fire controls as per the latest bushfire guidelines such as clearing adequate fire separation zones or in turn the costly exercise of lifting the bushfire attack level (BAL) rating of their home, to lessen the extent of bushland clearing.

The term 'firewise' refers to a proactive way of being, living, and doing what is required to be prepared for fire. It includes the knowledge and use of strategies/ procedures and sound community planning for protecting homes and lives from bushfire with emphasis on mitigation - before it starts. The term is generally consistent as applied in a National and Australian context including bushfire protection zones and the use of low-flammable tree species. The key recommendation of the Keelty Review into the Perth Hills Bushfire was:

> *...that fuel loads should be reduced around homes and other critical buildings. Evidence shows that BPZs can reduce the exposure of such assets to bushfire and thus assist in fire fighting efforts.* ('A Shared Responsibility' M.J. Keelty June 2011)

By virtue of human habitation it is important to recognise that CoA now has a changed urban ecology to the adjoining native State Forest Reserves which make up more than 50% of the area of the City of Armadale, especially within 'The Hills' precinct. The new land use and forest interface requires to be managed according to its changed land use status.

The Urban Forest Strategy recognises that this is not a fire management plan for the CoA, however the strategy understands the urban forest is a key component within such a plan. Therefore the strategy includes contemporary state and national best practice 'firewise' tree planting suggestions that would be included in a 'firewise' urban forest planning component of a dedicated CoA Fire Management Plan; i.e. recommended planting measures for nominated fire-prone precincts, chiefly within Building Protection and Hazard Separation zones (BPZ & HSZ) and the use of appropriate 'firewise' low flammable tree species for considered (historic) fire-prone precincts.

The Urban Forest Strategy recommends the preparation of a detailed Bushfire Management Plan specific to the CoA and one that recognises contemporary best practice 'Firewise landscape planning'. The recommendation would include that both the CoA Urban Forest Strategy and Bushfire Management Plan would seamlessly integrate strategies including those with the State Bushfire Management Guideline/ and future associated planning policy's. Contemporary best practice 'firewise' resources are referred to within the CoA urban forest strategy.

B4.2 Tree Planting in Building Protection Zones (BPZ)

Building protection zone

Definition - Low fuel area immediately surrounding buildings no more than the recommended maximum of 2 tonnes per hectare, minimum width of 20 metres and increasing with slope. FESA recommend spacing of plants should use a rule of thumb being three times the anticipated plant height within the building protection zone (BPZ).

The impact from fire is greatly reduced when there is little or nothing to burn. The aim of the building protection zone is to reduce the fuel that can burn, within a minimum 20 metre radius, to ensure that there will be no direct flame contact on a building from a bushfire. While this is the main aim it is also possible to reduce the potential radiant heat impact on the building. The BPZ can be included in the fuel reduced areas such as verges and lawn areas adjacent to the house.

This can be achieved by:

- Maintaining a minimum two metre gap between trees and the building, and have no trees overhanging the house
- Trees and branches that could fall on the house to be removed
- The parkland type clearing and slashing should provide for ten metres separation distance to the crowns of individual trees
- Pruning lower branches of remaining trees must be trimmed up to two metres off the ground, to stop a surface fire spreading to the canopy of the trees
- Making sure there is a gap between shrubs and trees, and that they are not clumped together.
- Keeping the grass short and pruning the scrub so that it is not dense and does not have fine, dead aerated material in the crown of the scrub
- Raking up leaf litter and twigs under trees, and removing trailing bark
- All leaves and tall grass are to be removed, suggest bush fire fuels must be maintained below a height of 10cm

Source: Australian Fire Control

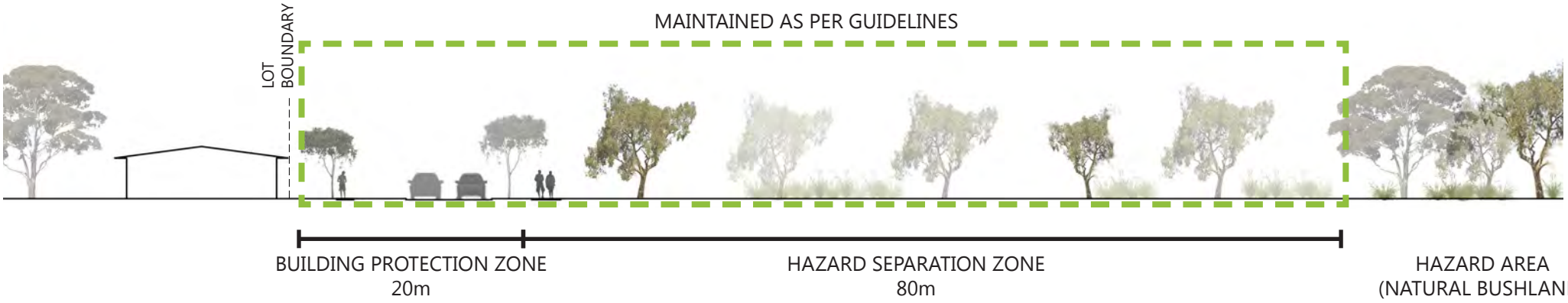
A firefighter hoses a fire in Roleystone 8th of February 2011
Source: Department of Parks and Wildlife

B4.3 Tree Planting in Hazard Separation Zones (HSZ)

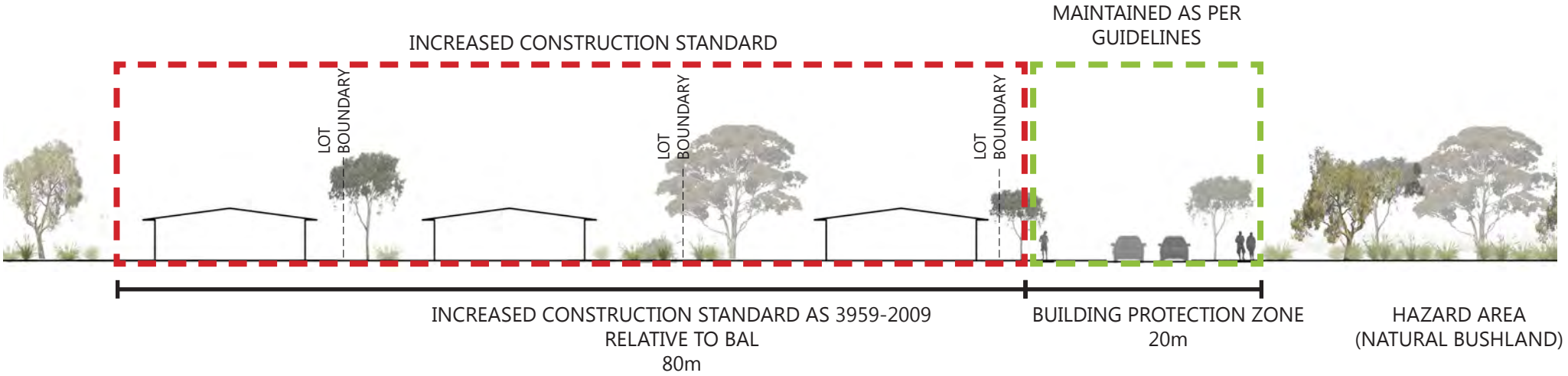
Hazard separation zone

Definition - HSZ are designated as the area surrounding a building which is maintained in a fuel reduced state. This is nominally up to 100 metres and contains a general fuel load of between 5 and 8 tonnes per hectare. The 100 metre distance applied for HSZ includes the building protection zone (i.e. is not additional to the 20 metre). FESA recommend spacing of plants should use a rule of thumb being twice the anticipated plant height in the hazard separation zone (HSZ). A HSZ can be achieved by slashing understorey species or physical removal of species to maintain a fuel reduced state. A Hazard Separation of 100 metres is recommended in all cases of bushfire prone areas.

Note: The Australian Standard sets out improving the ability of buildings in bushfire-prone areas to better withstand attack from bushfire, thus giving protection to occupants. If the Hazard Separation Zone of 100 metres cannot be achieved within recognised bushfire-prone areas then buildings will be required to be constructed as per the Australian Standard (AS) AS3959-2009 Bushfire Attack Rating (BAL). It is likely that the houses which occur along the perimeter of subdivision or within peri-urban environments adjacent and within remnant vegetation (Armadale Hills) cannot meet 100 metre HSZ and would require higher BAL ratings to meet AS guidelines for recognised fire-prone areas.



An example of a property adjacent to bushland with maintained BPZ and HSZ and without increased construction standards.
SCALE 1:500



Indicative section of location where Hazard Separation Zone of 100 metres cannot be achieved within recognised bushfire-prone areas. Buildings will be required to be constructed as per the Australian Standard (AS) AS3959-2009 Bushfire Attack Rating (BAL).
SCALE 1:500

Corymbia calophylla nuts
Source: Flickr jeans_Photos

B5 Tree Selection Guide

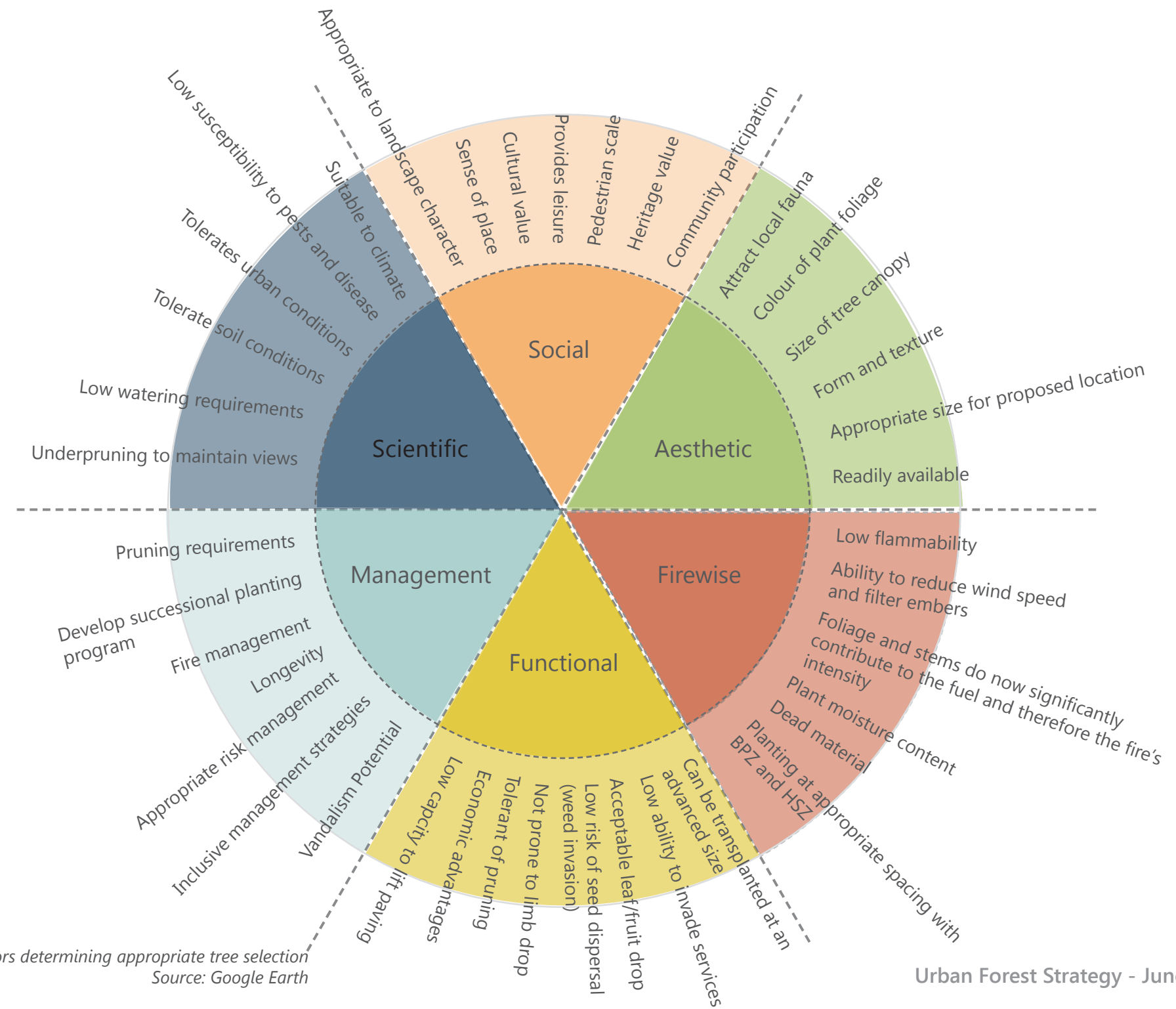
B5.1 Determining an appropriate tree palette

Tree selection is a complex task and requires an understanding of how a particular tree will affect, and be affected by its surroundings during the course of its lifetime. A major aspect to consider in street tree planting is the potential affect of each tree on services including sub surface drainage.

The six (6) key assessment criteria that the CoA street tree selection must align to are:

- Scientific
- Social
- Aesthetic
- Functional (Form)
- 'Firewise', and
- Management

Some of the main factors to consider in predicting a successful relationship between a tree and its context are summarised are illustrated in the following graphic



Factors determining appropriate tree selection
Source: Google Earth

B5.2 Tree Selection Guide

Please note the CoA Urban Forest Strategy assessment criteria and recommended tree selections are a guide only. Specific situation, safety, form and purpose is to be continually considered when determining the appropriate tree(s) planting.

Local

Mapping of the vegetation complexes allow an understanding of what trees are naturally associated with the different precincts across the CoA.

These tree species have helped define the natural character of each precinct and can form a base list of species for planting and preservation. The appropriateness of these species in a contemporary urban context is an essential consideration and will restrict the use of some species however where possible and appropriate their use should be encouraged.

The existence of these species is of great ecological importance and influences the "sense of place" of the region. Their incorporation into urban environments will benefit future generations; however achieving this requires an increased effort and understanding that can be led by The CoA stating a desire to include these species as the major contributors to its urban forest.

From the base selection of local trees, species are then further selected with regard to the tree selection matrix including resistance to disease, ease of maintenance, form and longevity.

Introduced

Introduced trees are recommended known performers for;

- Street trees
- Residential lots
- Parklands

'Firewise'

The 2011 FESA 'Plant Guide within the Building Protection Zone, for the Swan Coastal Plain of Western Australia' provides tables of information that can be applied to tree selection, including:

- Genus
- Species
- Average height (metres)
- Minimum distance from home (2.5 x Average height)
- Minimum spacing in BPZ (3 x Average height)
- Minimum spacing in HSZ (2 x Average height)

The FESA bush fire plant guide uses separation distances for trees as determined by height for all species, irrespective of their inherent flammability. For the purpose of the Urban Forest Strategy the 'firewise' selection does not use the taller local native varieties and considers those with a 20m minimum distance from residence therefore they could be used as single planting within a BPZ or sparingly within HSZ. The CoA Urban Forest Strategy recommends using less fire-retardant trees such as Eucalypts sparingly within the BPZ and HSZ's.

Local ‘firewise’ trees also preclude tree species that have potential for disease and poor form around residences.

Following is a recommended ‘firewise’ tree selection guide for the Swan Coastal Plain and Armadale Hills Precinct. The trees included are a mixture of exotic deciduous / evergreen and local native trees selected from the following guides;

Western Australia
- ‘Plant Guide within the Building Protection Zone for the Swan Coastal Plain of Western Australia’, FESA (DFES) Bushfire and Environmental Protection Branch, 2011

National
- ‘Plant Selection Key’, CFA Victoria 2012
- Victorian CFA’s 2012’ landscaping for bushfires
- Australian Plants Society VIC ‘Australian Native Plants For Fire Protection’

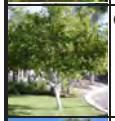
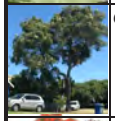
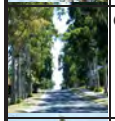
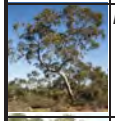
Armadale Hills vegetation
Source: Panoramio Steve111

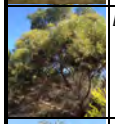
B6 Plant Schedule

PLANT SCHEDULE

Please note the CoA Urban Forest Strategy assessment criteria and recommended tree selections are a guide only. Specific situation, safety, form and purpose is to be continually considered when determining the appropriate tree(s) planting

Photo	Botanical Name	Common Name	Size (H x W)	Notes	Precinct	Local	Introduced	Fire Wise	Streetscape	Parkland	Residential
	*Agonis flexuosa*	WA Peppermint	8 -10m x 6m	Fibrous trunk with low branches, often partially disguised by a graceful dome shape and weeping habit	Armadale Strategic Metropolitan Centre, Swan Coastal Plain,	Y		Y	Y	Y	Y
	*Allocasuarina fraseriana*	WA Sheoak	8 - 12m x 3m	Casuarinas bear a resemblance to pine trees with needle-like foliage and woody fruits. The foliage, however, is not composed of true leaves but rather	Armadale Strategic Metropolitan Centre, Swan Coastal Plain,	Y			Y	Y	Y
	*Allocasuarina huegeliana*			Moderate to fast growing, nitrogen-fixing tree with potenial as a windbreak, hedge or screen (rather than street tree). Not recommended for poorly	Armadale Strategic Metropolitan Centre, Kelmscott Town Centre, The Hills			Y		Y	Y
	*Alnus glutinosa*	Black Alder	12 x 7m	Not for planting near water pipes/ drainage - root problems				Y			
	*Banksia grandis*			Concerns with ferts from internal gardens/ lawns	Swan Coastal Plain					Y	Y
	*Betula pendula*	Silver Birch	20 x 10m	Recommended for irrigated areas			Y	Y			
	*Brachychiton acerifolius*	Australian Flame Tree	6 - 10 x 5 - 10m	This semi- deciduous tree is much admired for its masses of crimson flowers which often appear when the tree is bare of foliage. Drought tolerant.			Y	Y	Y	Y	Y
	*Brachychiton populneus*	Black Kurrajong	10 - 15m x 5 - 8m	High drought tolerance coupled with an attractive broad-form			Y		Y	Y	Y
	*Callistemon viminallis*	Weeping Bottlebrush	10m	Commonly used tree. Doesn't contribute to sense of place and landscape character	The Hills, Armadale Strategic Metropolitan Centre, Swan Coastal Plain,		Y		Y	Y	Y

	*Citrus sp*			Recommended for private areas			Y	Y			Y
	*Citrus limon 'Meyer'*	Meyer Lemon	7 x 4m	Recommended for private areas			Y	Y			Y
	*Corymbia calophylla*	Marri	10-15m x 4 - 8m	Use in verges without footpaths (large nuts create path hazard). Currently used, readily available	Swan Coastal Plain, Armadale Strategic Metropolitan Centre, Kelmscott Town Centre, The Hills	Y			Y	Y	
	*Corymbia ficifolia*	Red Flowering Gum	15m	Grafted species recomended. Proven species	Swan Coastal Plain, The Hills, Armadale Strategic Metropolitan Centre,		Y		Y		
	*Corymbia haematoxylon*	Mountain Marri	15m	Occurs sandy soils over sandstone or lateritic duricrust. Breakaways, scarps	Kelmscott Town Centre, The Hills	Y			Y		
	*Corymbia maculata*	Spotted Gum	12m x 6m	Eastern states species. One of the most widely used street tree species	Armadale Strategic Metropolitan Centre, The Hills, Swan Coastal Plain,		Y		Y		
	*Cupressus sempervirens 'glauca'*	Italian Pencil Pine	15 x 1m	Recommended for private areas			Y				Y
	*Eucalyptus accedens*	Powderbark Wandoo	8 - 15m x 6-8m	Tree up to 25m	Kelmscott Town Centre, The Hills, Armadale Strategic Metropolitan Centre	Y			Y	Y	
	*Eucalyptus argutifolia*	Wabling Hill Mallee	4m H				Y	Y	Y	Y	Y
	*Eucalyptus caesia*	Silver Princess	8 x 4m		Hills		Y	Y	Y	Y	Y

	*Eucalyptus drummondii*	Drummond's Gum	8m H		Swan Coastal Plain			Y	Y	Y	Y
	*Eucalyptus foecunda*	Fremantle Mallee	2 - 5m H		Swan Coastal Plain, The Hills		Y	Y	Y	Y	Y
	*Eucalyptus forrestiana*	Fushicia Gum	4 - 6m x 3 - 4m	Small tree up to 4.5m high. Bright red buds	Armadale Strategic Metropolitan Centre, The Hills, Swan Coastal Plain, Kelmscott Town Centre		Y			Y	Y
	*Eucalyptus gomphocephala*	Tuart	10-40m H	Tolerates strong coastal winds and sandy, alkaline soils derived from limestone, Requires a large amount of space.	Swan Coastal Plain	Y				Y	
	*Eucalyptus laeliae*	Darling Range Ghost Gum	10m x 6m	Granite outcrops & hills.	Kelmscott Town Centre, The Hills	Y			Y	Y	Y
	*Eucalyptus lane-poolei*	Salmon White Gum	10m	Occurs on laterite and granite and along creek banks, Requires a large amount of space.	Swan Coastal Plain, Kelmscott Town Centre	Y			Y	Y	Y
	*Eucalyptus leucoxylon*	Yellow Gum	4 - 30m	Attractive small red flower and long flowering, medium tree. Popular in cultivation.	Swan Coastal Plain, The Hills, Armadale Strategic Metropolitan Centre,		Y		Y	Y	
	*Eucalyptus marginata*	Jarrah	40m	Slow growing, straight trunked, important ecological species, dieback susceptible, grow much smaller on the plain than in the hills (approx 15m)	Armadale Strategic Metropolitan Centre, The Hills, Swan Coastal Plain, Kelmscott Town Centre						
	*Eucalyptus patens*	Swan River Blackbutt	20m	Depressions, valleys and stream banks	Kelmscott Town Centre, Armadale Strategic Metropolitan Centre	Y			Y	Y	Y

	*Eucalyptus petrensis*	Rock Mallee	1. 5 - 4m H				Y	Y	Y	Y	Y
	*Eucalyptus sideroxylon rosea*	Red Iron Bark	20m		Armadale Strategic Metropolitan Centre		Y		Y	Y	
	*Eucalyptus todtiana*	Coastal Blackbutt	8 - 10m	Mallee or tree. Not recomended close to intersections or in narrow streets - can multi trunk (vision hazards)	Swan Coastal Plain	Y			Y	Y	Y
	*Eucalyptus torquata*	Coral Gum	7m x 5m	Small to medium sized tree. Striking red flowers, distinctive flower buds. Small and easy to managed	The Hills, Armadale Strategic Metropolitan Centre, Swan Coastal Plain, Kelmscott Town Centre,		Y		Y	Y	Y
	*Eucalyptus victrix*	Little Ghost Gum	6 x 3		Swan Coastal Plain,				Y	Y	Y
	*Eucalyptus wandoo*	Wandoo	15m	Bark white, often with grey patches	Swan Coastal Plain, The Hills	Y			Y	Y	Y
	*Fraxinus griffithii*	Evergreen Ash	6 - 8m x 4m	Fast growing, Tough and attractive tree.	The Hills, Armadale Strategic Metropolitan Centre, Swan Coastal Plain,		Y	Y	Y	Y	
	*Fraxinus 'Raywoodii'*	Claret Ash	10m x 6m	Deciduous. Symmetrical growth habit - Good avenue tree. Autumn colour	The Hills, Armadale Strategic Metropolitan Centre, Swan Coastal Plain, Kelmscott Town Centre,		Y	Y	Y	Y	
	*Hibiscus tiliaceus*		8 - 10m	Commonly used as shrub or screen, therefore requires underpruning as street tree and not recommended.	Armadale Strategic Metropolitan Centre, Swan Coastal Plain,		Y	Y			Y

	*Jacaranda mimosaefolia*	Jacaranda	10 - 12m x 8-10m	This tree is an elegant specimen with green soft foliage turning to yellow in Winter before shedding. The flowers are purple in colour and bell shaped.	The Hills, Armadale Strategic Metropolitan Centre, Swan Coastal Plain,		Y		Y	Y	Y
	*Lagerstoemeia indica x L. fauriei*	Crepe Myrtle	8 x 6m	Various colours of flowers, good specimen tree, vase shaped form and textured bark	The Hills, Armadale Strategic Metropolitan Centre, Swan Coastal Plain,		Y	Y	Y	Y	Y
	*Laurus nobilis*		15m H	Purple berries, excellent seaside or container plant			Y	Y	Y	Y	Y
	*Liquidambar styraciflua*	Liquidambar	13m x 9m	Large, fast growing deciduous tree. Best know for their spectacular Autumn colour. Sense of place / heritage value			Y		Y	Y	Y
	*Lophostomen confertus*	Brush Box	15 - 20m x 8 - 10m	Eastern States / commonly used street tree , does not contribute to landscape character. Requires irrigation during establishment, requires large amount of			Y	Y	Y		
	*Melaleuca leucadendra*	Weeping Paper Bark	8-10m x 4-5m	Occurs along swamps and watercourses. Attractive weeping foliage			Y		Y	Y	Y
	*Melaleuca preissiana*	Paperbark Tree	8m	Occurs around swamps and is an indicator of a watertable close to the surface	Swan Coastal Plain, Armadale Strategic Metropolitan Centre, Kelmscott Town Centre, The Hills	Y		Y	Y	Y	Y
	*Melaleuca quinquenervia*	Broadleaf Paper Bark	12m x 4m				Y		Y	Y	Y
	*Melaleuca raphiophylla*	Swamp Paperbark	7m	Potential for multi-stem trunk, requires underpruning. Associated with swamps, lakes and watercourses.	Swan Coastal Plain	Y		Y	Y	Y	Y
	*Metrosideros excelsa*	New Zealand Christmas Tree	10m x 10m	Fast growing, evergreen tree or shrub that grows well in sandy soils with red eucalyptus like flowers,	Swan Coastal Plain		Y	Y			
	*Michelia figo x Michelia doltsopa*		5m x 3m	Specimen planting			Y	Y			Y
	*Morus alba 'Pendula'*	Weeping Mulberry	3 x 4m	Specimen planting			Y	Y			Y

	*Olea europaea*	Olive	4 - 6m x 3 - 4m	Grows into large tree, fruiting, consideration to use around footpaths	Swan Coastal Plain,		Y	Y			
	*Plantanus acerifolia*	London Plane	15 x 10m	Allergic reaction. Ubiquitous and does not contribute to the local landscape character.	Swan Coastal Plain,		Y	Y	Y	Y	
	*Populus x canadensis*	Poplar	20 x 8m	Sense of place / heritage value. Root/drainage infrustructure concerns. Autumn colour	The Hills		Y	Y			
	*Prunus x blireana*	Flowering Plum	4 x 4m	Sense of place - Autumn colour in foothills. Mass display of double pink flowers - Very attactrive orchard and avenue planting	The Hills, Armadale Strategic Metropolitan Centre, Swan Coastal Plain,		Y	Y	Y		Y
	*Prunus cerasifera 'Nigra'*	Flowering Plum	5 x 4m	Sense of place - Autumn colour in foothills. Suitable for small gardens / small street tree	The Hills, Armadale Strategic Metropolitan Centre, Swan Coastal Plain,		Y	Y	Y		Y
	*Pyrus 'Bradford Pear'*	Ornamental Pear	11 x 7m	Sense of place - Autumn colour in foothills. Appropriate for urban conditions, poor soils and limited growing space	The Hills, Armadale Strategic Metropolitan Centre, Swan Coastal Plain,		Y	Y	Y		Y
	*Pyrus calleryana 'Capital'*	Capital Pear	11 x 3m	Sense of place - Autumn colour in foothills. Tolerates a range of conditions. Disease resistant	The Hills, Armadale Strategic Metropolitan Centre, Swan Coastal Plain,		Y		Y		Y
	*Quercus rubra*	Red Oak	10m x 9m	Wide crown provides good shade. Proven street tree species. Autmun colour, clean straight trunk form.			Y		Y	Y	
	*Sapium sebiferum*	Chinese Tallowood	8 x 8m	Sense of place - Autumn colour in foothills. Good form and texture, size, growth habit	The Hills, Armadale Strategic Metropolitan Centre, Swan Coastal Plain,		Y		Y	Y	Y
	*Syzigium smithii*	Lilly Pilly	5 - 15 x 5 - 10m		Swan Coastal Plain,		Y	Y	Y	Y	Y
	*Tipuana tipu*	Tipu Tree, Tipuana, Rosewood	8 - 15m x 8 - 10m	Avoid as street tree and planting in turf due to problems with shalllow roots	Armadale Strategic Metropolitan Centre,					Y	Y
	*Ulmus parvifolium*	Chinese Elm	13m H		Armadale Strategic Metropolitan Centre,		Y		Y	Y	

PART C - PRECINCT APPLICATION

Kelmscott Aerial
Source: Google Earth

Part C - Precinct Application

The CoA's Urban Forest Strategy is divided according to the four (4) main landscape character precincts with each of these precincts examined in terms of its unique environment, social/heritage and land use pattern qualities. Urban forest application and specific planting guide for each character precinct is as follows;

C1 The Swan Coastal Plain
C2 The Armadale Strategic Metropolitan Centre
C3 The Kelmscott Town Centre
C4 The Armadale Hills

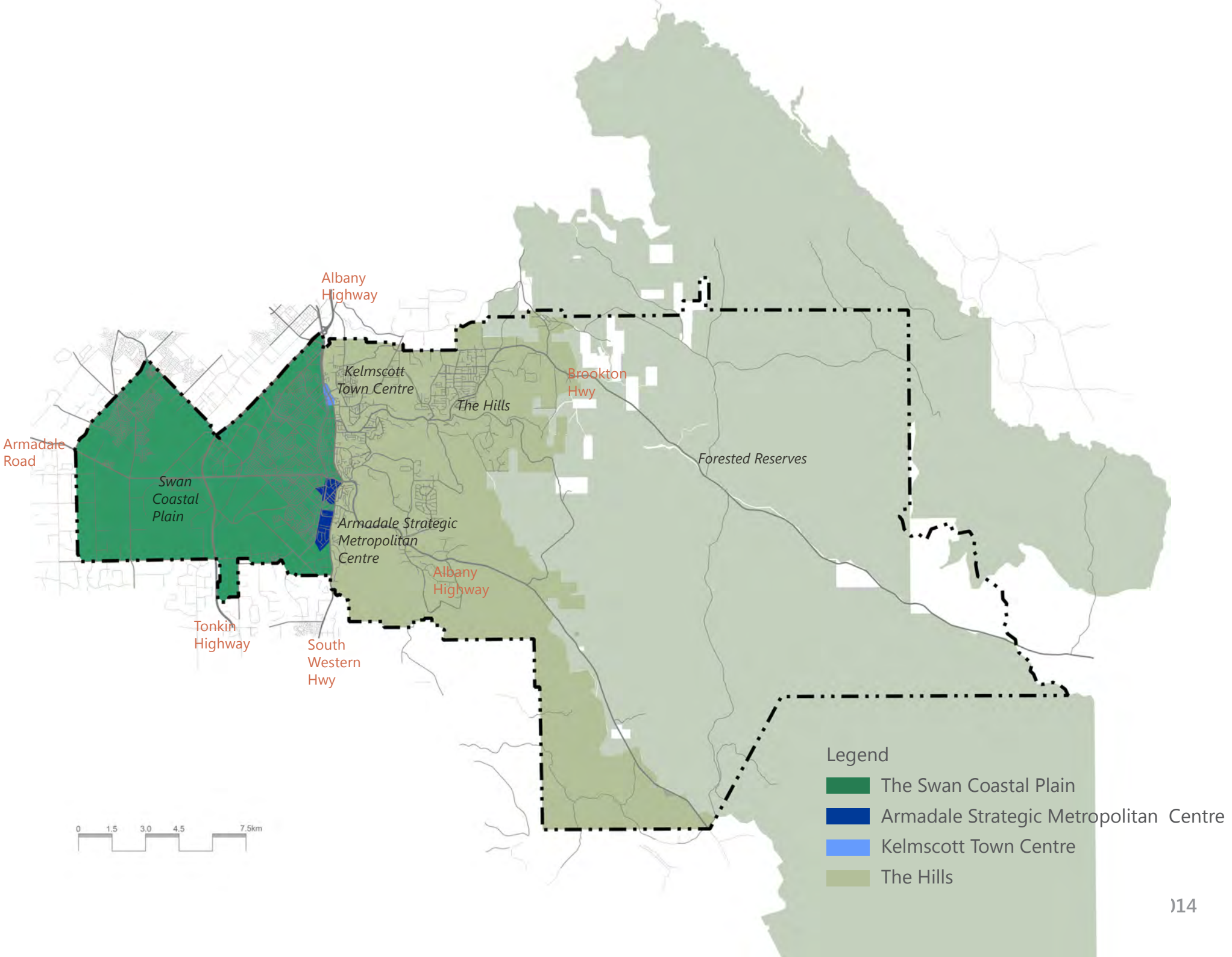
A list of tree species recommended to constitute the urban forest of the four (4) precincts has been compiled and divided into;

- Precincts
- Residential (front & rear yard planting)
- Parkland, (generally larger canopy planting), and
- Streetscapes (canopy planting according to the four Liveable Neighbourhoods street typologies)

Further categories include;

- Local
- Introduced, and
- Firewise

Providing a compiled list with a variety of options provides an opportunity to use a diversity of species within the appropriate precinct context.


Albany Highway
Kelmscott Town Centre
The Hills
Brookton Hwy
Armadale Road
Forested Reserves
Swan Coastal Plain
Armadale Strategic Metropolitan Centre
Albany Highway
Tonkin Highway
South Western Hwy
0 1.5 3.0 4.5 7.5km
Legend
The Swan Coastal Plain
Armadale Strategic Metropolitan Centre
Kelmscott Town Centre
The Hills



SUMMIT





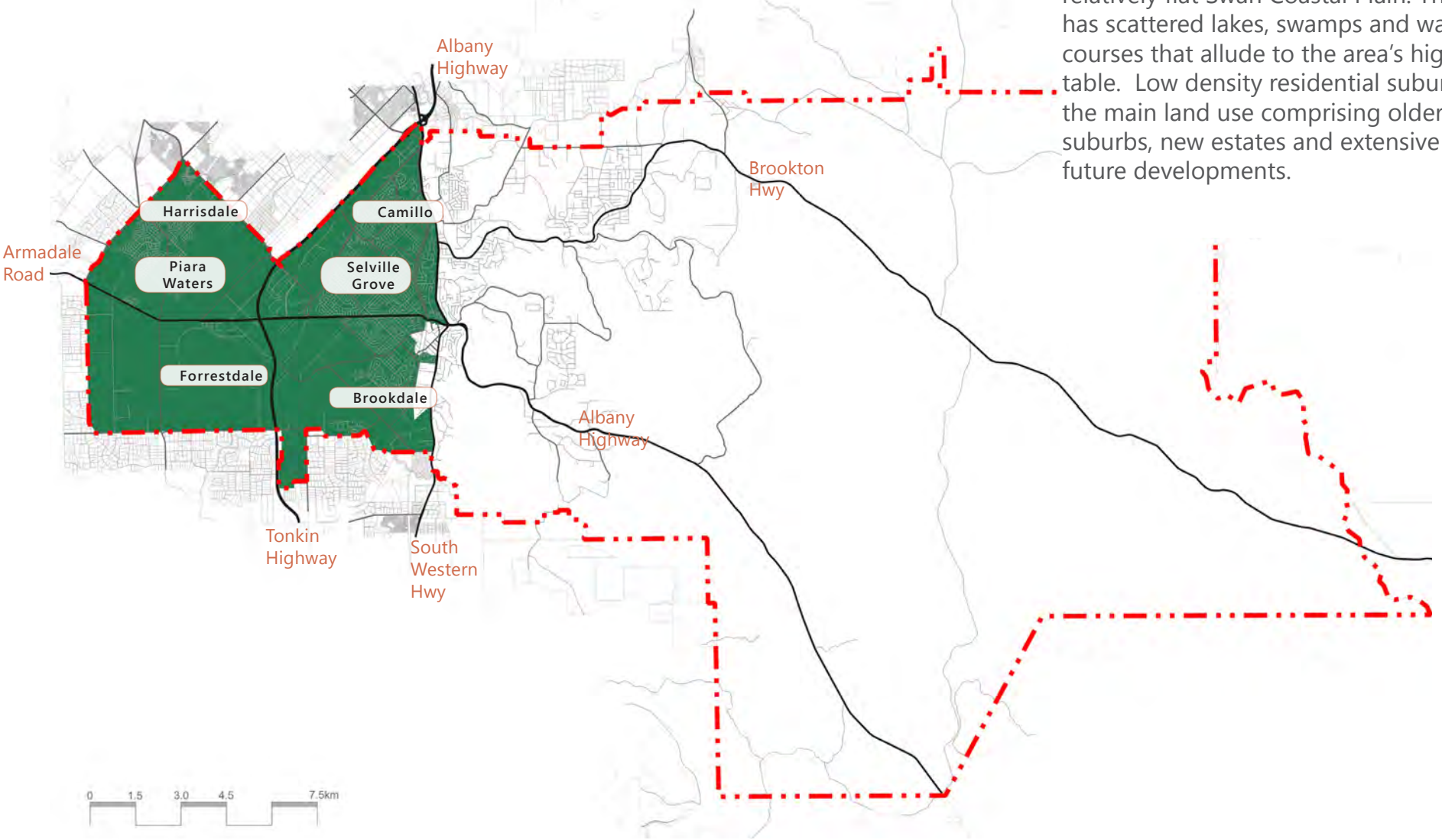




C1 Swan Coastal Plain Precinct

Character

The Swan Coastal Plain precinct is situated at the base of the Darling Escarpment and forms part of the eastern side of the relatively flat Swan Coastal Plain. The area has scattered lakes, swamps and water courses that allude to the area's high water table. Low density residential suburbia is the main land use comprising older existing suburbs, new estates and extensive planned future developments.



Swan Coastal Plain Precinct - Objectives

Plan and image of retained trees Mildura Way, Harrisdale
Source: Google Earth

Precinct Principle
There is a clear opportunity to influence the retention and development of the urban forest within CoA's Swan Coastal Plain precinct while allowing for 'firewise' considerations adjacent natural bushland reserves. The development of the urban forest can be achieved through recommendations from the Urban Forest Strategy and dedicated CoA urban forest guidelines / planning policy, as follows;

C1.1 Plan to Retain Canopy

- Develop planning policy to influence design for retention of significant trees within existing and future developments. Preservation of existing vegetation supports numerous social, environmental, economic and management benefits

- Develop a Swan Coastal Plain Significant/ Heritage Tree list to protect and enforce penalties for non-protection

- Accommodate existing street tree canopy within road reserves (verges) (i.e. Mildura Way, Harrisdale Green - see left)

C1.2 Plan to Increase Canopy

- Develop urban forest canopy targets (measured in percentage of canopy cover) for public and private areas (appropriated to fire-prone and non fire-prone areas)

- Encourage residents to contribute to the urban forest promoting suitable front and rear yard canopy tree planting (i.e. Kalinda Pass and Piara Waters – maximum plot ratio)

- The provision of an appropriate tree selection guide for new developments

- Enforce building footprint setbacks to allow for tree planting, especially in new developments where contemporary plot ratios tend to be maximised. i.e. private backyards traditionally contributed the largest percentage to an urban forest. Density and urban forest can be achieved (i.e. compare Drummoyne inner Sydney – rectangular narrow lots with rear lot setbacks in contrast to typical Perth Swan Coastal Plain large footprint housing product)

- Examine road reserves in relation to speed/frangibility, street furniture, path and bikeways and underground/above ground services. Street trees are to be provided with adequate space and given relevant importance as critical urban asset Define road hierarchy with use of local species where appropriate (i.e. Beenyup Road, Atwell)

- Plan for succession and longevity by supplementing existing street tree plantings with appropriate species

- Appropriate succession and supplementary planting for streets with above ground power lines

- Plant large verges that have high potential for street tree canopy establishment (i.e. Lyrebird loop, Seville Grove)

- Educate and encourage lot owners within existing suburbs to plant appropriate species to the front and rear of property (i.e. Marbella Ave, Seville Grove)

Enforce building footprint setbacks to allow for tree planting
Example above: Marbella Ave, Seville Grove,
Source: Google Earth

Example of how Density and urban forest can be achieved - Example Drummoyne inner Sydney with rectangular narrow lots with rear lot setbacks
Source: Google Earth

C1.4 Defined Road Hierarchy

Example: Beenyup Road, Atwell

- Develop strong treed avenues to define local character, gateways and people scale amenity

- Tree size defined by street scale reinforces street hierarchy and people scale amenity

- Use of local species highlight landscape character and "sense of place" (only where appropriate with regards to providing HPZ's in fire-prone areas adjacent unmodified bushland reserves)

C1.4 Promote 'Firewise' Urban Forest Planning

- Recommendation; A Bushfire Management Plan is required to map and identify fire-prone areas within the Swan Coastal Plain

- The Swan Coastal Plain fire-prone areas identified are to be provided with 'firewise' education to guide existing and future 'firewise' urban forest development, mitigation and management.

- Urban forest establishment including tree selection within identified fire-prone Building Protection (BPZ) and Hazard Separation Zones (HSZ) are to be 'firewise' specific for the Swan Coastal Plain and managed as a shared responsibility

Road hierarchy defined by trees
Example above: Beenyup Road, Atwell
Source: Google Earth

Selville Grove Sunset
Source: panoramio-JWB

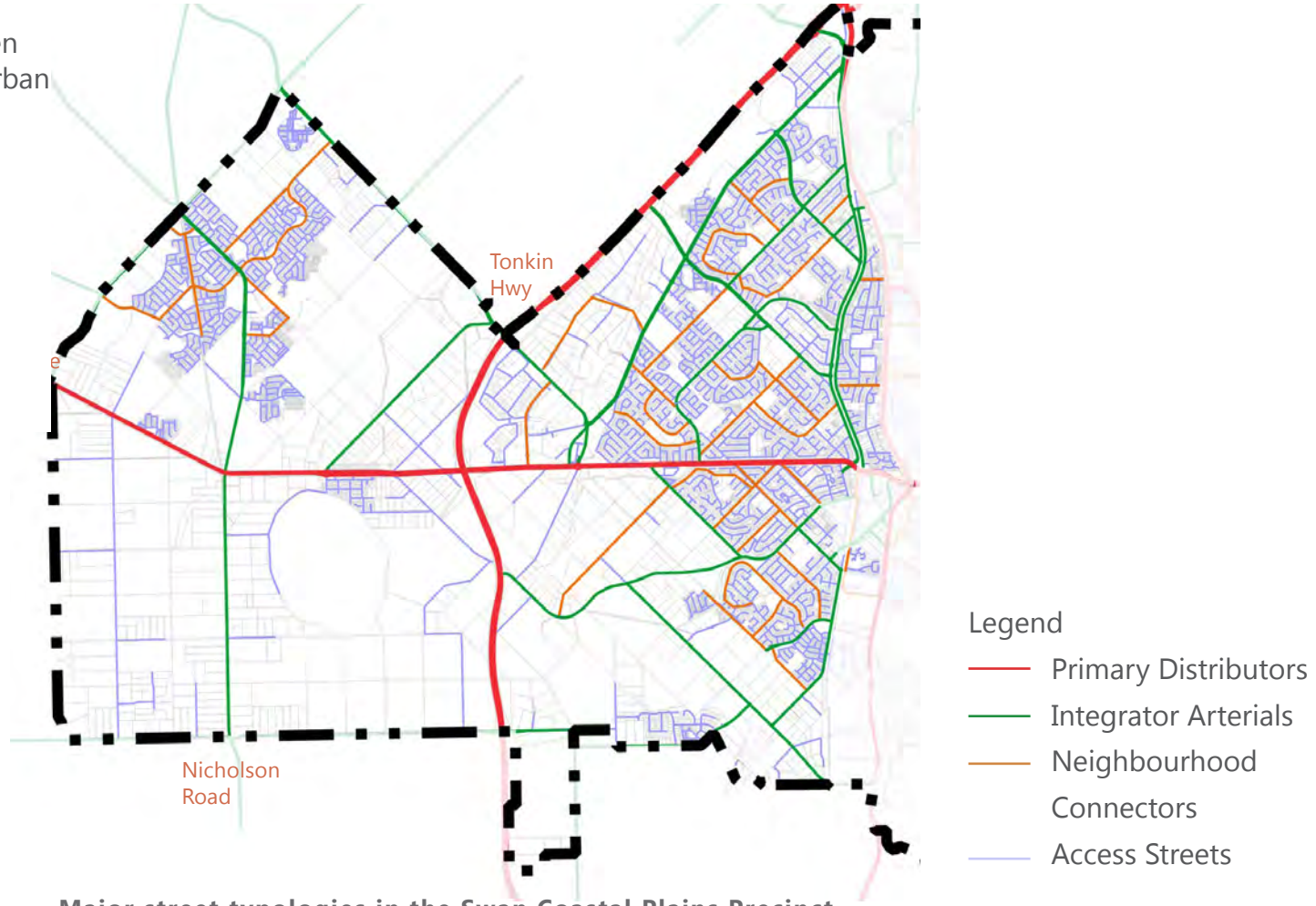
C1.5 Precinct Tree Selection Guide

A list of tree species recommended to constitute the urban forest of the Swan Coastal Plain precinct has been compiled and divided into three groupings:

- Local
- Introduced
- Fire wise

These groupings have been further broken down to the general conditions of four urban street typologies:

- Primary Distributors
- Integrator Arterials
- Neighbourhood Connectors
- Access Streets



Major street typologies in the Swan Coastal Plains Precinct

Below is a list of suggested tree species to comprise the urban forest of the Swan Coastal Plain Precinct. Please refer to the plant schedule for species information:

Local

Agonis flexuosa
Allocasuarina fraseriana
Banksia grandis
Corymbia calophylla
Eucalyptus gomphocephala
Eucalyptus lane-poolei
Eucalyptus marginata
Eucalyptus todtiana
Eucalyptus wandoo
Melaleuca preissiana
Melaleuca raphiophylla

Introduced

Brachychiton populneus
Callistemon viminallis
Corymbia ficifolia
Corymbia maculata
Cupressus sempervirens 'glauca'
Eucalyptus forrestiana
Eucalyptus leucoxylon
Eucalyptus marginata
Eucalyptus torquata
Eucalyptus victrix
Jacaranda mimosaefolia
Melaleuca leucadendra
Melaleuca quinquenervia
Pyrus calleryana 'Capital'
Quercus rubra
Sapium sebiferum

Fire wise

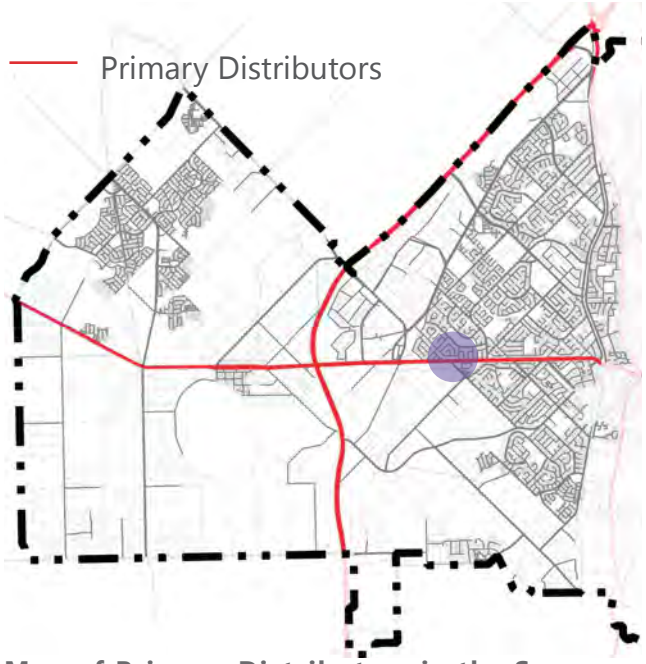
Alnus glutinosa
Betula pendula
Brachychiton acerifolius
Citrus sp
Citrus limon 'Meyer'
Eucalyptus drummondii
Eucalyptus foecunda
Ficus benjamina 'Midnight Beauty'
Fraxinus griffithii
Fraxinus 'Raywoodii'
Hibiscus tiliaceus
Hymenosporum flavum
Jacaranda mimosaefolia
Lagerstoemeia indica x L. fauriei
Laurus nobilis
Liquidambar styraciflua
Lophostomen confertus
Metrosideros excelsa
Olea europaea
Plantanus acerifolia
Prunus x blireana
Prunus cerasifera 'Nigra'
Pyrus 'Bradford Pear'
Sapium sebiferum
Syzigium smithii
Ulmus parvifolium

C1.6 Liveable Neighbourhoods Streetscapes

Primary distributors

Large local tree species Jarrah (*E. Marginata*), Marri (*C. calophylla*) and Wandoo (*E. wandoo*) is recommended as the major contributors to the urban forest in primary distributors in the Swan Coastal Plain Precinct.

Red Flowering Gum (*C. ficifolia*) is also recommended as a striking feature tree and appropriate companion to local species. Deciduous and 'firewise' tree species include *Plantanus acerifolia* and *Jacaranda mimosaefolia*.



Map of Primary Distributors in the Swan Coastal Plain Precinct - NTS

Local

Eucalyptus marginata
Corymbia calophylla
Eucalyptus wandoo

Introduced

Corymbia ficifolia

Fire wise

Plantanus acerifolia
Jacaranda mimosaefolia

Existing urban forest condition of an example location: Armadale Road near Seventh Road 1:500 @A4

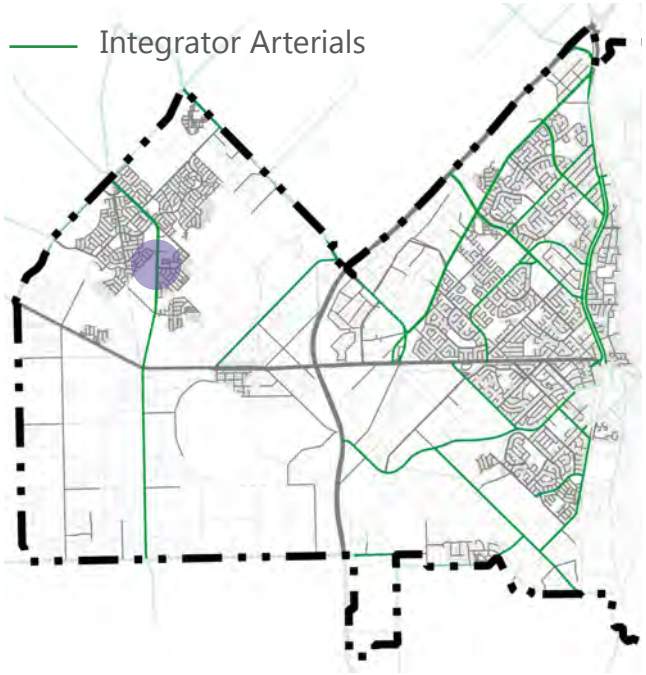
Potential urban forest condition of an example location: Armadale Road near Seventh Road 1:500 @A4

**Site by site assesment required for implementation potential*

Integrator Arterials

Local tree species WA Sheoak (*A. fraseriana*), Salmon White Gum (*E. lane-poolei*) and Coastal Blackbutt (*E. todtiana*) is recommended as the major contributors to the urban forest in Integrator Arterials in the Swan Coastal Plain Precinct. Spotted Gum (*C. maculata*) is also recommended as a proven urban performer and appropriate companion to local species.

Deciduous and 'firewise' trees would include *Liquidambar styraciflua* and *Ulmus parvifolia*.



Map of Integrator Arterials in the Swan Coastal Plain Precinct - NTS

Local

Allocasuarina fraseriana
Eucalyptus lane-poolei
Eucalyptus todtiana

Introduced

Corymbia maculata

Fire wise

Liquidambar styraciflua
Ulmus parvifolium

Existing urban forest condition of an example location: Nicholson Road, Harrisdale 1:500 @A4

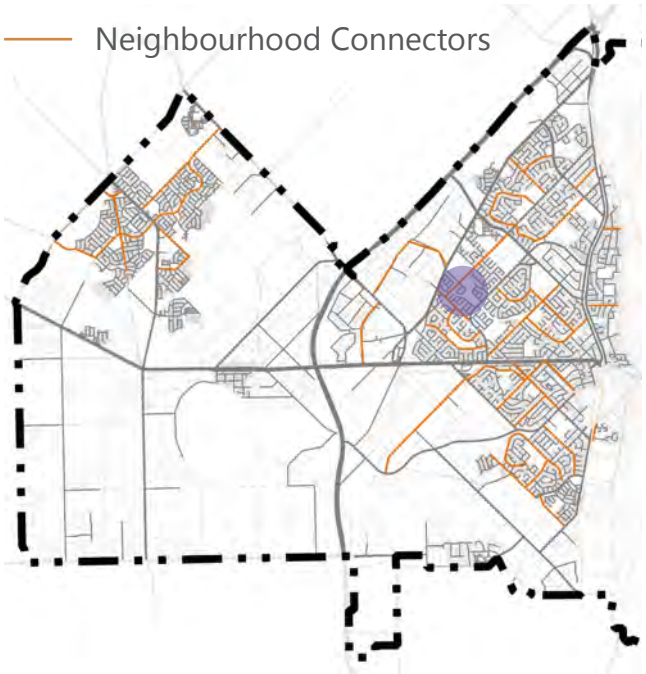
Potential urban forest condition of an example location: Nicholson Road, Harrisdale 1:500 @A4

**Site by site assesment required for implementation potential*

Neighbourhood Connectors

Local Stout Paperbark (*M. preissiana*) is recommended as the main feature of the urban forest in Neighbourhood Connectors in the Swan Coastal Plain Precinct. WA Peppermint (*A. flexuosa*), White Iron Bark (*E. leucoxylon*) and Northern Weeping Paperbark (*M. leucodendra*) are also recommended as appropriate companion species.

Deciduous and 'firewise' tree species include *Fraxinus raywoodii* and *Lagerstroemia indicia*



Map of Neighbourhood Connectors in the Swan Coastal Plain Precinct - NTS

Local

Melaleuca preissiana
Agonis flexuosa

Introduced

Eucalyptus leucoxylon
Melaleuca leucadendra

Fire wise

Lagerstoemeia indica x L. faurie
Fraxinus 'Raywoodii'

Existing urban forest condition of an example location: Braemore Street, Seville Grove 1:500 @A4

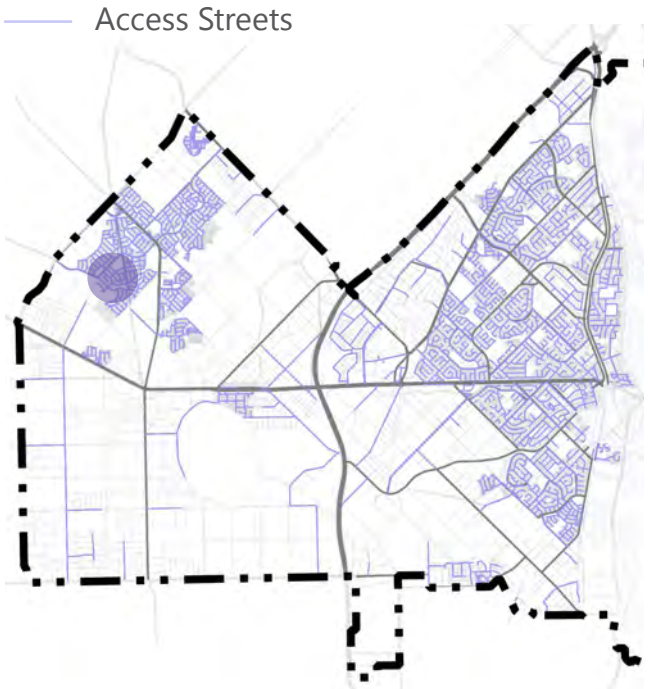
Potential urban forest condition of an example location: Braemore Street, Seville Grove 1:500 @A4

**Site by site assesment required for implementation potential*

Access Streets

Local Swamp Paperbark (*M. raphiophylla*) is recommended as the main feature of the urban forest in Access Streets in the Swan Coastal Plain Precinct. Coral Gum (*E. torquata*), Fuschia Gum (*E. forrestiana)* and Little Ghost Gum (*E.victrix*) are also recommended as appropriate companion species.

Deciduous and 'firewise' tree species include *Sapium sebiferum* and *Pyrus calleryana*



Map of Access Streets in the Swan Coastal Plain Precinct - NTS

Local

Melaleuca raphiophylla

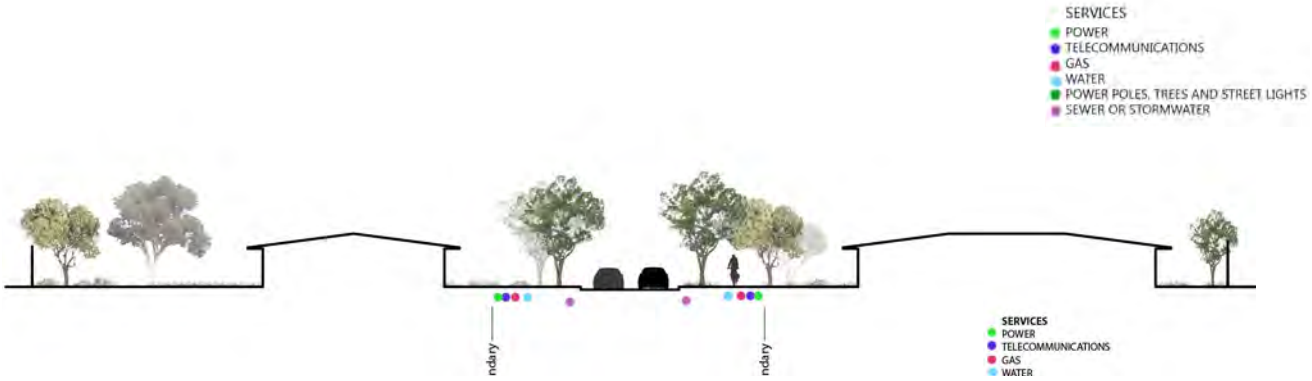
Introduced

Eucalyptus torquata
Eucalyptus forrestiana
Eucalyptus victrix

Fire wise

Pyrus calleryana
Sapium sebiferum

Existing urban forest condition of an example location: Barclay Way, Piara Waters 1:500 @A4

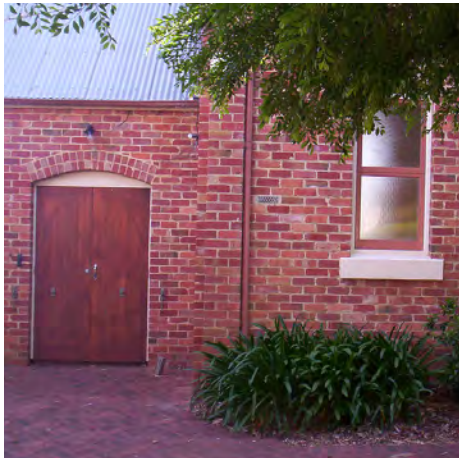


Potential urban forest condition of an example location: Barclay Way, Piara Waters 1:500 @A4

**Site by site assesment required for implementation potential*





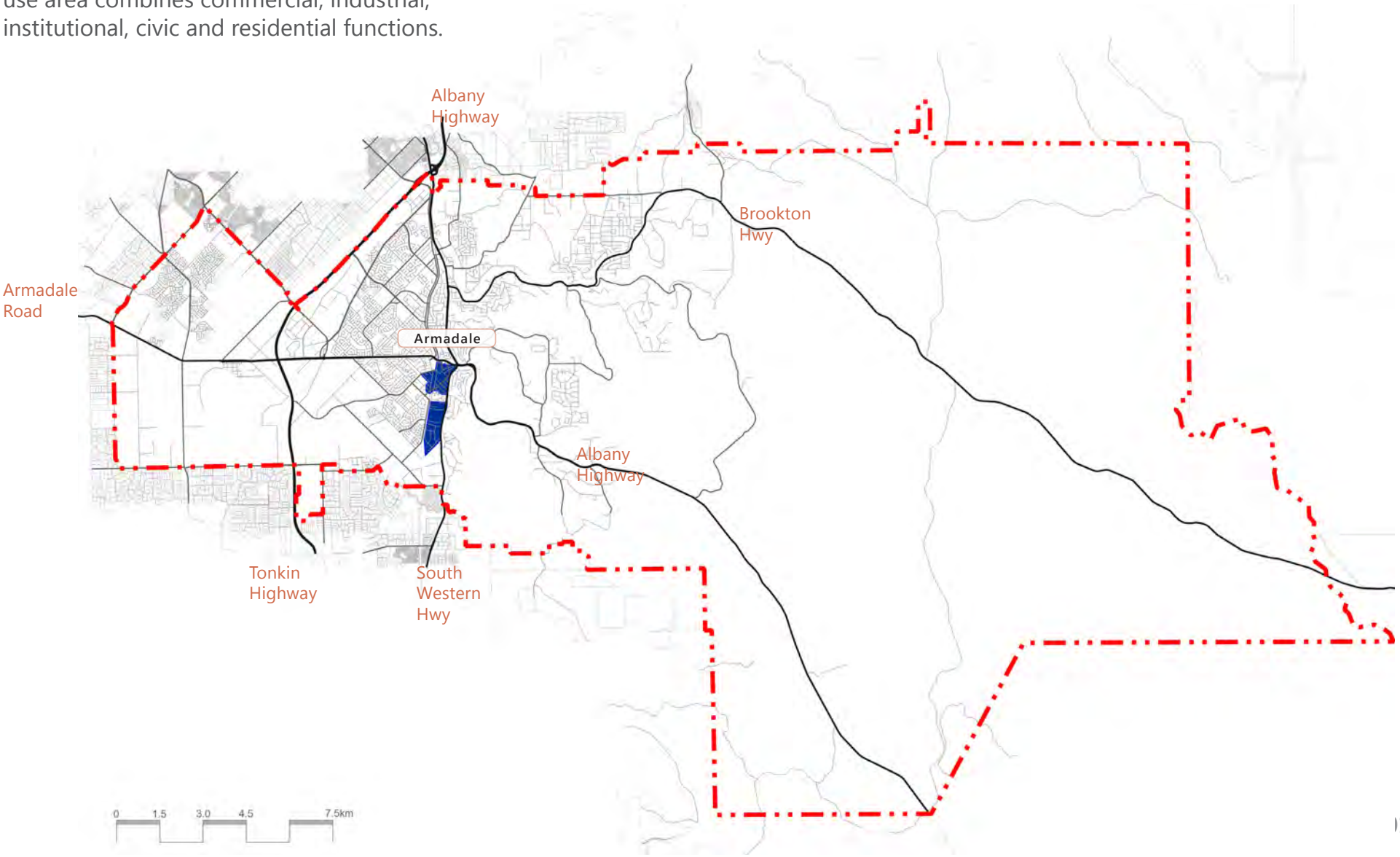




C2 - Armadale Strategic Metropolitan Centre

Character
Armadale Strategic Metropolitan Centre is an urban centre servicing the extensive surrounding residential area. This mixed use area combines commercial, industrial, institutional, civic and residential functions.

The Armadale Strategic Metropolitan Centre has a relatively established and maturing urban forest structure.



Armadale Strategic Metropolitan Centre

Trees providing urban street activation
Example: Jull St, Armadale
Source: Google Earth

Precinct Principle
The Armadale Strategic Metropolitan Centre has a relatively established urban forest structure. The key opportunities within the City centre is to further provide pedestrian amenity, including canopy planting that reinforces the city's identity and considers strengthening street hierarchy and way finding attributes.

The key opportunities within this centre are to undertake the following;

C2.1 Provide Pedestrian Amenity

- Supplement and succession plant Jull and Third Streets with existing deciduous Plane Trees (*Platanus sp.*) The deciduous Plane Trees provide adequate shade amenity in summer and solar access in winter.

- Provide urban trees to aid in slowing traffic speeds.

- Enhance street amenity to encourage street activity and enliven the city centre (shopping dining etc).

Strengthen street hierarchy
Example: Prospect Road, Armadale
Source: Google Earth

C2.2 Strengthen Street Hierarchy

- Use of trees to improve way finding and strengthen street hierarchy.

- Define major routes and access points.

- Plane Trees provide a strong identifier for pedestrians to acknowledge the City hub and pedestrian precinct.

- Preservation and supplementation of existing trees.

- Strong treed avenues frame entry to and from the City Centre as a pedestrian and vehicle place identifier. Existing large introduced native trees such as C. maculata and L. confertus are a strong pedestrian and visual amenity for the Armadale Strategic Metropolitan Centre and are to be retained and supplemented where appropriate. This is most notable around the City Council and Memorial Park areas. Opportunity to supplement established native trees planting such as *L. confertus* along Prospect and Fourth Roads and *C. maculata* and *E. sideroxylon* along lower order streets that stem from the city centre such as Commerce Avenue and Whitehead Streets as an aesthetic contrast to the City centre providing alternate light and dappled shade, strong way finding attributes.

- Large exotic and deciduous heritage tree planting such as Jacaranda's are situated in front of older established buildings and can be used to identify European heritage precincts.

Increase connection to place
Example: William St, Armadale and UWA Crawley Campus
Source: Google Earth

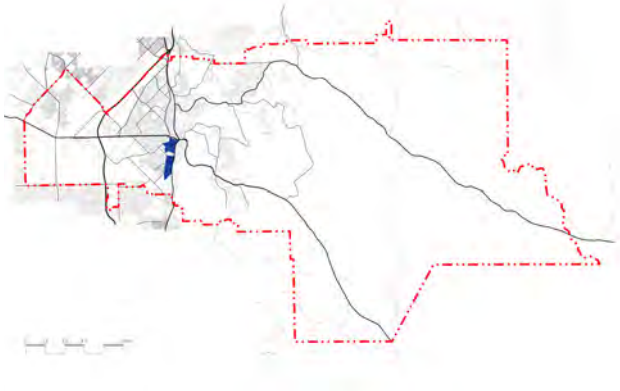
C2.3 Precinct Tree Selection Guide

A list of tree species recommended to constitute the urban forest of the Armadale Strategic Metropolitan Centre Precinct has been compiled and divided into three groupings:

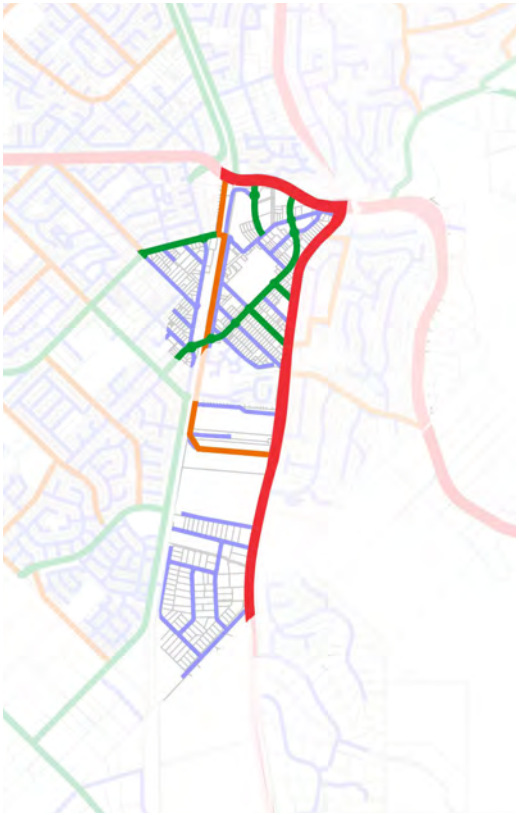
- Local
- Introduced
- Fire wise

These groupings have been further broken down to the general conditions of four urban street typologies:

- Primary Distributors
- Integrator Arterials
- Neighbourhood Connectors
- Access Streets



Context Plan



Major street typologies in the Armadale Strategic Metropolitan Centre Precinct

Below is a list of suggested tree species to comprise the urban forest of the Armadale Strategic Metropolitan Centre precinct. Please refer to the plant schedule for species information:

Local

Agonis flexuosa
Allocasuarina fraseriana
Allocasuarina huegeliana
Corymbia calophylla
Corymbia haematoxylon
Eucalyptus accedens
Eucalyptus laeliae
Eucalyptus lane-poolei
Eucalyptus marginata
Eucalyptus patens
Melaleuca preissiana

Introduced

Brachychiton populneus
Callistemon viminallis
Corymbia ficifolia
Corymbia maculata
Cupressus sempervirens 'glauca'
Eucalyptus forrestiana
Eucalyptus leucoxylon
Eucalyptus marginata
Eucalyptus sideroxylon rosea
Eucalyptus torquata
Jacaranda mimosaefolia
Liquidambar styraciflua
Melaleuca leucadendra
Melaleuca quinquenervia
Pyrus calleryana 'Capital'
Quercus rubra
Sapium sebiferum
Tipuana tipu
Ulmus parvifolium

Firewise

Betula pendula
Brachychiton acerifolius
Citrus sp
Citrus limon 'Meyer'
Alnus glutinosa
Eucalyptus argutifolia
Eucalyptus petrensis
Fraxinus griffithii
Fraxinus 'Raywoodii'
Hibiscus tiliaceus
Lagerstoemeia indica x L. fauriei
Laurus nobilis
Liquidambar styraciflua
Lophostomen confertus
Michelia figo x Michelia doltsopa
Morus alba 'Pendula'
Prunus x blireana
Prunus cerasifera 'Nigra'
Pyrus 'Bradford Pear'

C2.4 Liveable Neighbourhoods Streetscapes

Primary distributors

Large local tree species Jarrah (*E. Marginata*), Marri (*C. calophylla*), Swan River Blackbutt (*E. patens*) and Mountain Marri (*C. haematoxylon*) is recommended as the major contributors to the urban forest in primary distributors in the Armadale Strategic Metropolitan Centre Precinct.

Deciduous tree species include *Plantanus acerifolia* and *Jacaranda mimosaefolia*

Local	Introduced	Fire wise
Corymbia calophylla *Eucalyptus marginata* *Eucalyptus patens* *Corymbia haematoxylon*	*Lophostomen confertus*	*Plantanus acerifolia* *Jacaranda mimosaefolia*

Existing urban forest condition of an example location: Armadale Road between church av & orchard av 1:500 @A4

Potential urban forest condition of an example location: Armadale Road between church av & orchard av 1:500 @A4

**Site by site assesment required for implementation potential*
**Road widening and realingment is proposed for Armadale road and any tree planting should account for proposed future road extent.*

Primary Distributors

Map of Primary Distributors in the Armadale Regional City Precinct - NTS

Integrator Arterials

Local tree species WA Sheoak (*A. fraseriana*) and Powderbark Wandoo (*E. accedens*) are recommended as the major contributors to the urban forest in Integrator Arterials in the Armadale Strategic Metropolitan Centre Precinct. Spotted Gum (*C. maculata*) and Broad Leaf Paperbark (*M. quinquenervia)* is also recommended as a proven urban street trees and appropriate companions to local species.

Deciduous tree species would include *Liquidambar styraciflua* and *Ulmus parvifolia*

Integrator Arterials

Map of Integrator Arterials in the Armadale Regional City Precinct- NTS

Local

Allocasuarina fraseriana
Eucalyptus accedens

Introduced

Corymbia maculata
Melaleuca quinquenervia

Fire wise

Liquidambar styraciflua
Ulmus parvifolia

Existing urban forest condition of an example location: Church Avenue, Armadale 1:500 @A4

Potential urban forest condition of an example location: Church Avenue, Armadale 1:500 @A4

**Site by site assesment required for implementation potential*

Neighbourhood Connectors

Local Darling Range Ghost Gum (*E.laeliae*) and Salmon White Gum (*E.lane-poolei*) are recommended as the main feature of the urban forest in Neighbourhood Connectors in the Armadale Strategic Metropolitan Centre Precinct. WA Peppermint (*A. flexuosa*), Pink Flowering Iron Bark (*E. sideroxylon rosea)* are also recommended as appropriate companion species. Deciduous and 'firewise' tree species include *Fraxinus raywoodii* and *Lagerstroemia indicia*

Local

Eucalyptus laeliae
Eucalyptus lane-poolei
Agonis flexuosa

Introduced

Eucalyptus sideroxylon rosea

Fire wise

Lagerstoemeia indica
Fraxinus 'Raywoodii'

Neighbourhood Connectors

Map of Neighbourhood Connectors in the Armadale Regional City Precinct - NTS

Access Streets

Local Rock Sheoak *(A. huegeliana)* and Darling Range Ghost Gum *(E.laeliae)* are recommended as the main feature of the urban forest in Access Streets in the Armadale Strategic Metropolitan Centre Precinct. Coral Gum (*E. torquata*) and Fuschia Gum (*E. forrestiana)* are also recommended as appropriate and ornamental companion species. Deciduous and 'firewise' tree species include *Sapium sebiferum* and *Pyrus calleryana*

Access Streets

Map of Access Streets in the Armadale Regional City Precinct - NTS

Local

Allocasuarina huegeliana
Eucalyptus laeliae

Introduced

Eucalyptus torquata
Eucalyptus forrestiana

Fire wise

Pyrus calleryana
Sapium sebiferum

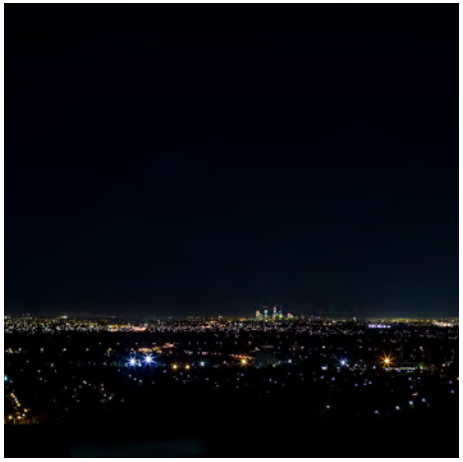
Existing urban forest condition of an example location: William Street, Armadale 1:500 @A4

Potential urban forest condition of an example location: William Street, Armadale 1:500 @A4

**Site by site assesment required for implementation potential*









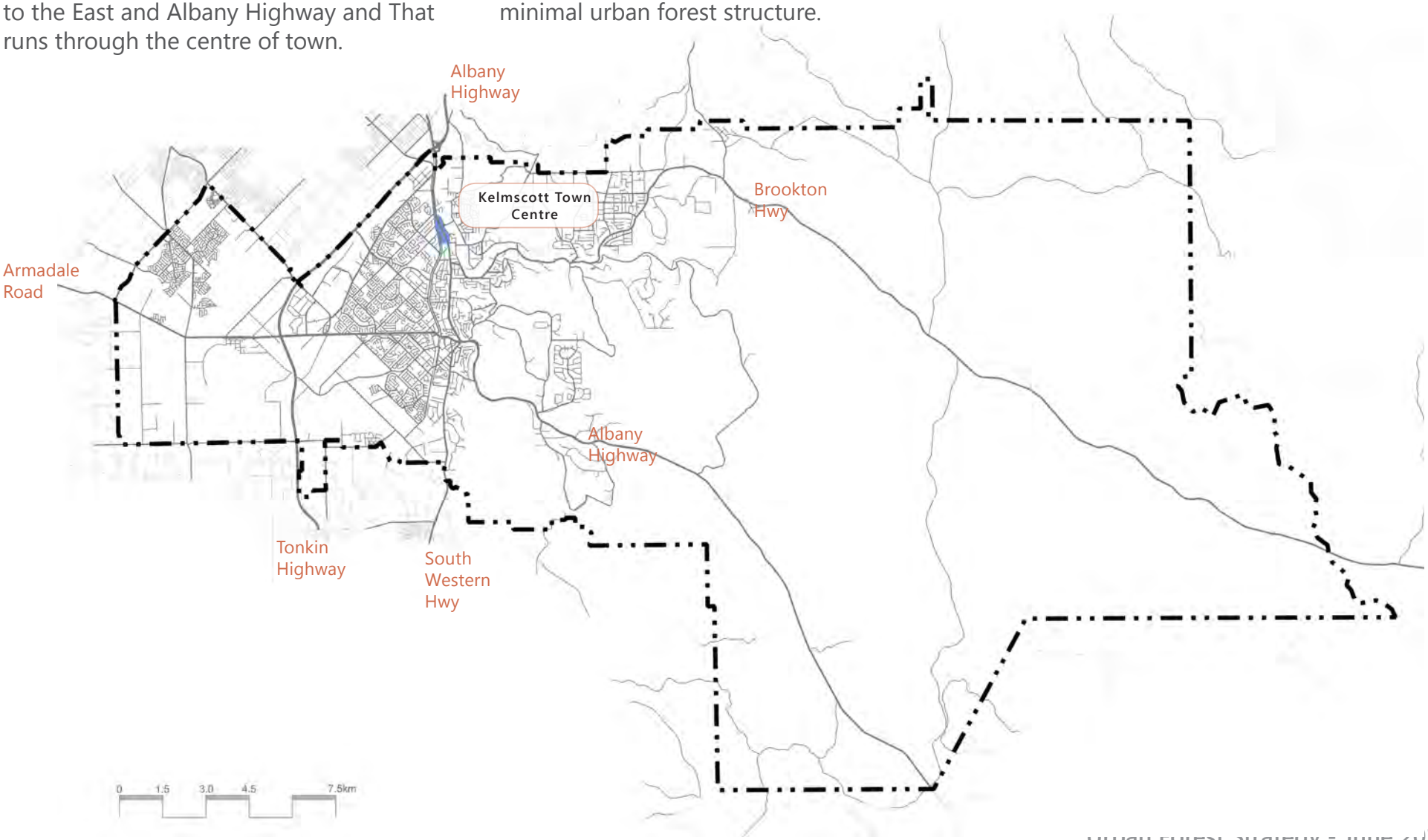



C3 - Kelmscott Town Centre

Character

The Kelmscott Town Centre is situated at the foot of the Darling Escarpment. Major features include the Armadale-Perth Railway to the west, The picturesque Canning River to the East and Albany Highway and That runs through the centre of town.

Street Tree planting is irregular and sparse. The main street has been recently planted with a formal row of Claret Ash's. In contrast to the Armadale Strategic Metropolitan Centre, the Kelmscott Town Centre has a minimal urban forest structure.



Kelmscott Town Centre - Objectives

Precinct Principle
In contrast to the Armadale Strategic Metropolitan Centre, the Kelmscott Town Centre has an undeveloped Urban Forest. The key urban forest opportunities within this centre is to further formalise and supplement the existing urban forest to provide pedestrian amenity and develop a unique theme that corresponds to the broader towns heritage and local sense of place as a 'tree change' destination and northern gateway to the CoA.

C3.1 Formalise Local Urban Forest
There is an opportunity to develop a detailed urban forest strategy for the Kelmscott Town Centre. This would include;

- Strengthen and supplement the deciduous tree / seasonal colour theme within the town centre

- Lesson the perceived highway width including removing or planting centre medians to provide interest and slow vehicles

- Consider shaded on street parking for left hand lane during non-peak periods and additional bike lane

- Lesson frontage retail street carparking or soften with large evergreen tree planting (*L. Confertus, Eucalyptus sp. Mallee* planting)

C3.2 Develop Pedestrian Amenity

- Strengthen Highway and off highway verges leading into the town centre with a pedestrian friendly environment including densely shaded pathways of deciduous and evergreen planting

- Lesson the perceived highway width by planting centre median to slow and provide pedestrian scale traffic environment and formalised slow pedestrian crossing areas

- Develop a pedestrian friendly circulation plan that navigates carparks, train station, key commercial areas etc. and reinforce with amenity tree planting

C3.3 Provide a Unique Theme

- Create a sense of arrival to Armadale

- Showcase Armadale as an enticing "tree change" destination.

- Contrast an evergreen tree palette on the highway leading into the town centre with a strong deciduous palette providing striking autumn colour on the highway within the town centre

- Select tree pallete theming that both promotes the seasonal colour changes in the hills, contrasting with the local plant community

- Suggested tree palette guide - *Fraxinus sp, Liquidambar sp, Quercus sp.* for deciduous palette and *E. marginata/E. patons, E. rudis*, larger feature planting together with local *E. Mallee* varieties for smaller feature planting.

Eclectic mix of tree species
Example: River Road, Kelmscott
Source: Google Earth

Strengthen entrance into foothills
Example: Church Street, Kelmscott
Source: Google Earth

C3.4 Precinct Tree Selection Guide

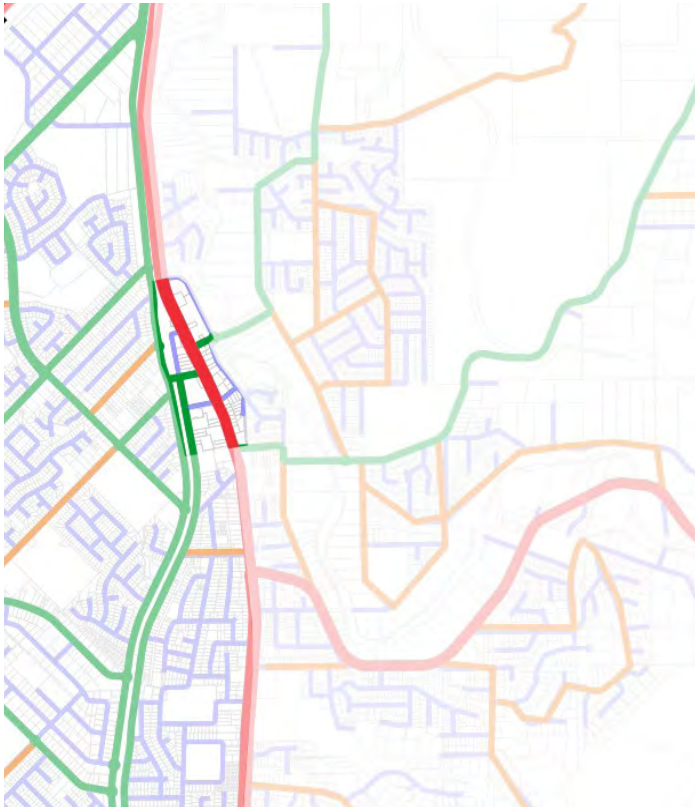
A list of tree species recommended to constitute the urban forest of the Kelmscott Town Centre precinct has been compiled and divided into three groupings:

- Local
- Introduced
- Fire wise

These groupings have been further broken down to the general conditions of four urban street typologies:

- Primary Distributors
- Integrator Arterials
- Neighbourhood Connectors
- Access Streets

Context Plan



Major street typologies in The Kelmscott Town Centre Precinct

Below is a list of suggested tree species to comprise the urban forest of the Kelmscott Precinct. Please refer to the plant schedule for species information:

Local

Agonis flexuosa
Allocasuarina huegeliana
Corymbia calophylla
Corymbia haematoxylon
Eucalyptus accedens
Eucalyptus laeliae
Eucalyptus lane-poolei
Eucalyptus patens
Melaleuca preissiana

Introduced

Brachychiton populneus
Corymbia ficifolia
Corymbia maculata
Cupressus sempervirens 'glauca'
Eucalyptus forrestiana
Eucalyptus marginata
Eucalyptus torquata
Liquidambar styraciflua
Melaleuca leucadendra
Melaleuca quinquenervia
Pyrus calleryana 'Capital'
Quercus rubra
Sapium sebiferum
Ulmus parvifolium

Firewise

Alnus glutinosa
Betula pendula
Brachychiton acerifolius
Citrus sp
Citrus limon 'Meyer'
Eucalyptus argutifolia
Eucalyptus petrensis
Ficus benjamina 'Midnight Beauty'
Fraxinus 'Raywoodii'
Lagerstoemeia indica x L. fauriei
Laurus nobilis
Lophostomen confertus
Michelia figo x Michelia doltsopa
Morus alba 'Pendula'
Plantanus acerifolia
Populus x canadensis
Prunus x blireana
Prunus cerasifera 'Nigra'
Pyrus 'Bradford Pear'

C3.5 Liveable Neighbourhoods Streetscapes

Primary distributors

Large local tree species Marri (*C. calophylla*), Swan River Blackbutt (*E. patens*) and Mountain Marri (*C. haematoxylon*) are recommended as the major contributors to the urban forest in primary distributors in the Kelmscott Town Centre Precinct.

Deciduous tree species include *Plantanus acerifolia* and *Jacaranda mimosaefolia* is also recommended to provide autumn colour as described in the precinct principles.

Primary Distributors

Map of Primary Distributors in The Kelmscott Town Centre Precinct - NTS

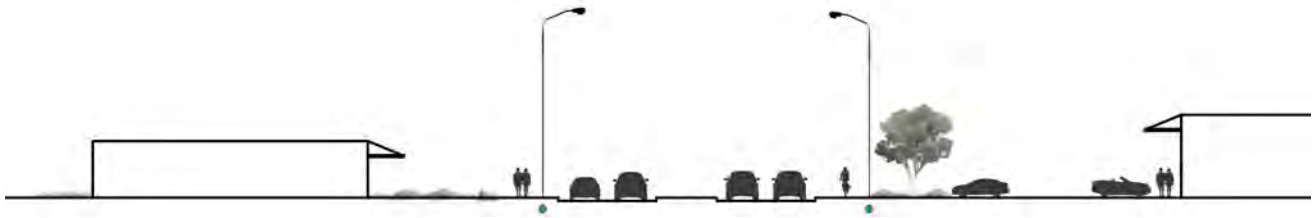
Local

Corymbia calophylla
Eucalyptus patens
Corymbia haematoxylon

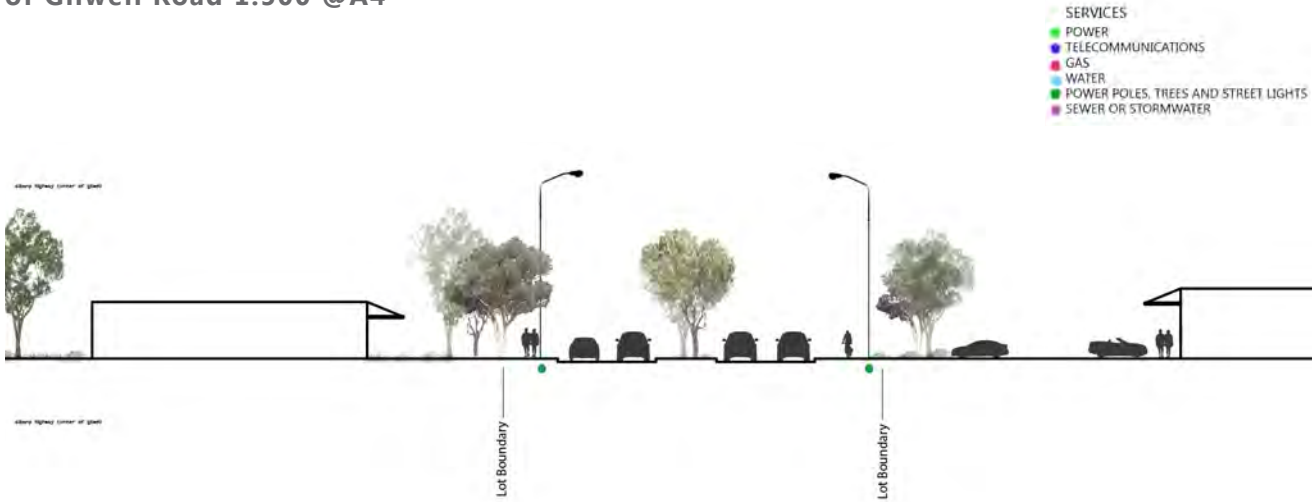
Introduced

Fire wise

Plantanus acerifolia
Jacaranda mimosaefolia



Existing urban forest condition of an example location: Albany Highway near corner of Gilwell Road 1:500 @A4



Potential urban forest condition of an example location: Albany Highway near corner of Gilwell Road 1:500 @A4

**Site by site assesment required for implementation potential*

Integrator Arterials

Local tree species WA Sheoak (*A. fraseriana*) and Powderbark Wandoo (*E. accedens)* are recommended as the major contributors to the urban forest in Integrator Arterials in The Kelmscott Town Centre Precinct. Deciduous tree species would include *Liquidambar styraciflua* and *Ulmus parvifolia* is also recommended to provide autumn colour as described in the precinct principles.

Local	Introduced	Fire wise
Allocasuarina fraseriana *Eucalyptus accedens*		*Liquidambar styraciflua* *Ulmus parvifolia*

Existing urban forest condition of an example location: Gilwell Avenue Kelmscott 1:500 @A4

Potential urban forest condition of an example location: Gilwell Avenue Kelmscott 1:500 @A4

**Site by site assesment required for implementation potential*

Integrator Arterials

Map of Integrator Arterials in The Kelmscott Town Centre Precinct - NTS

Neighbourhood Connectors

Local Darling Range Ghost Gum (*E.laeliae*) and Salmon White Gum (*E.lane-poolei*) are recommended as the main feature of the urban forest in Neighbourhood Connectors. *Fraxinus raywoodii* and *Lagerstroemia indicia* are also recommended to provide autumn colour as describe in the precinct principles.

Local	Introduced	Fire wise
Eucalyptus laeliae *Eucalyptus lane-poolei* *Agonis flexuosa*		*Lagerstoemeia indica* *Fraxinus 'Raywoodii'*

Existing urban forest condition of an example location: Connell Avenue, Kelmscott 1:500 @A4

Potential urban forest condition of an example location: Connell Avenue, Kelmscott 1:500 @A4

Neighbourhood Connectors

Map of Neighbourhood Connectors in The Kelmscott Town Centre Precinct - NTS

**Site by site assesment required for implementation potential*

Access Streets

Local Rock Sheoak *(A. huegeliana)* as well as Coral Gum (*E. torquata*) and Fuschia Gum (*E. forrestiana)* are recommended as the main feature of the urban forest in Access Streets in the Kelmscott Town Centre Precinct. Deciduous tree species include *Sapium sebiferum* and *Pyrus calleryana* also recommended to provide autumn colour as describe in the precinct principles.

Access Streets

Map of Access Streets in The Kelmscott Town Centre Precinct - NTS

Local

Allocasuarina huegeliana

Introduced

Eucalyptus torquata
Eucalyptus forrestiana

Fire wise

Pyrus calleryana
Sapium sebiferum

Existing urban forest condition of an example location: Penjan Place Kelmscott 1:500 @A4

Potential urban forest condition of an example location: Penjan Place Kelmscott 1:500 @A4

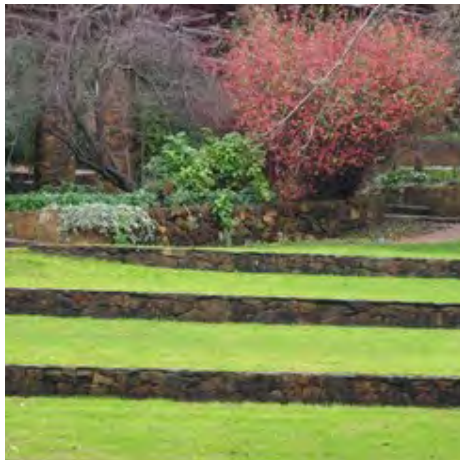
**Site by site assesment required for implementation potential*







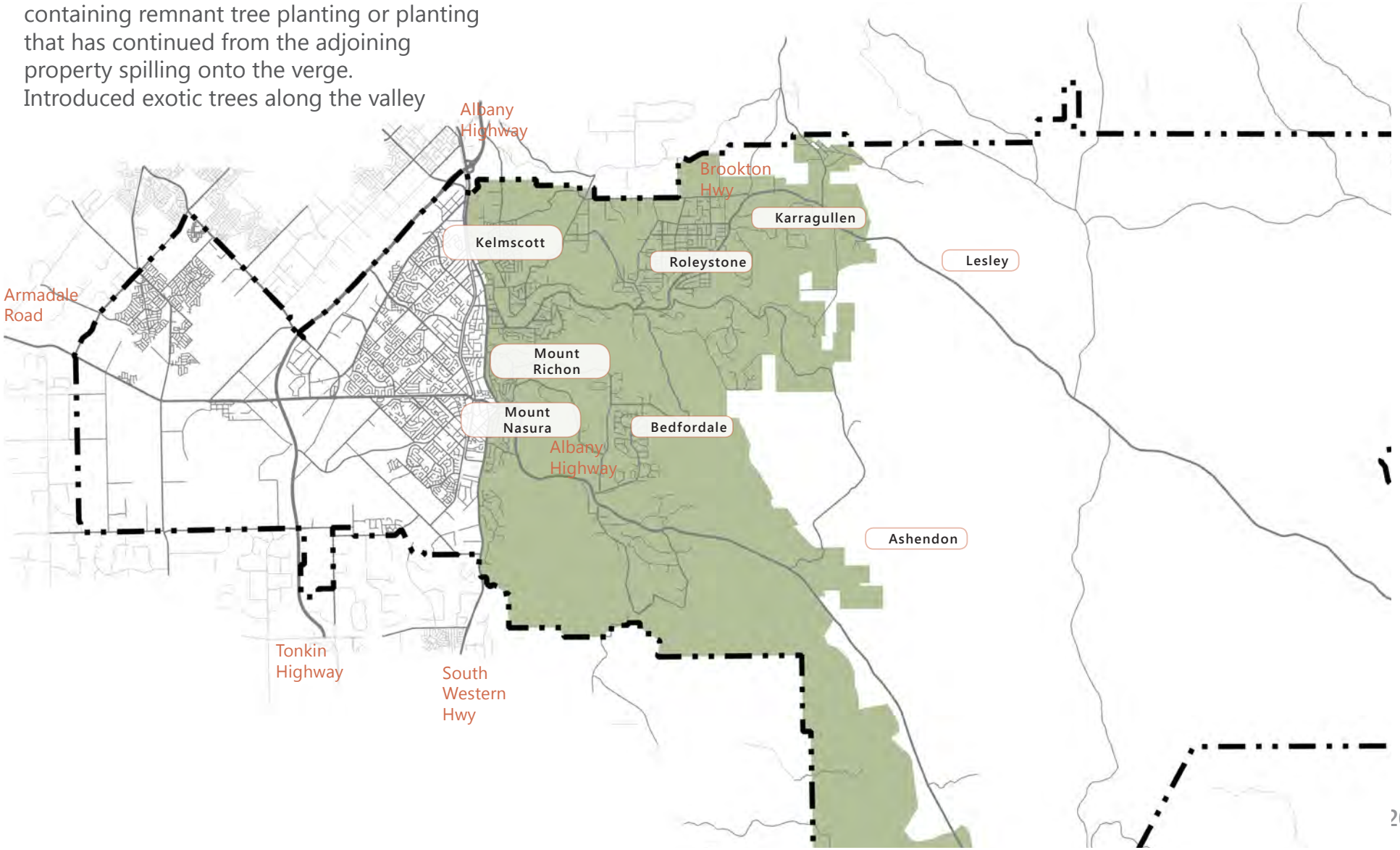


C4 - The Hills Precinct

Character

Residents within 'The Hills' precinct live within a distinct urban canopy. There is an informal aesthetic to most neighbourhood streetscapes with road easements either containing remnant tree planting or planting that has continued from the adjoining property spilling onto the verge. Introduced exotic trees along the valley floors, along creek or river banks and adjacent orchards are deciduous providing autumn colour, seasonal change and a sense of European farming heritage.



The Hills
Source: Flickr Popppet

The Hills Precinct - Objectives

C4.1 Support Informal Tree Canopy

- Continue the informal local tree canopy by not formalising street tree planting, especially within lower order streets

- Provide streetscape trees suitable to plant under powerlines and continue informal local and exotic tree planting

- The provision of an appropriate tree selection guide for new and infill development, encouraging residents to contribute to the eclectic urban forest promoting suitable front and rear yard canopy tree planting (appropriated to fire-prone areas)

- Educate and provide 'firewise', recognised low flammable tree species for protection and hazard zone planting as well as buffer planting

C4.2 Retain Biodiversity and Bushland Character

- Align with CoA fire management policies whilst maintaining the unique 'life amongst the forest' lifestyle

Canopy longevity
Example: Palm Road, Roleystone
Source: Google Earth

Ecological consideration
Example: Dumas Road, Bedfordale
Source: Google Earth

- Ensure ongoing planning, maintenance and management practices sustain and preserve the unique character, ecology and biodiversity of the hills Example: Dumas Road, Bedfordale

C4.3 Promote Shared Responsibility 'firewise' Urban Forest Planning

- The Armadale Hills have a history of bushfires and therefore would be considered a fire-prone area. The Urban Forest Strategy includes 'firewise' urban forest planning with regard to tree selection and recognising appropriate tree canopy treatments to Housing Protection and Hazard Separation Zones (BPZ & HSZ)

- This report recognises that the CoA Urban Forest Strategy is not a Bushfire Management Plan. The strategy recommends a detailed Bushfire Management Plan be prepared for the CoA. A specific plan that recognises best practice 'Firewise' landscape planning and refers to the State fire management guideline (future fire management planning policy) including national 'best practice' for 'firewise landscape planning'

- The Urban Forest Strategy does recognise the CoA's historic fire-prone condition and provides 'firewise' urban forest planning information that includes nominated tree planting for Building Protection (BPZ) and Hazard Separation Zones (HSZ) and recommends 'firewise' tree planting for considered CoA fire-prone precincts including peri-urban areas.

- The CoA Urban Forest Strategy recommends CoA fire-prone areas to be made clear through the Bushfire Management Plan. The fire-prone areas to be provided with 'firewise' education and a planning overlay for developers and community as part of planning policy to guide existing and future 'firewise' development

- A component of the Bushfire Management Plan the Urban Forest Strategy recommends that specific modelling of environmental factors pertaining to bushfire including; fuel loads, deciduous buffer tree planting, topographical influences, wind influences, temperature and other climatic influences. The CoA Fire Management Plan would also include detail recommendations that reflect best practice low flammable species and suggested buffer planting for specific areas. The Urban Forest Strategy is then to be reviewed to seamlessly integrate this detail information provided by the Armadale Fire Management Plan and the State bushfire management guideline/policy for detail implementation purposes

- Due to conflicting landscape values for living in a bushland environment unique Armadale Hills fire management solutions may consider community level early warning devices, community fire drills, and community safe zones (for example a school or sports oval, purpose built clearings or appropriate infrastructure at 800m ped sheds) for saving lives above saving houses within the bushland

- Recommend only larger bushland lots to be approved within the hills so that bushfire protection and hazard zones can be implemented effectively without relying on neighbours to achieve bushfire guidelines/policy

- A component of the Bushfire Management Plan the Urban Forest Strategy recommends that specific modelling of environmental factors pertaining to bushfire including; fuel loads, deciduous buffer tree planting, topographical influences, wind influences, temperature and other climatic influences. The CoA Fire Management Plan would also include detail recommendations that reflect best practice low flammable species and suggested buffer planting for specific areas. The Urban Forest Strategy is then to be reviewed to seamlessly integrate this detail information provided by the Armadale Fire Management Plan and the State bushfire management guideline/policy for detail implementation purposes

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- Recommend only larger bushland lots to be approved within the hills so that bushfire protection and hazard zones can be implemented effectively without relying on neighbours to achieve bushfire guidelines/policy

Precinct Tree Selection Guide

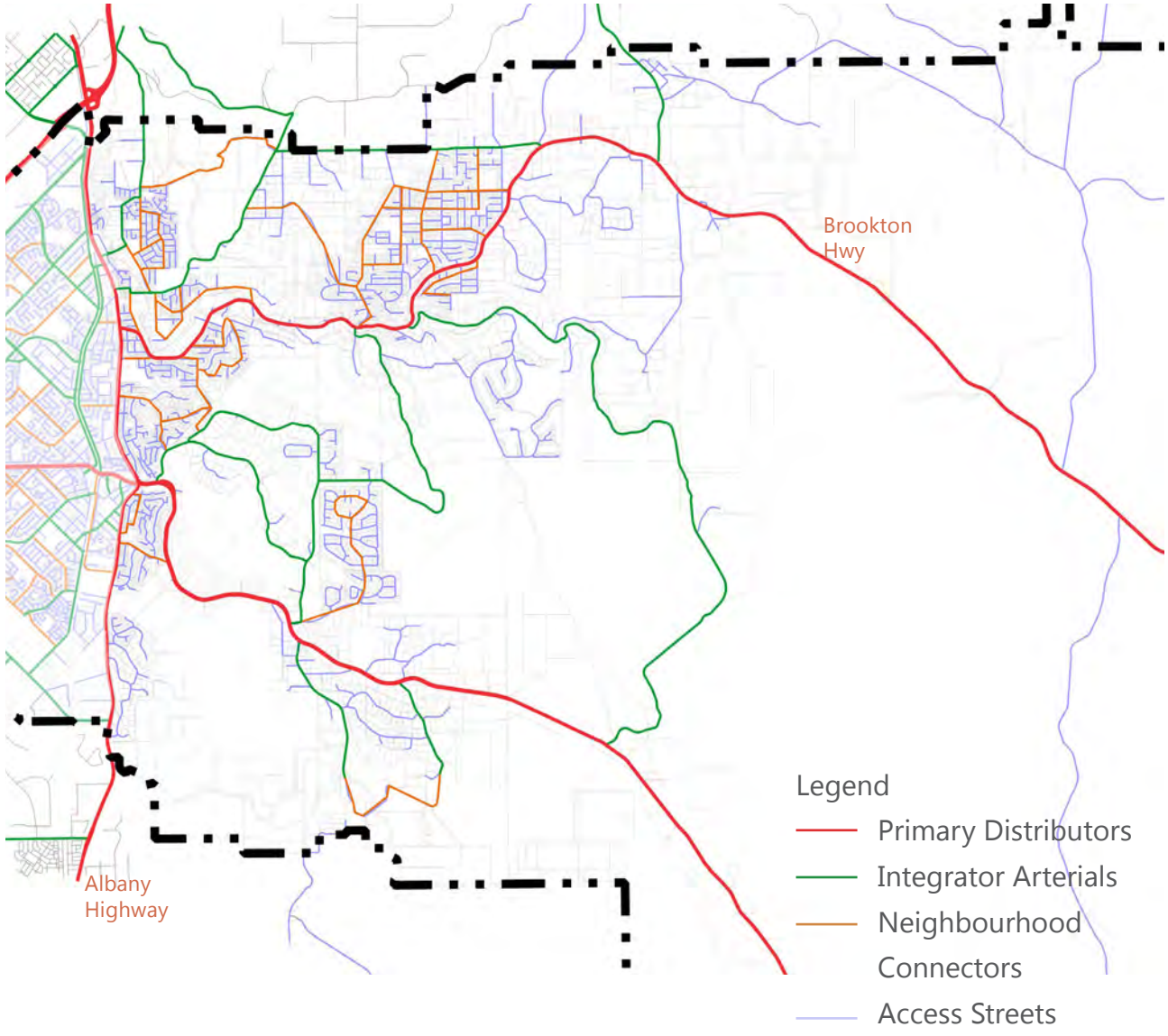
A list of tree species recommended to constitute the urban forest of The Hills precinct has been compiled and divided into three groupings:

- Local
- Introduced
- Fire wise

These groupings have been further broken down to the general conditions of four urban street typologies:

- Primary Distributors
- Integrator Arterials
- Neighbourhood Connectors
- Access Streets

Context Plan



Major street typologies in The Hills Precinct

Below is a list of suggested tree species to comprise the urban forest of The Hills precinct. Please refer to the plant schedule for species information:

Local

Melaleuca preissiana
Corymbia calophylla
Corymbia haematoxylon
Eucalyptus accedens
Eucalyptus caesia
Eucalyptus foecunda
Eucalyptus laeliae
Eucalyptus lane-poolei
Eucalyptus patens
Eucalyptus wandoo

Introduced

Betula pendula
Brachychiton acerifolius
Citrus sp
Citrus limon 'Meyer'
Eucalyptus argutifolia
Eucalyptus caesia
Eucalyptus foecunda
Eucalyptus petrensis
Ficus benjamina 'Midnight Beauty'
Fraxinus griffithii
Fraxinus 'Raywoodii'
Lagerstoemeia indica x L. fauriei
Laurus nobilis
Lophostomen confertus
Michelia figo x Michelia doltsopa
Morus alba 'Pendula'
Plantanus acerifolia
Populus x canadensis
Prunus x blireana
Prunus cerasifera 'Nigra'
Pyrus 'Bradford Pear'
Brachychiton populneus
Callistemon viminallis
Corymbia maculata
Cupressus sempervirens 'glauca'
Eucalyptus forrestiana
Eucalyptus torquata
Jacaranda mimosaefolia
Liquidambar styraciflua
Melaleuca leucadendra
Melaleuca quinquenervia
Pyrus calleryana 'Capital'
Quercus rubra
Sapium sebiferum
Ulmus parvifolium

Firewise

Allocasuarina huegeliana
Alnus glutinosa
Betula pendula
Brachychiton acerifolius
Citrus sp
Citrus limon 'Meyer'
Eucalyptus argutifolia
Eucalyptus caesia
Eucalyptus foecunda
Eucalyptus petrensis
Ficus benjamina 'Midnight Beauty'
Fraxinus griffithii
Fraxinus 'Raywoodii'
Lagerstoemeia indica x L. fauriei
Laurus nobilis
Lophostomen confertus
Melaleuca preissiana
Michelia figo x Michelia doltsopa
Morus alba 'Pendula'
Plantanus acerifolia
Populus x canadensis
Prunus x blireana
Prunus cerasifera 'Nigra'
Pyrus 'Bradford Pear'

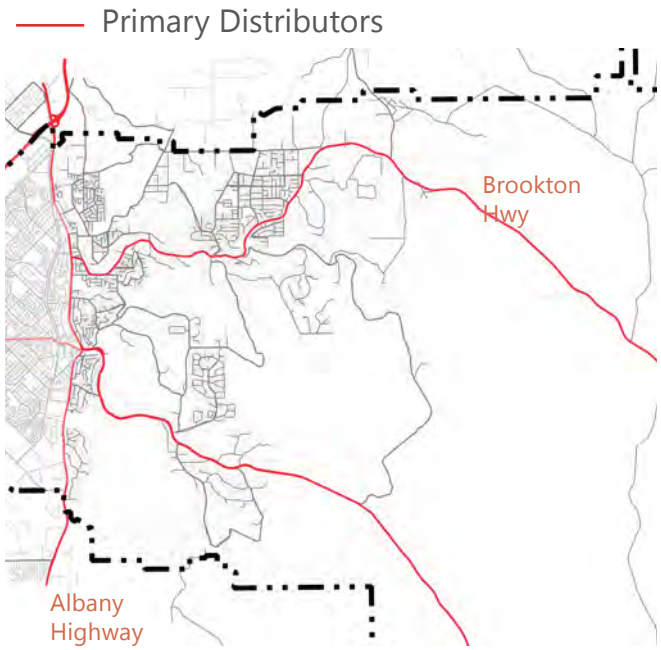
C4.5 Liveable Neighbourhoods Streetscapes

Primary distributors

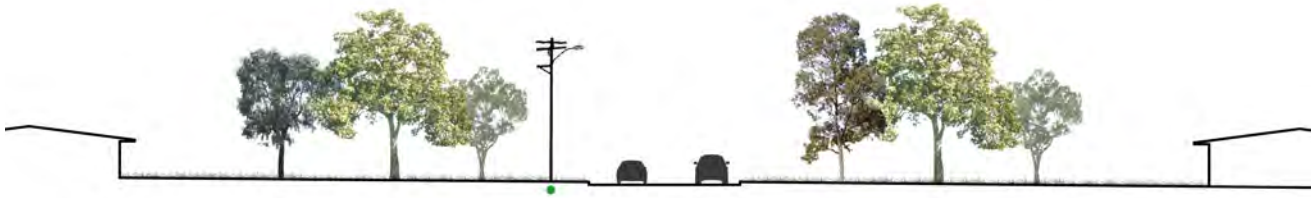
'Firewise' tree species include *Plantanus acerifolia* and *Jacaranda mimosaefolia* as major contributors to highlight gateways, provide formal and fire break / buffer planting.

Large local tree species Marri (*C. calophylla*), and Jarrah (*E. marginata*) are recommended as minor informal ecological contributors to the urban forest in primary distributors within the Hills Precinct.

Local	Introduced	Fire wise
Corymbia calophylla *Eucalyptus marginata*		*Plantanus acerifolia* *Jacaranda mimosaefolia*



Map of Primary Distributors in The Hills Precinct - NTS



Existing urban forest condition of an example location: Brookton highway. Roleystone 1:500 @A4

Potential urban forest condition of an example location: Brookton highway, Roleystone 1:500 @A4

**Site by site assesment required for implementation potential*

Integrator Arterials

'Firewise' tree species would include *Liquidambar styraciflua* and *Ulmus parvifolia* as major contributors to highlight gateways, provide formal and fire break / buffer planting.

Local tree species (*E. lane-poolei*) and Powderbark Wandoo (*E. accedens*) are recommended as minor informal ecological contributors to the urban forest in integrator arterials in the Hills Precinct.

Integrator Arterials

Map of Integrator Arterials in The Hills Precinct - NTS

Local

Eucalyptus accedens
Eucalyptus lane-poolei

Introduced

Fire wise

Liquidambar styraciflua
Ulmus parvifolia

Existing urban forest condition of an example location: Tourist Drive Roleystone 1:500 @A4

Potential urban forest condition of an example location: Tourist Drive Roleystone 1:500 @A4

**Site by site assesment required for implementation potential*

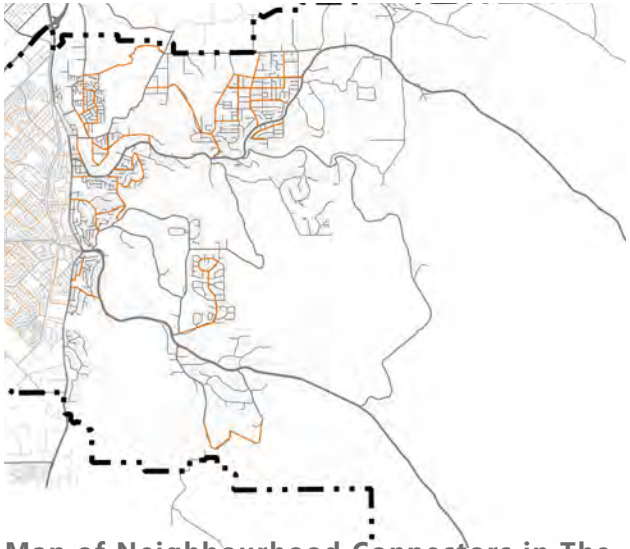
Neighbourhood Connectors

'Firewise' tree species include *Fraxinus raywoodii* and *Lagerstroemia indicia* as major contributors to provide informal and fire break / buffer planting.

Local Darling Range Ghost Gum (*E. laeliae*) and Salmon White Gum (*E. lane-poolei*) are recommended as minor informal ecological contributors to the urban forest in neighbourhood connectors in the Hills Precinct.

Small local Mallee tree species including *Eucalyptus foecunda, Eucalyptus caesia,* Coral Gum (*E. torquata*) and Fuschia Gum (*E. forrestiana*) for informal native plantings under power lines

Neighbourhood Connectors



Map of Neighbourhood Connectors in The Hills Precinct - NTS

Local

Eucalyptus laeliae
Eucalyptus lane-poolei
Eucalyptus caesia
Eucalyptus foecunda

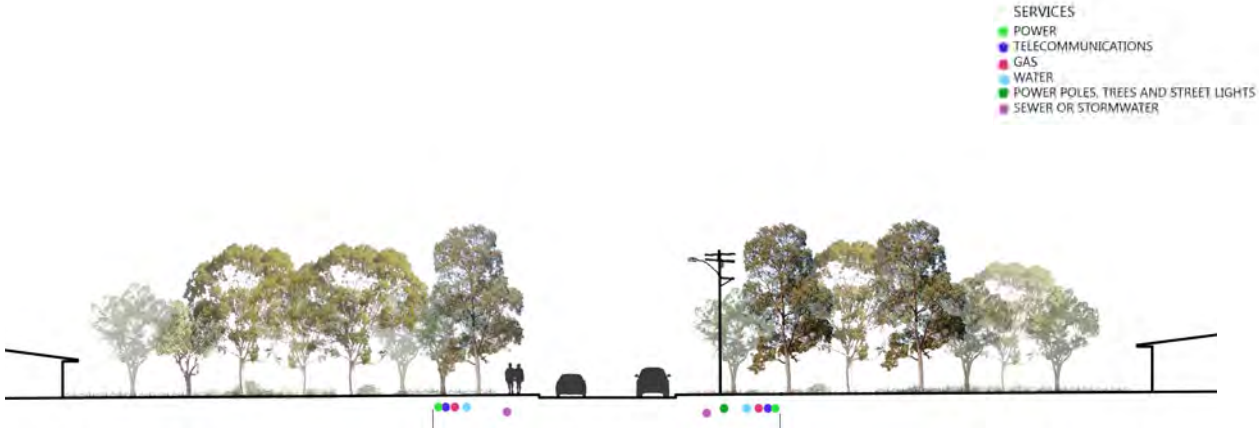
Introduced

Eucalyptus torquata
Eucalyptus forrestiana

Fire wise

Lagerstoemeia indica
Fraxinus 'Raywoodii'

Existing urban forest condition of an example location: Tourist Drive Roleystone 1:500 @A4



Potential urban forest condition of an example location: Tourist Drive Roleystone 1:500 @A4

**Site by site assesment required for implementation potential*

Access Streets

'Firewise' tree species include *Sapium sebiferum* and *Pyrus calleryana* as major contributors to provide informal and fire break / buffer planting.

Small local Mallee tree species including *Eucalyptus foecunda, Eucalyptus caesia,* Coral Gum (*E. torquata*) and Fuschia Gum (*E. forrestiana*) for informal native plantings under power lines.

Local

Eucalyptus caesia
Eucalyptus foecunda

Introduced

Eucalyptus forrestiana
Eucalyptus torquata

Fire wise

Pyrus calleryana
Sapium sebiferum

Access Streets

Map of Access Streets in the Hills Precinct - NTS

Existing urban forest condition of an example location: Hookway Crescent, Roleystone 1:500 @A4

Potential urban forest condition of an example location: Hookway Crescent, Roleystone 1:500 @A4

**Site by site assesment required for implementation potential*

Part D – TOWARDS IMPLEMENTATION

Community Planting Day for Karawara Herb Garden
Source: City of South Perth

Citizen foresters
Source: Casey Trees

D1 Towards Implementation

To the credit of the CoA, the Urban Forest Strategy has been prepared through an inclusive process with project team, various departments and initial public engagement. It is recommended the public engagement can continue in future stages of planning, implementation and management to increase public education and involvement in this invaluable resource, as well as increased ownership and personal contribution to 'their' urban forest canopy.

Current initiatives that are already undertaken by CoA are the Neighbourhood Verge Plan and Street Tree Request initiative. The Neighbourhood Verge Plan promotes neighbourly interaction (3 households or more) working together to prepare a verge plan.

Through both initiatives, the CoA contributes resources including minor grading, plant materials, planting labour, initial watering and fertilising etc. Residents are then encouraged to assist with ongoing maintenance inputs (watering, weeding, pruning etc).

Inclusive governance models are emerging around the world, setting precedents of online tree data management systems. Key precedents are:

Philly Map Tree
http://www.phillytreemap.org/

Urban Forest Map
http://urbanforestmap.org/

These tools are collaborative mapping tools with information collected via 'crowd sourcing' to create inventory of trees.

Strengths of this tool include;

- Online database including extensive tree information
- Quantification of yearly eco benefits (CO_2 reduction, water benefits, energy benefits, air quality benefits etc)
- Tool for reporting issues, hazardous or dead trees
- Increase community involvement through 'crowd sourcing'
- Increase education and awareness on economic and environmental benefits
- Citizens forming responsible entities such as 'Friends of the Urban Forest'

There is opportunity during future works to strengthen and build upon current initiatives to further develop an inclusive implementation process. This could aim to provide participants with increased opportunity to take ownership and contribute to 'their' urban forest canopy.

D2 Recommendations

Recommendation	Action	Responsibility
R1 – Develop Urban Tree Planning Policy	- Prepare a document which outlines retention of existing trees within urban infill and green development. Existing tree retention should be promoted as high priority and considered in development applications. - Ensure appropriate space is made available as part of local planning policy for tree canopy development within urban infill and green field developments, particularly within rear building setbacks (backyards) in private residents. In addition, tree canopy planting allowed for within streetscapes (verges). Note: this is with regard to fire-prone 'firewise' planting best practice.	CoA, MRA, State Government
R2 – Urban Tree Asset Management Plan	- The report recommends the CoA existing tree heritage registry and Tree Preservation Order (TPO) be marketed and open to community input and expanded to cover all urban areas, including areas flagged for green field development. Unnecessary and unapproved removal of existing registered trees would induce heavy penalty.	CoA
R3 – Urban Tree Implementation Plan	- Undertake mapping to collect data on existing public and private tree asset and canopy cover and provide data to assist in developing canopy goals and to determine priority of infill planting. - Develop 5 year implementation and management plan with community consultation.	CoA, CoA community

Recommendation	Action	Responsibility
R4 – Bushfire Management Plan	- The strategy recommends a detailed Bushfire Management Plan be prepared for the CoA. A specific plan that recognises best practice 'firewise' landscape planning and refers to the State Fire Management Guideline (future fire management planning policy) including national 'best practice' for 'firewise landscape planning'. It is recommended this plan include: - Clarification of bushfire prone areas, and provision of these areas with 'firewise' education and a planning overlay for developers and community as part of planning policy to guide existing and future 'firewise' development. - Modelling of environmental factors pertaining to bushfire including; fuel loads, deciduous buffer tree planting, topographical influences, wind influences, temperature and other climatic influences. - Due to conflicting landscape values for living in a bushland environment unique Armadale Hills fire management solutions may consider early warning devices at a community level, community fire drills, and community safe zones (for example a school or sports oval, purpose built clearings or appropriate infrastructure at 800m ped sheds) for saving lives above saving houses within the bushland. - Recommend only larger bushland lots to be approved within the hills so that bushfire protection and hazard zones can be implemented effectively lessoning reliance on neighbours to achieve bushfire compliance to guidelines/policy.	CoA, MRA, State Government

View through the trees to the Swan Coastal Plain
Source: Flickr - Simon Cherriman

Conclusion

In conclusion, the City of Armadale Urban Forest Strategy is a product of a collaborative and inclusive approach that is both holistic in methodology and practical in implementation. The document sets up an agreed 'vision' and guiding 'objectives' to provide a framework for future direction and guide implementation.

The Urban Forest Strategy draws upon the existing landscape character to define landscape precincts, which comprise land use, environmental and social values. By strengthening this landscape character there is opportunity to provide future generations with a resilient, healthy and diverse urban forest canopy.

Trees can coexist with increased urban density with poor urban forest outcomes experienced in contemporary urban development through poor early planning / design and not allowing adequate area within early open space, private lot and streetscape planning. "Liveable Neighbourhoods" has been used within this document to influence tree planting from an early planning level, ensuring tree planting strategy is directed towards outcomes appropriate for the main street types. Private built form setbacks are to be considered to allow space for urban forest retention and development and open space is to be planned around existing significant trees and appropriately introducing a biodiversity of trees to a sustainable Armadale urban forest.

Furthermore, by aligning with the 'Liveable Neighbourhoods' planning guideline the purpose is to improve the ease of the strategies application and increases its relevance at structure planning level, as well as ensuring practical useability for long term planning and daily operations.

The City of Armadale Urban Forest Strategy recognises that this is not a fire management plan, however the strategy understands the urban forest is a key component within such a plan. Therefore the strategy includes state and national best practice 'firewise' tree planting suggestions that would be included in a 'firewise' urban forest planning component of a dedicated City of Armadale Fire Management Plan; i.e. recommended planting measures for nominated fire-prone precincts, chiefly within Building Protection and Hazard Separation zones (BPZ & HSZ) and the use of appropriate 'firewise' low flammable tree species for fire-prone precincts.

The City of Armadale Urban Forest Strategy will continue to evolve to include implementation and management opportunities such as the following;

- Continue to educate and engage with local community / stakeholders / land owners regarding implementation and management of the urban forest
- Increased community implementation, ownership and management of public street trees
- Develop innovative techniques in shared responsibility models
- Integrate the Urban Forest Strategy with local planning policy and approvals
- Investigate urban forest implementation and management funding options
- Integrate the Urban Forest Strategy with a local fire management plan
- Crowd source information regarding development and management of the urban forest
- Inclusion of resident groups (e.g. Roleybushcare)
- Develop interactive on-line tree mapping system

Appreciation

The Armadale Urban Forest Strategy recognises and appreciates the collaborative efforts and inputs from the following community, stakeholders and interest group representatives:

- City of Armadale
- Araluen Botanic Park Foundation Inc.
- Max & Barb Margetts – Kelmscott Residents
- Mr. W.G. O'Grady – Haynes Resident
- Peter and Zoe Stewart – Roleystone Residents
- Roleybushcare
- Eddie & Marilyn Longyear – Armadale Residents
- Kelvin Oliver – Roleystone Resident
- WA State Emergency Management Committee
- WA State Fire & Emergency Services – Office of Bushfire Risk Management
- The Bushfire Front Inc
- David Ward – Roleystone Resident
- Caroline Wielinga – CoA Resident
- Armadale Gosnells Landcare Group Inc.
- David James – Forrestdale Resident
- Greg Walkington – Kelmscott Resident

References

Urban Forest Strategy References;

- CoS 2013) City of Sydney, Urban Forest Strategy, 2013
- (CoM 2012) City of Melbourne, Urban Forest Strategy, 2012
- (Wiki Urban Forestry 2014) http://en.wikipedia.org/wiki/Urban_forestry
- Source: SWALSC Website http://www.noongar.org.au/noongar-people-history.php
- Source Australian Bureau of Meteorology Website - Perth

At the time of developing the Urban Forest Strategy a state fire management planning policy and local fire management plan had not been prepared. This Strategy is to be updated and reviewed / cross referenced when the state fire management planning policy is developed.
Relevant planning and report references include national and local best practice 'firewise' documents, as follows.

Western Australia

- 'Plant Guide within the Building Protection Zone for the Swan Coastal Plain of Western Australia', FESA (DFES) Bushfire and Environmental Protection Branch, 2011
- 'Planning for Bushfire Protection Guidelines', DFES/WAPC, 2010
- WA Department of Fire & Emergency Services (DFES), Bushfire 2014 http://www.dfes.wa.gov.au/safetyinformation/fire/bushfire
- ('A Shared Responsibility' M.J. Keelty June 2011) 'A Shared Responsibility' the report of the Perth Hills Bushfire February 2011 Review, M.J. Keelty June 2011

National

- 'Landscaping for Bushfire', CFA Victoria 2012
- 'Plant Selection Key', CFA Victoria 2012
- 'Victorian Bushfires Royal Commission', Chapter 6 - Planning and Building Final Report, Volume 2, 2010
- 'Bushfire Penetration into Urban Areas in Australia - A Spatial Analysis', Risk Frontiers, for Bushfire CRC and Victorian Bushfires Royal Commission, 2010
- (NFPA 2014)National Fire Protection Association's http://www.firewise.org/about.aspx
- (Bill Gammage ABC July 2012) Bill Gammage: Prevent Bushfire the Aboriginal Way ABC July 2014, by Bill Brown http://www.abc.net.au/local/audio/2012/05/28/3512963.htm
- (DoE October 1994) Biodiversity and Fire: The effects and effectiveness of fire management. Australian Government Department of Environment Biodiversity series paper No. 8 October 1994 Jon Boura Risk Management Department, CFA, Victoria

Appendix A: Costing Estimates and Staging

CITY OF ARMADALE PRECINCTS	2014/15 Year 1	2015/16 Year 2	2016/17 Year 3	2017/18 Year 4	2018/19 Year 5	2019/20 Year 6
URBAN FOREST STRATEGY 5 YEARS AND BEYOND						
SWAN COASTAL PLAIN						
Total Capital Expenditure	$0	$0	$0	$0	$0	$0
Total Maintenance Expenditure (20%)	$0	$0	$0	$0	$0	$0
ARMADALE STRATEGIC METROPOLITAN CENTRE						
Total Capital Expenditure	$0	$0	$0	$0	$0	$0
Total Maintenance Expenditure (20%)	$0	$0	$0	$0	$0	$0
KELMSCOTT TOWN CENTRE						
Total Capital Expenditure	$0	$0	$0	$0	$0	$0
Total Maintenance Expenditure (20%)	$0	$0	$0	$0	$0	$0
ARMADALE HILLS						
Total Capital Expenditure	$0	$0	$0	$0	$0	$0
Total Maintenance Expenditure (20%)	$0	$0	$0	$0	$0	$0
TOTAL URBAN FOREST CAPITAL EXPENDITURE (Excludes Maintenance)	$0	$0	$0	$0	$0	$0

Appendix B: City of Armadale Urban Forest Strategy Engagement Presentation

www.armadale.wa.gov.au