

Draft Local Biodiversity Strategy:

Natural Area Planning in the Shire of Kalamunda



The Shire of Kalamunda will protect, manage and promote the social, economic and environmental values of biodiversity to ensure a lasting legacy for future generations

March 2008



**shire of
kalamunda**

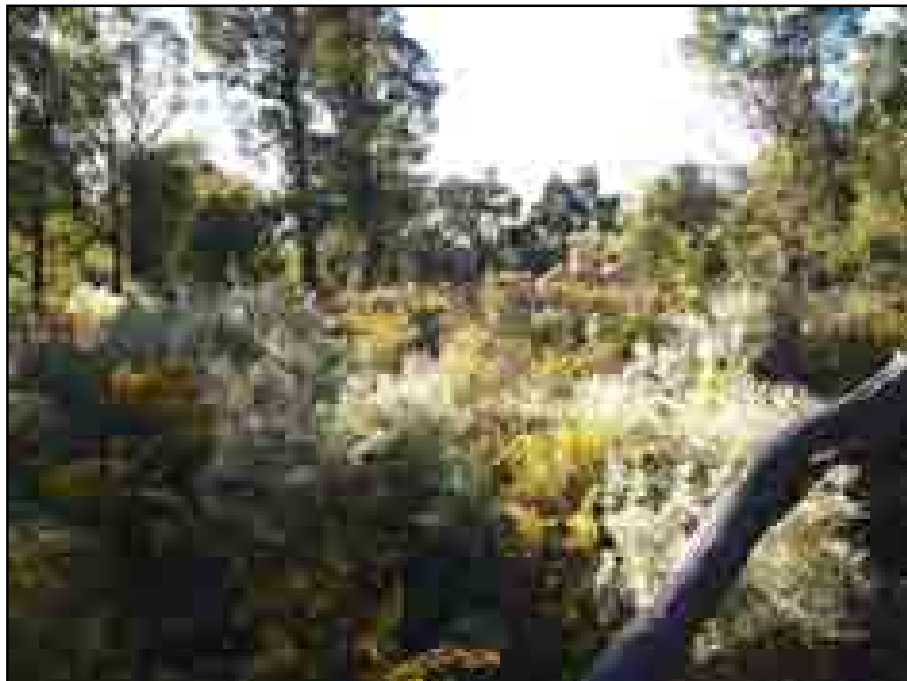
Message from the Shire President

The Shire of Kalamunda contains a very valuable natural environment. This is derived from the three distinct land areas – the Swan Coastal Plain, the Darling Scarp and the Darling Plateau – that make up the Shire landscape.

The Local Biodiversity Strategy has been developed to protect existing natural areas that are important to the community whilst also allowing for growth and development.

Protection of natural areas is important in maintaining the sense of place in the Shire. This Strategy proposes many mechanisms that the Shire can use to guide development, decision making and future activities so that the Shire's unique environment is maintained for future generations. The Shire welcomes community feedback on the Strategy.

Councillor Donald McKechnie
Shire President



Norwood Reserve – Photo taken by Eleanor Bennet

Executive Summary

The Shire of Kalamunda is being influenced from the metropolitan wide growth and industrialisation. The Shire of Kalamunda will need to strategically plan for this growth to ensure the retention and protection of natural areas. This will allow for development whilst also maintaining the sense of place characteristic of the Shire.

The Local Biodiversity Strategy has been developed in anticipation of future development encroaching into natural assets. This strategy aims to strategically plan natural area protection so that biodiversity conservation is incorporated into the Shire's planning and decision making processes. This will ensure that the Shire's unique natural environment is protected and maintained for future generations to enjoy.

Part A of the Local Biodiversity Strategy provides background information on biodiversity and specifically discusses threats to biodiversity within the Shire of Kalamunda. It also details current protection mechanisms and reasons for producing a Local Biodiversity Strategy.

The Local Biodiversity Strategy has been developed using the Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region (WALGA, PBP 2004). These guidelines recommend the development of biodiversity targets to guide protection of the Shires natural areas and introduce four key elements for implementation.

The pre-European extent of native vegetation within the Shire of Kalamunda was 32,354ha (PBP, 2003 unpub.). Within the Shire of Kalamunda 24,081ha of native vegetation remain. Of this, 21,970ha are within Bush Forever sites, National Parks, Regional Parks and State Forest and are therefore outside of the control of the Local Government.

The term Local Natural Areas has been developed for the natural areas over which Local Government can exercise the most control. Within the Shire, 2,110ha remain in Local Natural Areas. These areas form the focus of the Local Biodiversity Strategy.

The targets detailed in **Part B** of the Local Biodiversity Strategy will guide the increased protection of natural areas, including areas of native vegetation and other natural features. The targets have been developed following analysis of the opportunities and constraints posed by land zoning and planned development.

Biodiversity feature targets have been developed to maintain specific biodiversity features such as rare flora and fauna, wetlands and waterways. Representation targets have been developed to protect a percentage of each of the 14 vegetation complexes found within the Shire.

In order to meet the biodiversity targets and to protect biodiversity in the long-term, an action plan has been developed in **Part C** of the Local Biodiversity Strategy. Implementation of the action plan will allow the Shire to:

- Protect of its own natural areas thereby setting an example to others,
- Incorporate biodiversity protection into planning and decision making, and
- Encourage private landowners to voluntarily protect their natural areas.

The implementation of the strategy will initially be absorbed into current Council budgets and by obtaining grant funding.

The implementation of this Strategy will affect the wider Shire community. It is important that feedback to this draft Strategy is provided by the community, developers and State Government. This will ensure that the proposed targets and actions are achievable and the Shire can achieve its vision for biodiversity protection.

Your Comments

The Council welcomes public comment of the Draft Local Biodiversity Strategy.

This Strategy represents the Council's proposed position on protection and management of the remaining Local Natural Areas in the Shire. Options for improving the protection of these natural areas are discussed and actions for implementation are presented.

It is important that residents, land owners and developers comment on the proposals detailed in the Draft Local Biodiversity Strategy so that issues from all sectors are taken into account before the Strategy is finalised.

Public comments are invited with regards to any of the proposals detailed within the report. Comments received on the Draft Local Biodiversity Strategy will be used to finalise the Strategy.

Comments should be sent to:

Chief Executive Officer
Shire of Kalamunda
PO Box 42
KALAMUNDA WA 6926

Or emailed to kala.shire@kalamunda.wa.gov.au

The closing date for submission is 30th May 2008



Brush-tailed Bettong. Photo provided by the Australian Wildlife Conservancy

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1 Introduction

In 1998, the Federal Government released the National Local Government Biodiversity Strategy, which made a number of recommendations regarding the conservation of biodiversity by Local Government. In response to this national strategy, the Perth Biodiversity Project (PBP) was developed as a partnership project between 31 Local Governments, WALGA, the Swan Catchment Council and the Department for Planning and Infrastructure (DPI).

Local Government Biodiversity Planning Guidelines were then developed to assist Local Governments strategically plan for the retention, protection and management of Perth's biodiversity.



Anigozanthos manglesii (Kangaroo Paw) and *Conospermum stoechadis* (Common Smokebush)

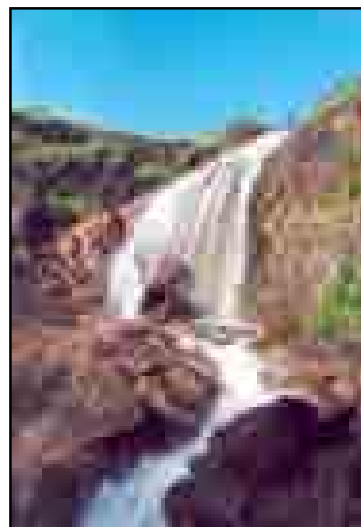
In August 2004 the Shire of Kalamunda resolved to participate in a pilot program with the PBP to trial the use of these guidelines in the development of a Local Biodiversity Strategy.

The development of a Local Biodiversity Strategy will help the Shire of Kalamunda integrate biodiversity conservation into its core business and provide a basis for strategic, consistent and well informed decision making. Setting targets as part of the strategy will also demonstrate a commitment to biodiversity conservation that is aligned with State and Federal policy and legislation.

The Local Biodiversity Strategy focuses on the protection of natural areas – any physical area that contains native species or ecological communities in a relatively natural state and therefore contains biodiversity.

Natural areas contained within the Shire of Kalamunda include:

- Areas of native vegetation,
- Vegetated or open wetlands (lakes, swamps),
- Waterways (rivers, creeks),
- Springs,
- Rock outcrops, and
- Bare ground (generally sand or mud).



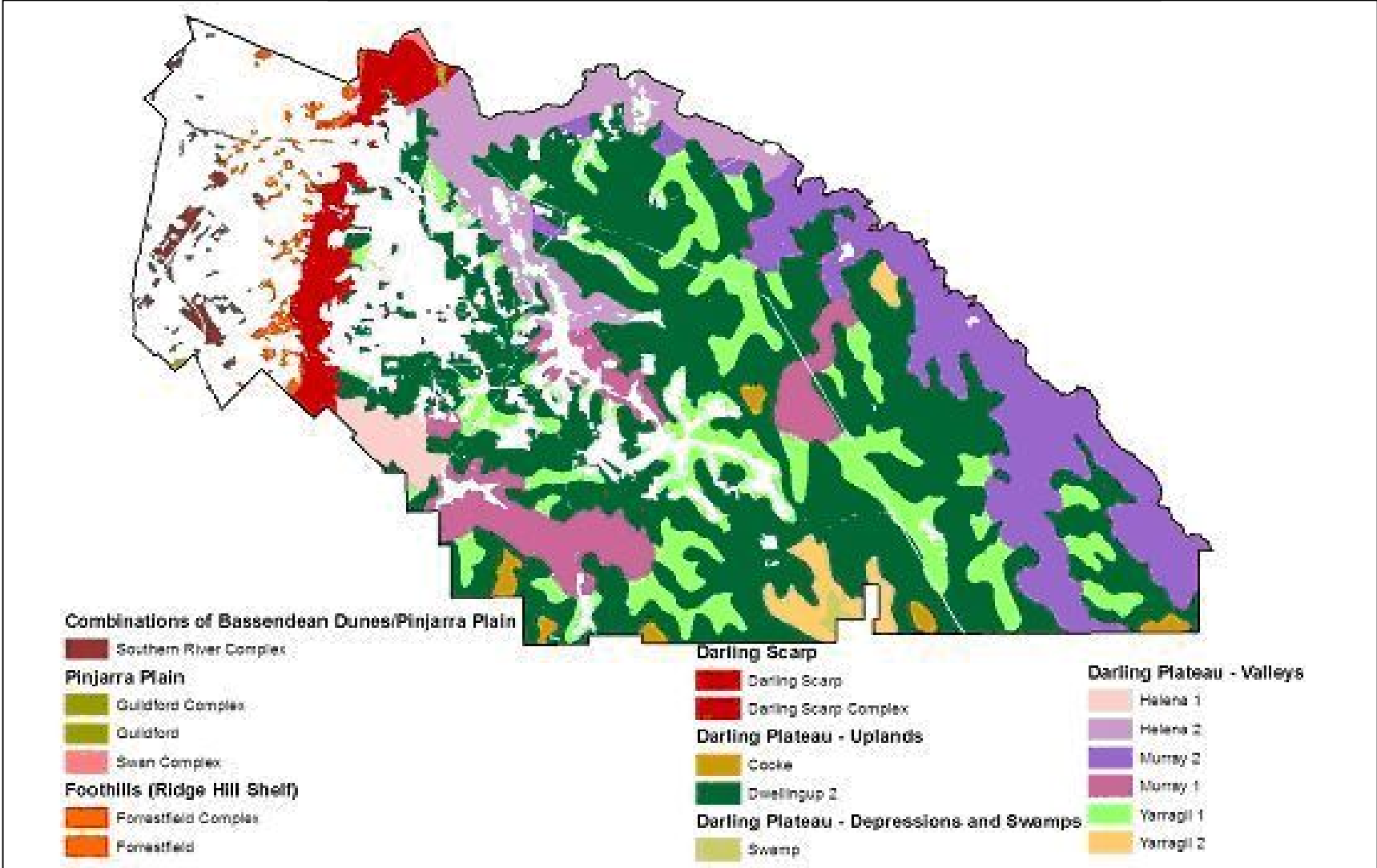
Lesmurdie Falls

The term Local Natural Area (LNA) has been defined by the Perth Biodiversity Project. Local Natural Areas describe natural areas outside Department of Environment and Conservation (DEC) managed estate (National Parks, State Forest), Regional Parks and Bush Forever Sites not managed by Local Government. LNAs therefore represent the natural areas over which Local Government can exercise most control.

The total area of the Shire of Kalamunda, and hence the Pre-European extent of native vegetation, is 32,354 hectares. Only 24,081 of this currently remains. A summary of the remaining native vegetation extent by administrative planning category is shown in **Table 1**. Native vegetation extent by vegetation complex in the Shire of Kalamunda is shown in **Figure 1**.

Table 1: Summary of the remaining native vegetation extent within the Shire of Kalamunda classified by administrative planning category (Perth Biodiversity Project, unpub. 2007)			
Administrative Planning Category	Area (ha)	% of total	
Total Area of Shire	34,900	100	
Total Urban Area	10,819	31	
Total Conservation Area	24,081	69	
• Bush Forever	307	0.88	
• DEC Conservation	9,185	26.32	
• DEC State Forest	11,011	31.55	
• Regional Parks	1,467	4.20	
• Local Natural Areas	2,110	6.05	

Figure 1: Native vegetation extent by vegetation complex in the Shire of Kalamunda



The preparation of this document represents the local biodiversity planning process and includes:

- Identification of the natural area resource,
- Development of a vision statement and targets for the protection and management of Local Natural Areas, and
- Presents the four key outcomes for the Local Biodiversity Strategy:
 - i. Local Planning Policy for Biodiversity Conservation,
 - ii. Incentives Strategy for Private Land Conservation,
 - iii. Management of Local Government reserves, and
 - iv. Formalisation of the protection status of locally significant natural areas.



Bobtails are one of the many fauna species to inhabit the Shire of Kalamunda

Part A: An Introduction to Biodiversity Conservation



2 What is Biodiversity?

Biodiversity refers to the variety of life forms; the different plants, animals and micro-organisms, the genes they contain and the ecosystems they form. It is usually considered in terms of genetic diversity, species diversity and ecosystem diversity (Commonwealth of Australia 1996).

The conservation of ecosystem diversity is the most strategic way to conserve all levels of biodiversity (genetic, species and ecosystem) and aims to prevent these elements of biodiversity reaching the point where they become threatened. For example, by conserving an area of bushland in good condition that includes trees, shrubs and groundcovers, the number of plant species conserved in that community is increased and the number of animal species that can be supported is also increased by providing a greater number of food sources and habitat types.



Melloway Reserve – Photo taken by Eleanor Bennett

A method used to describe ecosystem diversity is the ecological community concept. An ecological community is “a naturally occurring biological assemblage that occurs in a particular type of habitat” (English & Blyth 1997, 1999). In the Perth Metropolitan Region (PMR), the most common way to interpret and quantify ecological communities based on area is to use the vegetation complexes defined and mapped by Heddle, Longeragan and Havel (1980) and Mattiske and Havel (1998). These vegetation complexes are based on the patterning of vegetation at a regional scale reflected by the underlying key determining factors of landform, soil and climate.

Vegetation complexes have therefore been used to develop some of the biodiversity targets found in **Part B**.

3 Why is Biodiversity Conservation important?



Thysanotus multiflora (Fringed Lily). Photo taken by Linda Kirchner

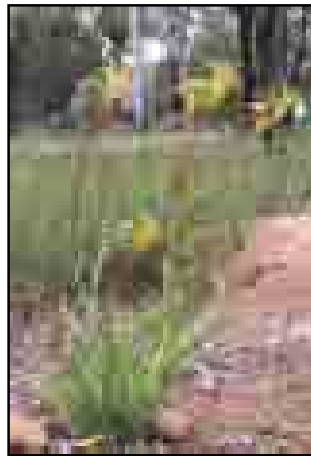
Southwest Western Australia has been recognised globally as one of the planet’s 34 major biodiversity hotspots, and is the only one in Australia. To qualify as a hotspot, a region must meet two strict criteria; it must contain at least 1,500 species of higher order plants as endemics, and it has to have lost at least 70% of its original habitat (Southwest Australia Ecoregion Initiative, 2006). Southwest Western Australia is

therefore a significant part of the planet's natural heritage and the conservation of the biodiversity is the responsibility of all Australians.

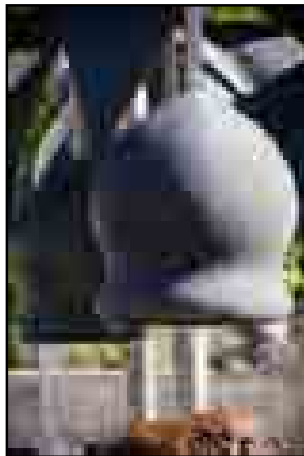
Maintaining biological diversity is more than just protecting wildlife and their habitats in nature conservation reserves. It is also about the sustainable use of biological resources and safeguarding the life-support systems on earth, therefore biodiversity is also a component of sustainable development (National Strategy for the Conservation of Australia's Biological Diversity, 1996).

Biodiversity is also important to humanity in numerous ways:

- To use the biodiversity resource to add value to our lives, for example in food production, and the production of medical and industrial products.
- As the basis for adaptation to changing environments.
- In the maintenance of a wide array of ecological services such as:
 - Hydrological cycles - groundwater recharge, watershed protection and buffering against extreme events,
 - Climate regulation,
 - Soil production and fertility,
 - Protection from erosion,
 - Nutrient storage and cycling,
 - Pollutant breakdown and absorption and
 - The ability to recover from unpredictable events.
- For cultural identity - Australian society has placed great cultural value on the 'bush' with the kangaroo, koala and emu becoming national icons, the kangaroo paw becoming the State emblem and the gumnut becoming the symbol of the Shire.



Kangaroo Paw – Symbol of Western Australia



Gumnut Fountain – The Gumnut: symbol of the Shire

- Aboriginal and Torres Strait Islander peoples have a rich cultural diversity that is closely linked with their environment.
- For tourism and recreational purposes. Both active and passive recreational benefits of our ecosystems are highly valued by an increasing number of people.
- To provide "living laboratories" to study ways to maintain the genetic base of harvested biological resources and how to rehabilitate degraded systems.

The economic values of protecting the remaining biological resource are also vast. Some of these costs have now been estimated. The CSIRO, for example, has

estimated the cost of rehabilitating degraded ecological systems at around \$1 billion annually.

Redressing environmental degradation can be extremely expensive so it is better to try to prevent degradation occurring to reduce long term costs. If prevention of degradation is impossible, then costs can be reduced by strategic and timely conservation actions with regard to protection of natural areas and rehabilitation.

The conservation of biodiversity also has ethical benefits. The presence of a wide range of living organisms reminds people that they are but one interdependent part of Earth. The Earth belongs to the future as well as the present; no single species or generation can claim it as its own. This is an idea that has been reflected in the vision statement drafted by the Steering Group Committee (refer to **Section 6**).

Biodiversity is also likely to have values that are unknown to us today but will present opportunities to future West Australians, and these opportunities should be protected through a precautionary approach to minimise impacts from today's activities.

4 Threats to the Shire of Kalamunda's Biodiversity

There are a number of threats to the management and ongoing viability of natural areas. They range from factors that can be controlled (e.g. weeds) to factors that are global or exist outside the land managers control (e.g. climate change, inappropriate fire regimes).

The Local Biodiversity Strategy aims to address these threats through the incorporation of land use planning controls, policy formulation and on-ground management. The main threats to biodiversity in the Shire of Kalamunda are detailed below.

4.1 Subdivision and development approval

Until recently, biodiversity conservation has not been considered an important aspect in land use planning. Activities such as subdivision have therefore led to widespread clearing of native vegetation. This is apparent where urban areas have been subdivided and the retention of areas with biodiversity conservation value has not been considered a priority. It is also apparent that degradation of remnant vegetation has occurred where rural zones have been changed to special rural zones and led to smaller lot sizes, without the retention of vegetation.

Protection of biodiversity needs to be considered in the early stages of the land use planning process. This consideration will require detailed desktop assessment during the structure planning phase of subdivisions.

Land capability analysis is required during subdivision of land zoned for special rural and rural composite uses. This analysis must consider retention of remnant vegetation, wetlands and waterways. In order to preserve biodiversity values within these zonings this requirement should be enforced.

The Shire's Local Planning Scheme contains provisions for the protection of the environment as part of any development approval. These provisions can be used to provide conditions for the achievement of biodiversity conservation.

The biggest opportunity to biodiversity conservation comes from its inclusion in the planning process. Biodiversity therefore needs to be considered during the assessment of all development applications, during structure planning and when enforcing the purposes of various zonings.

The development of the Local Biodiversity Strategy will provide the Shire with opportunities to better include biodiversity in its planning process.

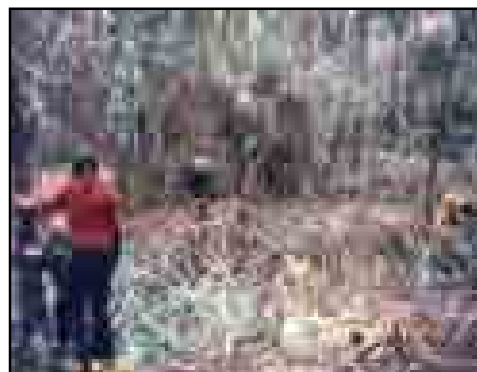
4.2 Weeds

Put simply, a weed is a plant growing where it is not wanted (Hussey *et al* 2007). Environmental weeds that compete with (and displace) local native plant species are a significant threat to natural areas. Weeds compete with local native plant species for space and light and deprive local fauna of suitable habitat. Controlling weeds in natural areas is a significant cost to the management of these natural areas (Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region 2004).

There are approximately 197 weed species known to occur within the Shire of Kalamunda. The top ten priority weeds are summarised in **Table 2** below:

Specific Name	Common Name	Rating
<i>Asparagus asparagoides</i>	Bridal Creeper	High
<i>Cortaderia selloana</i>	Pampas Grass	High
<i>Eragrostis curvula</i>	African Love Grass	High
<i>Freesia</i> aff. <i>Leichtlinii</i>	Freesia	High
<i>Homeria flaccida</i>	One Leaf Cape Tulip	High
<i>Hyparrhenia hirta</i>	Tambookie Grass	High
<i>Heptospermum laevigatum</i>	Victorian Tea Tree	High
<i>Watsonia bulbifera</i>	Watsonia	High
<i>Rubus</i> spp	Blackberry	Moderate
<i>Echium plantagineum</i>	Paterson's Curse	Moderate

The Shire's Weed Control Strategy is the main management tool used to eradicate weeds. The *Shire of Kalamunda Pest Plant By-laws, 1979* can also be used for the control of Blackberry, African Feather Grass and Watsonia on private land. Collaboration between landholders and Shire staff to find solutions to weed infestations is however currently the preferred method of weed eradication on private land. Examples of this include provision of technical advice and seeking grant funding.



Weed control at Plesse Brook

4.3 Feral animals



*Feral cats predate on local wildlife.
Photo taken by Greg Calvert*

Feral animals are introduced animals that compete with, predate and introduce diseases on native local fauna. They can also alter the structure, density and floristic composition of natural areas through grazing and soil disturbance (Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region 2004).

Feral animals likely to occur in the Shire of Kalamunda include, but are not limited to, the following:

- Feral cats,
- Foxes,
- European Bees,
- Rats,
- Rabbits, and
- Rainbow Lorikeets.

Feral animal control is largely the responsibility of State Government although the Shire has produced a checklist for domestic cat owners. There is scope to investigate further controls with regard to domestic and feral cats.

4.4 Habitat fragmentation

Significant clearing of native vegetation has taken place in the Shire of Kalamunda as part of ongoing urbanisation and industrialisation. Clearing has also taken place on reserved land in order to create recreational parks. The remaining natural areas are therefore now fragmented across the landscape which is especially apparent on the Swan Coastal Plain.



Clearing for urbanisation can lead to loss of significant natural areas. Photo taken by Karen Britza

Habitat fragmentation has many detrimental impacts including:

- Reduced habitat for individual species and isolation of species living in an area,
- Interference with the ability of populations to disperse and recolonise areas after disturbance (such as fire) or mortality,
- Decreasing population size to below the threshold where it can be self-sustaining through reproduction, and
- Magnification of the negative impact of surrounding land uses (edge effects) in comparison to corresponding areas of habitat that are not fragmented.

(Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region 2004)

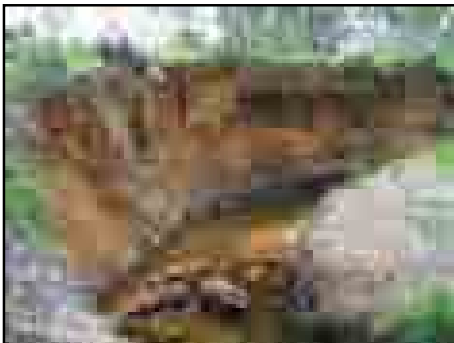
4.5 Changed water regimes/ water quality

Plants and plant communities in a given area are strongly influenced by water availability. Urbanisation has significantly altered water regimes in the Shire and therefore the water available to plants.

Wetlands on the Swan Coastal Plain, for example, have historically been used for stormwater discharge. Some wetlands areas that were previously seasonally inundated have become permanently inundated which has led to death of some flora species.

Excessive nutrients, sediments and pollutants can also have a significant effect on native vegetation, wetlands and waterways. Excessive nutrients and pollutants contribute to algal blooms, death of aquatic life in wetlands and promote the spread of weeds in both upland and wetland natural areas (Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region 2004).

4.6 Erosion



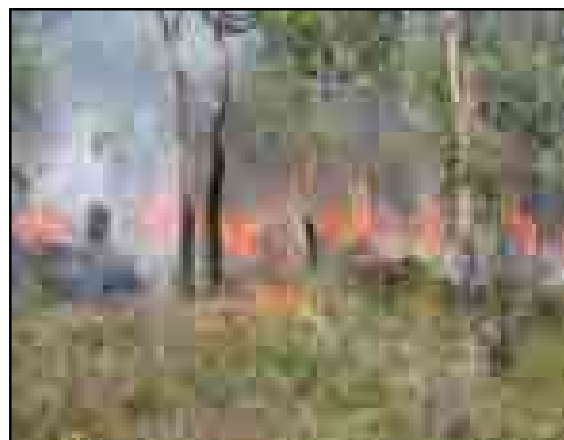
Bank erosion along Poison Gully

Erosion is evident along the numerous creeklines within the Shire of Kalamunda which causes physical degradation to these natural areas. Erosion is magnified by increased discharge of stormwater into the creeklines which increases the volume of water carried by these waterways. This contributes to sedimentation and eutrophication further downstream.

4.7 Inappropriate fire regimes

Inappropriate fire regimes are those which occur at a frequency unsuitable for the local environment. Fires occurring too frequently may limit the recovery and regeneration of flora; while areas left unburnt for long periods may limit the reproduction mechanisms of some flora species that rely on smoke or heat for seed germination. Inappropriate fire regimes can alter the structure, density, and floristic composition of natural areas.

There are impacts on fauna through direct mortality or through a lack of refuge areas during and in the recovery period after fire (Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region 2004).



*Fire can have a devastating effect on natural areas.
Photo by Sandra Hohloch (DEC)*

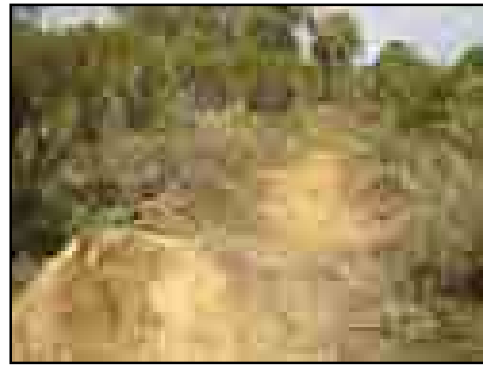
Fire controls within the Shire are implemented by Shire rangers and the Department of Environment and Conservation (DEC). Fire controls aim to limit the detrimental effect on people, belongings and the environment. Unfortunately fires are frequently started by arsonists and the impact of this is difficult to control.

4.8 Diseases

Diseases (for example, Phytophthora Dieback, canker) can alter the structure and floristics of natural areas by causing the death of native vegetation. The resilience of native vegetation to disease is reduced when impacted by other threats (Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region 2004). The Shire of Kalamunda has undertaken Phytophthora treatment at reserves and is developing a process by which Phytophthora treatment kits can be made available to the wider community.

4.9 Inappropriate land use

Human use of natural areas including inappropriate access, recreational activities and firewood collection can have a detrimental effect on natural areas. Inappropriate or uncontrolled recreational activities can directly disturb the vegetation (through damage from vehicles and motorcycles or the creation of walking tracks) that may result in erosion, and allows the introduction of weeds and disease.



Bike jump at Maida Vale Reserve

Firewood collection can have an incremental but devastating effect on wildlife habitat through the removal of dead and fallen trees.

In order to reduce the impacts of inappropriate human use on natural areas the Shire of Kalamunda undertakes the following activities:

- Development of joint recreational and environmental reserve management plans,
- Community education,
- Installation of fencing as required, and
- Ongoing liaison between the Community Services, Parks and Gardens and Environmental sections with Shire.

4.10 Climate

The unique biodiversity found within Australia is largely a result of Australia's climate, soils and isolation. Current and future climate change will affect biodiversity directly through changes to temperature, rainfall and extreme events, and through altering the nature and intensity of existing biodiversity pressures (e.g. salinisation, loss of wetlands, density and distribution of weeds). This will bring changes to landscapes and ecosystem services as species adapt, emigrate or immigrate and others become isolated (State of the Environment Report EPA 2007).

Reducing the effect of other threatening processes may help to increase the resilience of communities within the Shire of Kalamunda. This will mean that they are more likely to withstand the effects of climate change and can adapt as necessary.

5 Conservation of Local Biodiversity

The value of biodiversity is increasingly being realised by local governments across the country. Of all tiers of Government, Local Government has the greatest opportunity to interact directly with the community. This gives local government the opportunity to show leadership within the community, and to offer vital support and encouragement to local land and property owners to conserve native flora and fauna.

Providing a local focus to biodiversity conservation also allows the Local Biodiversity Strategy to be developed in a way that is more meaningful to the community.

5.1 Current protection for biodiversity

5.1.1 Legislation, policy and Guidelines

There are numerous international agreements and conventions linked to biodiversity conservation as well as a number of Federal, State and Local laws and policies. The production of the Local Biodiversity Strategy will help the Shire meet its responsibilities under these laws and policies and achieve sustainable development and natural resource management objectives. Legislation, strategies and policies related to biodiversity conservation are detailed in **Box 1** below and further detail is provided at www.slp.wa.gov.au.



Fungi provide an important function within the natural environment

Box 1: Legislation, policy and guidance related to biodiversity conservation

- Japan Australia Migratory Birds Agreement (Australian Treaty Series 1981 No 6)
 - China Australia Migratory Birds Agreement (Australian Treaty Series 1988 No 22)
 - Convention on Biological Diversity 1992
- Federal Legislation and Policies**
- Environmental Protection and Biodiversity Conservation Act 1999
 - National Strategy for the Conservation of Australia's Biological Diversity 1996
 - National Local Government Biodiversity Strategy 1999
 - National Weeds Strategy 1997
 - National Objectives and Targets for Biodiversity Conservation 2001-2005
 - Threat abatement plan for *Phytophthora cinnamomi* 2001
- State Legislation and Policy**
- Wildlife Conservation Act 1950
 - Aboriginal Heritage Act 1972
 - Agriculture and Related Resources Protection Act 1976
 - Conservation and Land Management Act 1984
 - Environmental Protection Act 1986
 - Native Title Act 1993
 - Local Government Act 1995
 - Environmental Protection (Clearing Native Vegetation) Regulations 2004
 - Planning and Development Act 2005
 - State Planning Policy 1997
 - Hope for the Future: The Western Australian State Sustainability Strategy 2003
 - State Planning Policy No.2: Environment and Natural Resources Policy 2003
 - State Planning Policy No.2.9: Water Resources, 2006
 - State Planning Policy No.2.8: Draft Bushland Policy for the Perth Metropolitan Region 2004
 - Wetlands conservation policy 1997
 - System 6 1981
 - Bush Forever 2000
 - WA Weed Plan 2001
 - Forest Management Plan 2004-2013
- Regional Policies and Strategies**
- Perth Biodiversity Project 2004
 - Local Government (NRM) Policy Development Project 2000
 - Swan Region Strategy for Natural Resource Management (NRM) 2004
- Council Policies, Management Plans, Local Laws & Regulations**
- Shire of Kalamunda Pest Plant By-laws 1979
 - Local Planning Scheme No. 3 2007
 - Future of the District Plan 2006-2011 (2006)
 - Shire of Kalamunda's Strategic Plan 2000-2025 (2000)
 - Weed Control Strategy 2002
 - District Conservation Strategy 1995
 - The Wildlife Corridor Strategy 1998
 - Flood and Stream Management Policy 2002
 - Tree Preservation Policy 2002
 - Protection of the Environment Policy 2002

5.1.2 Land Use Planning in the Shire of Kalamunda

The Perth Metropolitan Region (PMR) is being influenced by the industrial activity occurring in Asia. This had led to unprecedented population growth that is affecting all Local Governments of the PMR. As the areas allocated for residential development become fully developed new areas for development may have to be found. It is therefore important that the Shire of Kalamunda plan for future development.

At present there are areas zoned for urban use which have not been fully developed. In some areas it will be necessary to develop Structure Plans for future urban and industrial development.

Currently there are no set criteria for choosing areas to be retained as public open space and conservation areas during the structure planning phase and no detailed on-ground assessment takes place. Historically the areas set aside for public open space have been already earmarked for protection e.g. Bush Forever sites, wetlands and waterways. Flora and fauna surveys are not conducted until well into the subdivision stage when reallocating the public open space and protecting valuable biodiversity assets may be difficult to achieve.

Many high quality bushland remnants have been lost by not including biodiversity conservation early in Structure Planning.

The Shire's Local Planning Scheme contains provisions in respect to removal of vegetation. The Shire can therefore use any of the state legislation or guidelines listed in **Box 1** when assessing applications which will result in the removal of native vegetation. Consideration of the environment also has to be taken into account as part of the land capability analysis for subdivision in numerous zonings.

5.1.3 Strategic direction

Preparation of a Local Biodiversity Strategy is supported by the Shire's Future of the District Plan 2006-2011.

The development of a Local Biodiversity Strategy will provide a strong position for the Shire of Kalamunda when assessing new developments, rezonings and structure plans. As part of this strategy, targets and an action plan have been developed to provide a clear direction to how biodiversity will be conserved in the long term. These targets are detailed in **Part B** and the action plan is detailed in **Part C**.

5.2 Why produce a Local Biodiversity Strategy?

The Shire of Kalamunda originally contained 32,354 hectares of native vegetation and associated wetlands and waterways. Only 24,081 hectares (74.4%) of this is present today. 21,970 ha are protected via Bush Forever and the State conservation estate and 2,110 hectares do not have any formal protection – the areas known as Local Natural Areas (LNAs) (**Table 1**).

The Local Biodiversity Strategy will focus on the LNAs so that the remaining biodiversity of the Shire is protected and provides a lasting legacy for future generations.

The production of a Local Biodiversity Strategy also helps the Shire meet the expectations of the community with regard to the natural environment. Refer to **Box 2** below.

Box 2: The expectations of the community with regards to the environment (Shire of Kalamunda Cultural Plan 2006)

The community views the Shire of Kalamunda as having a significant role as a custodian of the natural environment, and should lead to recognition that the Shire is a leader in the protection, management, retention, preservation and rehabilitation of natural environmental assets.

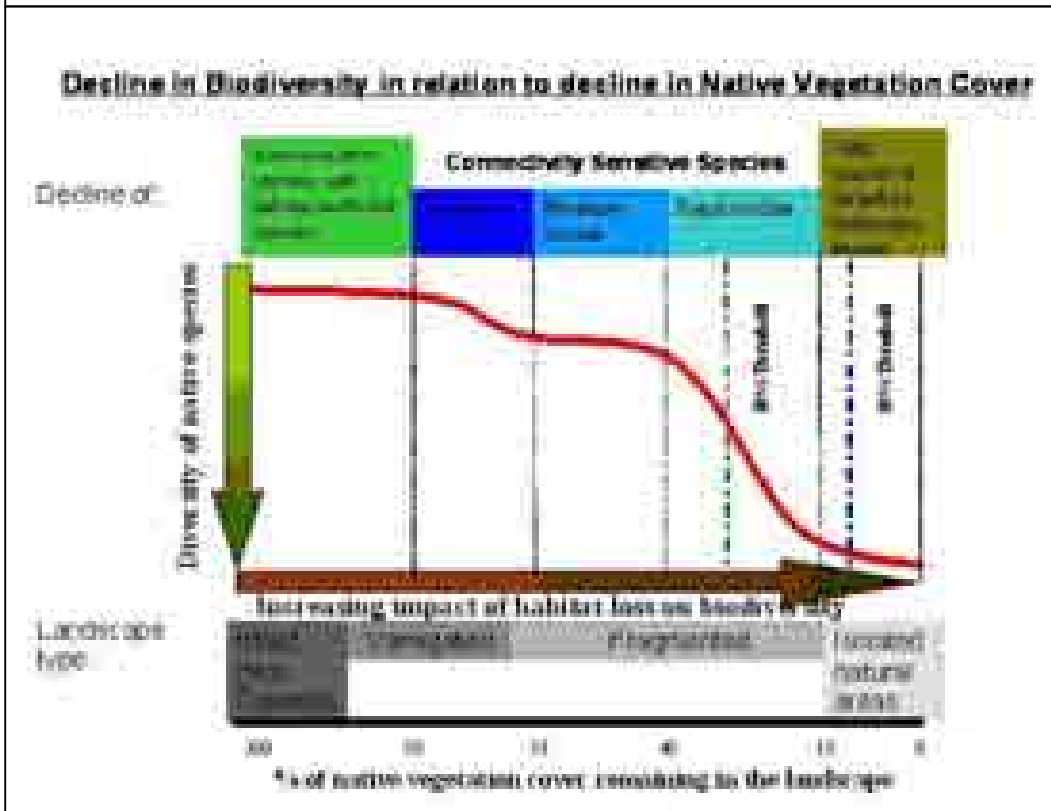
The Shire community favours sustainable development that is sensitive to, and compatible with, the natural environment. There is also a strong desire to balance environmental protection and management with recreational enjoyment.

5.2.1 How much should be protected?

Current science indicates that retaining 30% of the original extent of an ecological community is required to prevent exponential loss of species (Smith and Siversten 2001) as depicted by **Figure 2** below.

The National Objectives and Targets for Conservation 2001-2005 and the Environmental Protection Authority's (EPA's) biodiversity principles for biodiversity conservation also recognise the need to retain 30% of each ecological community. Where retention of the original extent of an ecological community is 10% or less, that community is considered to be endangered.

Figure 2: Decline in Biodiversity in relation to decline in Native Vegetation Cover (supplied by the PBP)



Bush Forever is the primary mechanism for implementing the State Government's commitment to conserve regionally significant bushland in Perth. There are 287 Bush Forever sites, which represent, where achievable, a target of conservation of at least 10% of each of the original 26 vegetation complexes of the Swan Coastal Plain (Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Area, 2004).

As Bush Forever has a regional focus and does not consider areas that are locally significant, there is the opportunity for the Local Biodiversity Strategy to compliment Bush Forever by increasing the protection of locally significant ecological communities or vegetation complexes and providing linkages between Bush Forever sites.

Of the remaining vegetation complexes on the Swan Coastal Plain within the Shire of Kalamunda, there are 3 complexes protected in Bush Forever Sites; Southern River, Forrestfield and Guildford. The protection of these complexes in Bush Forever Sites within the Shire of Kalamunda is summarised in **Table 3** below.

Table 3: Summary of Bush Forever sites within the Shire of Kalamunda by vegetation complex (figures taken from PBP mapping datasets, 2005)			
Vegetation Complex	Pre-European Extent	Extent protected in Bush Forever Sites	
	ha	ha	% of original
Forrestfield Complex	1925	64.738	3.36
Guildford Complex	91	9.034	8.43
Southern River Complex	2319	195.458	9.93

Bush Forever does not provide protection for these three vegetation complexes above 10%. Increased protection of the Southern River, Forrestfield and Guildford vegetation complexes is therefore essential to ensure that these communities do not become endangered. Past clearing already means that the national target of 30% is unlikely to be achieved for these vegetation complexes.

The 30% target is achievable for vegetation complexes in the Jarrah Forest and the Darling Scarp due to the level of retention of native vegetation, in good or better condition, and the higher levels of protection within Regional Parks and National Parks. Targets for protection are further discussed in **Part B**.

5.2.2 What should be protected?

Further to vegetation complexes or ecological communities, specific features of the biodiversity within the Shire should be protected. Rare species, threatened communities and other significant natural features often associated with regionally significant areas are protected in Bush Forever. Local Natural Areas may also contain these features; however at this stage there is no formal process to identify these features before land use plans are developed.

It is recommended that processes be developed to ensure that thorough ecological assessments occur as part of planning for future developments (refer to **Section 11.3**).

5.2.3 How will natural areas be protected?

The implementation of the Local Biodiversity Strategy will assist in local area planning by considering biodiversity when preparing detailed local structure plans, assessing subdivision and development applications with more rigorous ecological criteria and making minor amendments to the local planning scheme. This will be assisted by the development of a local planning policy for biodiversity conservation.

The local planning policy will provide a formalised and equal assessment process for each development proposal likely to affect Local Natural Areas. It is envisaged that a detailed desktop assessment and on-ground surveys maybe required prior to any approvals or work commencing.

Between 2001 and 2005, 59 hectares of native vegetation were cleared, mostly in Local Natural Areas. The future of Local Natural Areas is therefore uncertain and remaining Local Natural Areas are considered to be retained but not protected. This strategy will aim to increase the protection of these areas. For the purposes of this report, an area will be protected if:

- Public land has been vested for the purposes of conservation,
- Private land is covered by a management agreement of at least 5 years, or
- Private land has a permanent conservation covenant.

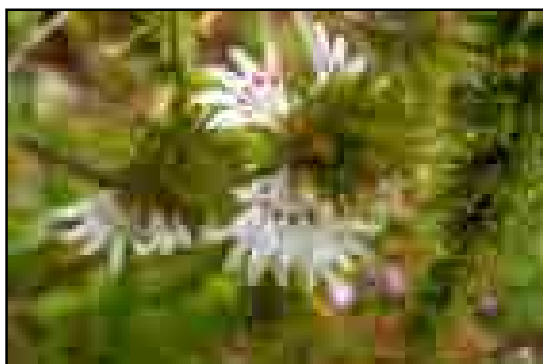
It should also be noted that protected natural areas will need to be managed to alleviate the threats to biodiversity and funds will need to be allocated. Generally larger areas in good or excellent vegetation condition require less maintenance than smaller more degraded areas.

5.2.4 How will natural areas be identified?

Locally significant natural areas in the Shire of Kalamunda have been identified using the criteria detailed in the Local Government Biodiversity Planning Guidelines. The standard ecological criteria for local biodiversity planning are grouped under the following themes:

- Representation of ecological communities,
- Diversity,
- Rarity,
- Maintaining ecological processes or natural systems – connectivity
- Protecting wetland, streamline and estuarine fringing vegetation

These criteria have also been used to develop local biodiversity targets which are detailed in **Part B**.



Goodenia fasciculata – Bristly scaevola. Photo taken by Linda Kirchner

Part B: The Biodiversity Resource and Targets for Protection



6 Vision Statement

A vision statement is a broad aspirational statement that defines the condition of biodiversity for future generations. The vision statement for the Shire of Kalamunda with regards to biodiversity conservation was developed with the Steering Group committee. This committee included representatives from both Council and community. The vision statement therefore represents the long-term Council direction with regards to biodiversity and features the opinion of the community.

The Shire of Kalamunda's vision statement with regard to biodiversity conservation is:

The Shire of Kalamunda will protect, manage and promote the social, economic and environmental values of biodiversity to ensure a lasting legacy for future generations.



7 An Introduction to Targets

A number of high level targets have been developed in recognition of the importance of protecting higher levels of biodiversity before degradation through development occurs. It is proposed that these targets will guide the development and implementation of the Local Biodiversity Strategy and ensure common understanding amongst stakeholders. Targets are also useful in establishing priorities for protection.

Two types of targets have been developed:

- i. Biodiversity feature targets and
- ii. Representational targets.

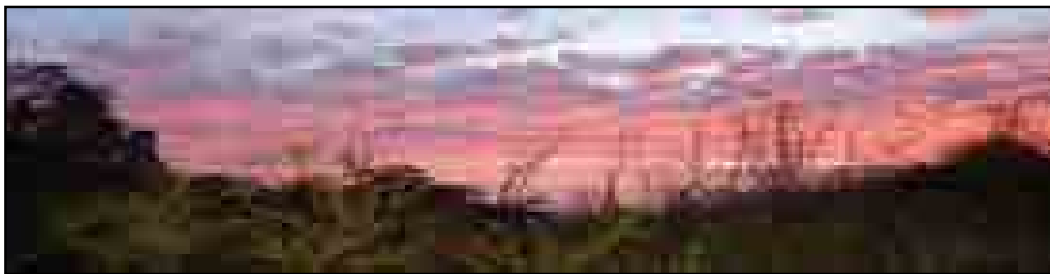
Specific biodiversity feature targets focus on protecting significant local natural areas containing the following biodiversity features or functions:

- Rare species and ecological communities,
- Wetlands, waterways and associated riparian vegetation, and
- Ecological linkages - maintaining ecological processes or natural systems.

Biodiversity feature targets are discussed in detail in **Section 8**.

Representational targets focus on retaining and protecting a proportion of each of the characteristic ecological communities found within the Shire. These targets are expressed as an area in hectares or as a percentage of the original vegetation extent. Representational targets are discussed in detail in **Section 9**.

In order to be classified as being high priority for protection, a Local Natural Area will usually meet a representational target and at least one specific biodiversity feature target.



View from Lesmurdie Falls at sunset. Photo by Karen Britza

7.1 How were the targets developed?

The targets were drafted by Shire environmental staff using the standard ecological criteria for identifying locally significant natural areas detailed in the Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region (Western Australian Local Government Association and Perth Biodiversity Project, 2004). Development of the targets also considered the opportunities and constraints to achieving each target and current legislative requirements.

Input into the targets was provided by a Technical Working Group made up of planning, parks and gardens, engineering and community services staff. Draft targets were then taken to a Steering Group made up of members of the community, Councillors, representatives from State Government and representatives from the Perth Biodiversity Project (PBP).

The final drafts of the proposed targets are presented below. Further comment on these targets is sought during the public review period.

8 Biodiversity Feature Targets

Specific biodiversity feature targets focus on protecting significant local natural areas. Biodiversity feature targets should be used in conjunction with representational targets to prioritise Local Natural Areas (LNAs) managed by the Shire and will be used to assess other LNAs as part of planning decision making.

Development of specific biodiversity feature targets will also help in the development of processes to identify these features earlier in the development approval process.

Examples of how these targets will be achieved are detailed in **Section 13.1**.

8.1 Rare Species and Ecological Communities

8.1.1 Threatened Ecological Communities

Threatened Ecological Communities are ecological communities that have been assessed by the Federal or State Government and assigned a threat status.

At a national level, the Shire of Kalamunda is recognised as containing two TECs protected under the *Environmental Protection Biodiversity Conservation (EPBC) Act 1999*.

At a State level, the Department of Environment and Conservation (DEC) has also been identifying and informally listing Threatened Ecological Communities (TECs) for eight years. While these TEC are not afforded direct statutory protection their significance is acknowledged through other State environmental processes (for example, Environmental Impact Assessment in accordance with Part IV of the *Environmental Protection Act 1986*).

All known TECs in the Shire of Kalamunda occur on the Swan Coastal Plain where the pressures from development are highest.

Protection of TECs is summarised in **Table 4** below.

Threatened Ecological Communities	EPBC Act 1999 Status	DEC Status
<i>Corymbia calophylla</i> - <i>Kingia australis</i> woodlands on heavy soils of the Swan Coastal Plain (DEC TEC - SCP3a)	Endangered	Critically endangered
Shrublands and Woodlands of the eastern Swan Coastal Plain (DEC TEC - SCP3c)	Endangered	Critically endangered
SCP20a - <i>Banksia attenuata</i> woodland over species-rich dense shrubland's	-	Endangered

These factors were therefore taken into consideration during the development of the TEC target which is detailed in **Box 3** below.

Box 3: Proposed target for Threatened Ecological Communities (Federal and State)

Retain and protect natural areas containing TECs and where there is significant natural area remaining, protect buffers and the associated vegetation that is contiguous with these communities. Where practicable, enhance these natural areas to maintain and improve biodiversity values.

Further information regarding the *EPBC Act 1999* can be found at www.environment.gov.au/epbc/index.html.

8.1.2 Threatened Plants and Declared Rare Flora (DRF)

Threatened plants are plant species likely to become extinct or which are recognised as being rare at a Federal or State level. These species should be protected and managed in order to prevent extinctions and encourage recovery.

At a national level, the Shire is known or likely to contain a number plant species protected under the *EPBC Act 1999*. Those species known to occur in the Shire correspond to species declared under the State's *Wildlife Conservation Act 1950*. This is likely to be due to the fact that before a species can be declared under this act it must be adequately surveyed. DRF species were found and reported during assessment of the Shire reserves undertaken in the 2005 and 2006 spring seasons. This information is summarised in **Table 5** below.

Table 5: Threatened plant species listed under the <i>EPBC Act 1999</i> and species declared under the <i>Wildlife Conservation Act 1950</i> (Information adapted from data supplied by the Department of Environment and Water Resources and the Department of Environment and Conservation)			
Plant Species	Status under <i>EPBC Act 1999</i>	State DRF species	Presence
<i>Acacia anormala</i> (Grass Wattle)	Vulnerable	Yes	Species or species habitat known to occur within area
<i>Acacia aphylla</i> (Leafless Rock Wattle)	Vulnerable	Yes	Species or species habitat known to occur within area
<i>Andersonia gracilis</i> (Slender Andersonia)	Endangered	Yes	Species or species habitat likely to occur within area
<i>Anthocercis gracilia</i> (Slender Tailflower)	Vulnerable	Yes	Species or species habitat likely to occur within area
<i>Caladenia huegelii</i> (Grand Spider Orchid)	Endangered	Yes	Species or species habitat likely to occur within area
<i>Calytrix breviseta</i> subsp. <i>breviseta</i> (Swamp Starflower)	Endangered	Yes	Species or species habitat likely to occur within area
<i>Conospermum undulatum</i> (Wavy-leaved Smokebush)	Vulnerable	Yes	Species or species habitat known to occur within area
<i>Darwinia apiculata</i> (Scarp	Endangered	Yes	Species or species

Darwinia)			habitat known to occur within area
<i>Diuris drummodii</i> (Tall Donkey Orchid)	Vulnerable	Yes	Species or species habitat likely to occur within area
<i>Dryandra mimica</i> (Summer Honeypot)	Endangered	Yes	Species or species habitat known to occur within area
<i>Lasiopetalum pterocarpum</i> (Wing-fruited Lasiopetalum)	Endangered	Yes	Species or species habitat likely to occur within area
<i>Lepidosperma rostratum</i> (Beaked Lepidosperma)	Endangered	Yes	Species or species habitat likely to occur within area
<i>Macarthuria keigheryi</i> (Keighery's Macarthuria)	Endangered	Yes	Species or species habitat known to occur within area
<i>Thelymitra stellata</i> (Star Sun-orchid)	Endangered	Yes	Species or species habitat likely to occur within area

The presence of threatened plants or declared rare flora may however remain undetected if processes are not in place to undergo ecological assessment prior to development. It is not possible to estimate how many additional rare flora species will be identified in the Shire in the future. It is also possible that as more is known about particular species of DRF or as protection programs are initiated the status of DRF species may change.

A 50m buffer of continuous vegetation surrounding DRF is protected under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

These factors were therefore taken into consideration during the development of the rare flora target which is detailed in **Box 4** below:

Box 4: Proposed Target for Declared Rare Flora (this includes all known species that are protected under the EPBC Act 1999)

Retain and protect natural areas containing DRF and, provide and protect a buffer to the natural area containing the DRF. Where practicable, enhance these natural areas to maintain and improve biodiversity values.

Threatened species protected by the *EPBC Act 1999* are not directly detailed in this target as all known threatened species in the Shire are also declared under the *Wildlife Conservation Act 1950*. All species that may occur due to the presence of suitable habitat, but are yet to be detected, are also declared species.

Further information regarding the EPBC Act 1999, the Wildlife Conservation Act 1950 and the Environmental Protection (Clearing of Native Vegetation) Regulations 2004 can be found at www.slp.wa.gov.au.

8.1.3 Threatened and Specially Protected Fauna (SPF)

Threatened fauna are native animal species which are likely to become extinct or which have been declared in need of special protection at a Federal or State level. These species should be protected in order to prevent extinction and to encourage species recovery.

At a national level, the Shire is known or likely to contain a number of threatened fauna species listed under the *EPBC Act 1999*. The Shire is also likely to contain habitat for a number of threatened fauna species which should also be protected so that in the event of species recovery, populations can expand.

At a State level, all native fauna species in Western Australia are protected unless otherwise declared under the *Wildlife Conservation Act 1950*. Native animals therefore cannot usually be captured or killed without a licence. Some threatened native fauna species are further declared to be 'fauna that is in need of special protection' under the Act. The *Wildlife Conservation (Specially Protected Fauna) Notice 2006* lists Specially Protected Fauna in the following four schedules:

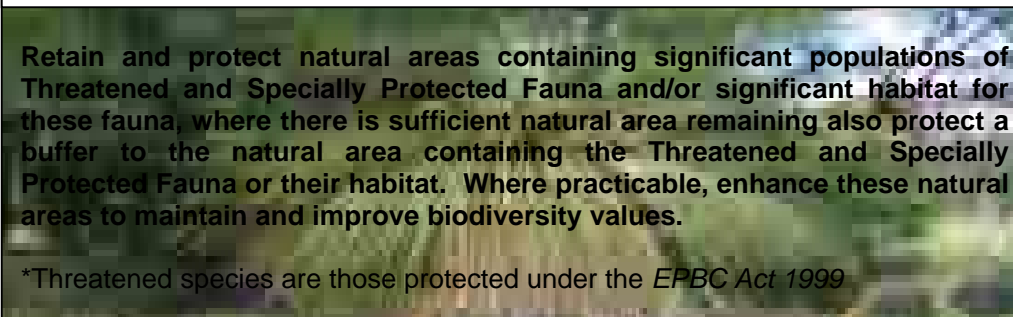
- Schedule 1 – Fauna that is rare or likely to become extinct
- Schedule 2 – Fauna that is presumed to be extinct
- Schedule 3 – Birds protected under international agreement
- Schedule 4 – Other Specially Protected Fauna

The presence of Threatened or Specially Protected Fauna in the Shire of Kalamunda is summarised in **Table 6** below. Known species are species that have been sighted within the last 5 years. Sightings have been taken from DEC records, PBP/Birds Australia surveys and surveys undertaken by Friends Groups.

Table 6: Threatened Fauna Species or their habitat listed under the <i>EPBC Act 1999</i> or the <i>Wildlife Conservation Act 1950</i> likely or known to occur in the Shire of Kalamunda (Information provided by the Department of Environment and Water Resources, the Department of Environment and Conservation, PBP and Birds Australia and Friends of Crumpet Creek)			
Threatened Fauna Species	EPBC Act Status	Wildlife Conservation Act Schedule	Presence
Threatened Species - Birds			
<i>Calyptorhynchus baudinii</i> (Baudin's Cockatoo)	Vulnerable	Schedule 1	Species or species habitat known to occur within area
<i>Calyptorhynchus latirostris</i> (Carnaby's Black-Cockatoo)	Endangered	Schedule 1	Species or species habitat known to occur within area
<i>Calyptorhynchus banksii naso</i> (Forest Red-tailed Black-Cockatoo)		Schedule 1	Species or species habitat known to occur within area
<i>Calyptorhynchus sp</i> (White-tailed Black Cockatoo)		Schedule 1	Species or species habitat may occur within area. Last sighting 1975 (DEC).
<i>Falco peregrinus</i> (Peregrine Falcon)		Schedule 4	Species or species habitat known to occur within area.
Threatened Species - Mammals			
<i>Dasyunis geoffroi</i> (Chuditch)	Vulnerable	Schedule 1	Species or species habitat known to occur within area.
<i>Phascogale calura</i> (Red-tailed Phascogale)	Endangered	Schedule 1	Species or species habitat may occur within area.
<i>Setonix brachynus</i> (Quokka)	Vulnerable	Schedule 1	Species or species habitat may occur within area. Last

			sighting 1934 (DEC).
<i>Myrmecobius fasciatus</i> (Numbat)	Vulnerable	Schedule 1	Species or species habitat may occur. Last sighting 1981 (DEC).
<i>Phascogale tapoatafa ssp.</i> (Brush-tailed Phascogale)	-	Schedule 1	Species or species habitat known to occur within area.
Migratory Terrestrial Species - Birds			
<i>Haliaeetus leucogaster</i> (White-bellied Sea-Eagle)	Migratory	-	Species or species habitat likely to occur within area.
<i>Merops ornatus</i> (Rainbow Bee-eater)	Migratory	-	Species or species habitat known to occur within area.
Migratory Wetland Species - Birds			
<i>Ardea alba</i> (Great Egret, White Egret)	Migratory	-	Species or species habitat known to occur within area.
<i>Ardea ibis</i> (Cattle Egret)	Migratory	-	Species or species habitat may to occur within area.
Migratory Marine Species - Birds			
<i>Apus pacificus</i> (Fork-tailed Swift)	Migratory	-	Species or species habitat may to occur within area.
<i>Ardea alba</i> (Great Egret, White Egret)	Migratory	-	Species or species habitat known to occur within area.
<i>Ardea ibis</i> (Cattle Egret)	Migratory	-	Species or species habitat may to occur within area.
Threatened Species - Reptiles			
<i>Morelia spilota imbricata</i> (Carpet Python)	-	Schedule 4	Species or species habitat known to occur within area.

These factors were therefore taken into consideration during the development of the rare fauna target which is detailed in **Box 5** below:

Box 5: Proposed Target for Threatened and Specially Protected Fauna (Federal & State)
 <p>Retain and protect natural areas containing significant populations of Threatened and Specially Protected Fauna and/or significant habitat for these fauna, where there is sufficient natural area remaining also protect a buffer to the natural area containing the Threatened and Specially Protected Fauna or their habitat. Where practicable, enhance these natural areas to maintain and improve biodiversity values.</p> <p>*Threatened species are those protected under the <i>EPBC Act 1999</i></p>

Note: This target has been slightly adapted from the target drafted by the Steering Group in order to recognise the species known to occur in the Shire, protected under the *EPBC Act 1999* but not the *Wildlife Conservation Act 1950*.

Further information regarding the *EPBC Act 1999* and the *Wildlife Conservation Act 1950* can be found at www.environment.gov.au/epbc/index.html and www.slp.wa.gov.au.

8.1.4 Priority Species

Priority species refer to flora and fauna species which are not protected by legislation but which are recognised by the State Government as being rare or as requiring further surveys to determine rarity status.

With regards to flora, there are many species that are known from only a few collections, or a few sites. Such flora may be rare or threatened, but cannot be considered for declaration as rare flora until such survey has been undertaken.

There are three categories of priority flora covering these poorly known species. The categories are arranged to give an indication of the priority for undertaking further surveys based on the number of known sites, and the degree of threat to those populations.

Priority one flora species are taxa which are known from one or a few (generally less than 5) populations which are under threat, either due to small population size, or being on lands under immediate threat.

Priority two flora species are taxa which are known from one or a few (generally less than 5) where at least some are not believed to be under immediate threat.

Priority three flora species are taxa known from several populations and where the taxa are not believed to be under threat, either due to the number of known populations (generally greater than 5), or known populations being large, and either widespread or protected.

Priority four flora species are taxa that have been adequately surveyed and are considered to be rare but not currently threatened.

The Priority Flora species that occur in the Shire of Kalamunda are summarised in **Table 7** below. It should be noted that the ranking of these may change as further surveys are conducted and some species may be declared.

Priority Species	Priority Ranking
<i>Tripterococcus paniculatus ms</i>	P1
<i>Xanthoparmelia darligensis</i>	P1
<i>Pithocarpa corymbulosa</i>	P2
<i>Haemodorum loratum</i>	P3
<i>Isopogon drummondii</i>	P3
<i>Tetradlea sp. Granite</i>	P3
<i>Thelymitra magnifica ms</i>	P3
<i>Boronia tenius</i>	P4
<i>Eucalyptus graniticola x ms</i>	P4
<i>Grevillea thelemanniana</i>	P4
<i>Pimelea rara</i>	P4
<i>Stylidium striatum</i>	P4

A list of fauna taxa that either needs surveying to determine whether the species requires protection or whether it could require special protection should present circumstances change is maintained by the State. These taxa are known as priority

taxa. Of the five priority fauna taxa categories, the Shire contains species from the categories Priority Four and Priority Five:

- **Priority Four** – taxa in need of monitoring. Taxa which are considered to have been adequately surveyed, or for which sufficient knowledge is available, and which are considered not currently threatened or in need of special protection, but could if present circumstances change. These taxa are usually represented on conservation lands.
- **Priority Five** – taxa that are conservation dependent. Species that are not threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

(Draft Guidance Statement No. 33: Environmental Guidance for Planning and Development 2005).

The Priority Fauna species likely to occur in the Shire are summarised in **Table 8** below.

Priority Fauna	Priority Ranking
<i>Macropus irma Western</i> (Brush Wallaby)	P4
<i>Hydromys chrysogaster</i> (Water-rat (Rakali))	P4
<i>Morelia spilota imbricata</i> (Carpet Python)	P4
<i>Ctenotus delli</i> (Dell's Skink)	P4
<i>Bettongia penicillata ogilbyi</i> (Woylie)	P5
<i>Isodon obesulus fusciventer</i> (Quenda)	P5

The potential for Priority Species to be rare even though declaration status is not given has been recognised by the development of a Priority Species target. This target is detailed in **Box 6** below.

Box 6: Proposed Target for Priority Species



Retain and protect natural areas containing substantial populations of Priority Flora and significant habitat for Priority Fauna. Where possible, include a buffer and/or enhance these natural areas.

8.2 Wetlands, Waterways and associated riparian vegetation

8.2.1 Wetlands

Wetlands are important with regard to biodiversity as they often have high species richness and provide a dependable location for many bird species. At a national level, Ramsar Wetlands are protected by the *EPBC Act 1999*. The Ramsar Convention on Wetlands defines a wetland as:

“areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh,

brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres”

Wetlands are directly linked with their surrounding landscape. This landscape forms the catchment of the wetland, and activities that occur in the catchment can ultimately impact on the health and functioning of the wetland. The Shire of Kalamunda is within the same catchment as the Forrestdale and Thompson Lakes which together form a Ramsar wetland.

There are many different types of wetlands. Examples in the Shire of Kalamunda include:

- Lakes,
- Floodplains,
- Seasonally inundated wetlands,
- Damplands, and
- Springs.

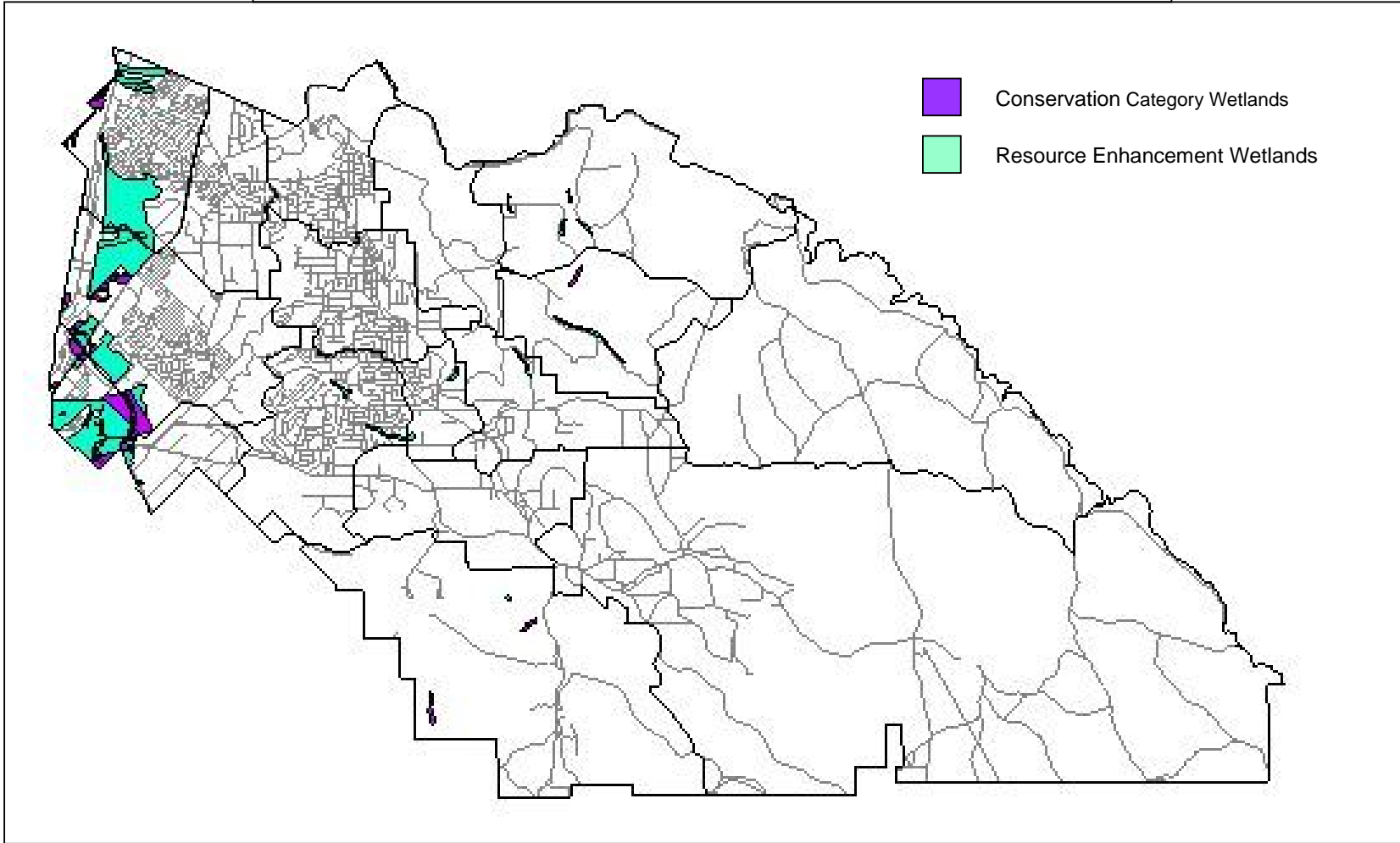
Under the State *Environmental Protection Act 1986* environmental harm involving removal or destruction of, or damage to native vegetation or the habitat of native vegetation or indigenous aquatic or terrestrial animals is prohibited. Wetland habitats are therefore protected from environmental harm under this legislation.

Under the State *Environmental Protection (Clearing Native Vegetation) Regulations 2004* the Conservation Category Wetlands (CCW) identified by the DEC geomorphic wetlands dataset are defined as Environmentally Sensitive Areas (ESAs). Exemptions to the requirements of these regulations do not apply within ESAs and therefore the vegetation surrounding CCW's is more highly protected. There are 21 CCW's areas within the Shire of Kalamunda. These are shown on **Figure 3** below.



An example of a seasonally inundated wetland in the Shire of Kalamunda

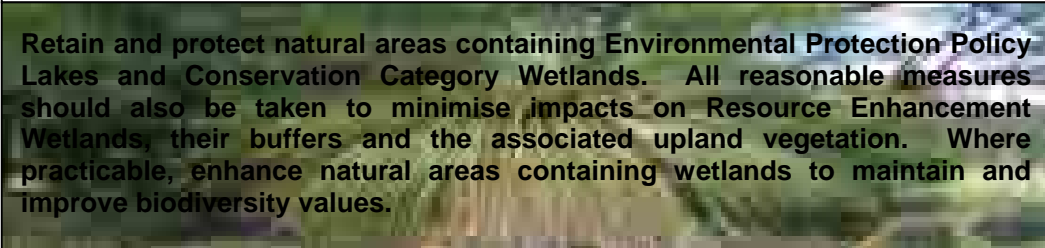
Figure 3: Conservation Category and Resource Enhancement wetlands in the Shire of Kalamunda



Conservation category wetlands (CCW) can be part of larger wetland systems but the other areas within the system may be more degraded and do not warrant the conservation category status. Wetland categories defined in the DEC geomorphic dataset are summarised in **Table 9** below:

Table 9: Wetland categories defined in the DEC geomorphic dataset (Information taken from the Water and Rivers Commission Position Statement: Wetlands, Water and Rivers Commission 2001)		
Management Category	General Description	Management Objectives
C – Conservation (incorporates EPA Bulletin 686 categories H and C)	Wetlands support a high level of ecological attributes and functions.	Highest priority wetlands. Objective is preservation of wetland attributes and functions through various mechanisms including: <ul style="list-style-type: none"> • reservation in national parks, crown reserves and State owned land, • protection under Environmental Protection Policies, and • wetland covenanting by landowners. These are the most valuable wetlands and the Commission will oppose any activity that may lead to further loss or degradation. No development.
R - Resource enhancement (incorporates EPA Bulletin 686 categories O and R)	Wetlands which may have been partially modified but still support substantial ecological attributes and functions.	Priority wetlands. Ultimate objective is for management, restoration and protection towards improving their conservation value. These wetlands have the potential to be restored to conservation category. This can be achieved by restoring wetland structure, function and biodiversity. Protection is recommended through a number of mechanisms.
M - Multiple use (aligned with EPA Bulletin 686 category M)	Wetlands with few important ecological attributes and functions remaining.	Use, development and management should be considered in the context of ecologically sustainable development and best management practice catchment planning through landcare. Should be considered in strategic planning

The information in **Table 9** was considered when drafting the wetlands target. Resource enhancement wetlands have therefore been included in the wetlands target as they support ecological attributes and restoration to conservation category status is possible. Resource enhancement wetlands found within the Shire of Kalamunda area shown on **Figure 3** above. The drafted wetlands target is detailed in **Box 7**.

Box 7: Proposed Target for Wetlands
 <p>Retain and protect natural areas containing Environmental Protection Policy Lakes and Conservation Category Wetlands. All reasonable measures should also be taken to minimise impacts on Resource Enhancement Wetlands, their buffers and the associated upland vegetation. Where practicable, enhance natural areas containing wetlands to maintain and improve biodiversity values.</p>

Further information regarding the *EPBC Act 1999*, the *Wildlife Conservation Act 1950* and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* can be found at www.environment.gov.au/epbc/index.html and www.slp.wa.gov.au.

8.2.2 Waterways

Waterways are natural areas important for biodiversity conservation as they can provide important breeding and feeding sites for fauna and can be important in the maintenance of life cycles for specialised plant groups.

A waterway can be a creek, brook, river, or stream, and include a lake, estuary or inlet at its base. Any waterway in the Shire of Kalamunda is likely to be owned and managed by a number of different landowners and organisations.

The Shire of Kalamunda contains a number of waterways as shown by **Figure 4** below.

The importance of waterways within the Shire is currently recognised in a number of ways:

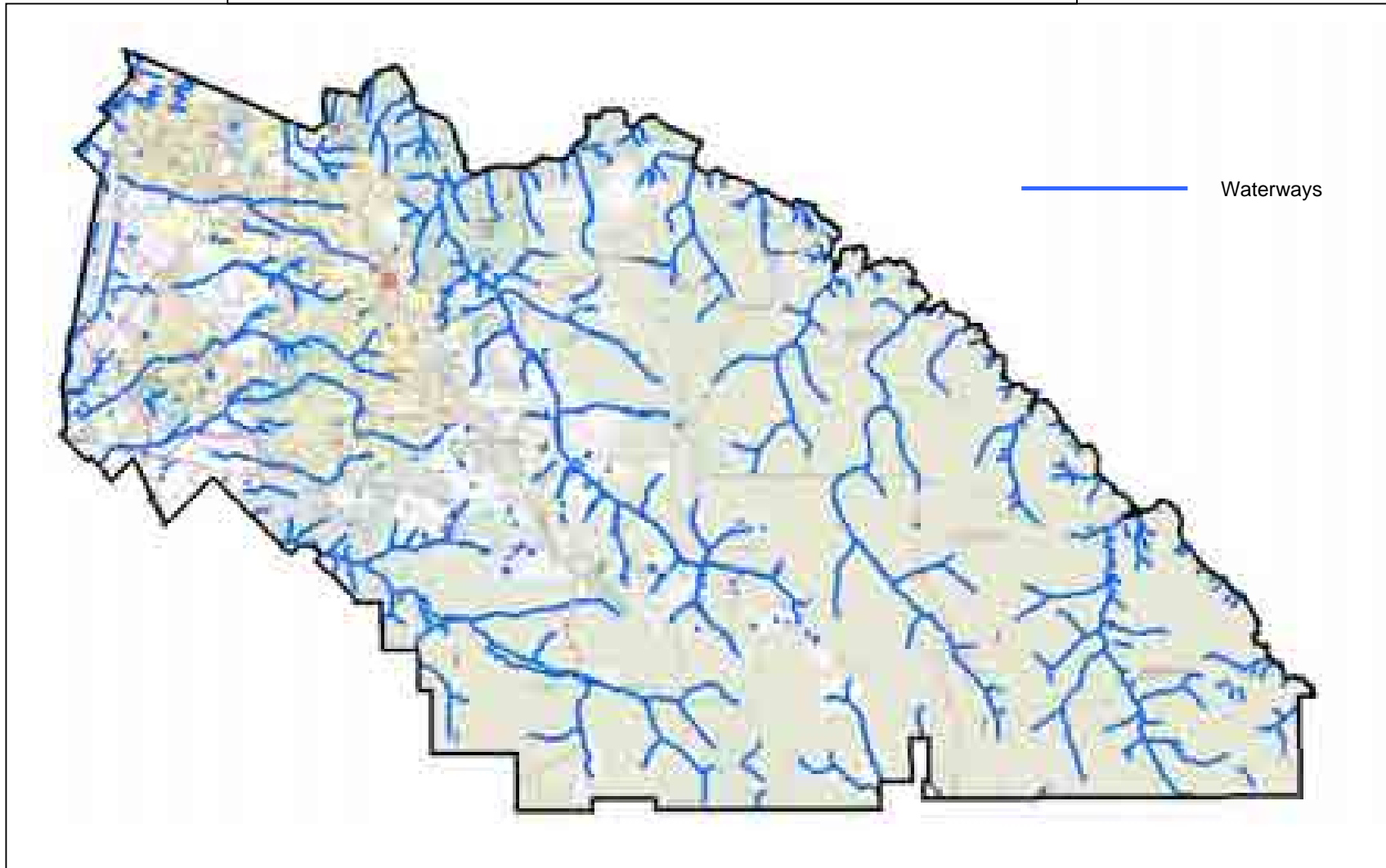
- Water quality monitoring,
- Management plan development and implementation,
- Policy,
- Support for Friends Group activities and
- Restoration works.

With regard to policy, the Shire has developed a Flood and Stream Management Policy. The enforcement of this policy will help to reduce negative ecological impacts on waterways within the Shire. This policy is not utilised until a development application is received. The policy needs to be considered during subdivision and structure planning phases to ensure that the policy can still be enforced after the subdivision has occurred.

Aside from policy implementation, other activities currently occurring on waterways around the Shire are summarised in **Table 10** below.

Table 10: Current activities on waterways within the Shire of Kalamunda	
Waterway	Current Activity
Crumpet Creek	Friends Group, Management Plan implementation, water quality monitoring
Helena River	Water quality monitoring, Catchment Group activities
Kadina Brook	Friends Group, Management Plan implementation, water quality monitoring
Lower Lesmurdie Falls	Friends Group
Nestlebrae Creek	Friends Group
Piesse Brook	Friends Group, water quality monitoring
Poison Gully	Friends Group, Management Plan implementation, water quality monitoring
Quenda Creek	Friends Group, Management Plan implementation
Toornart Creek	Friends Group, restoration works
Woodlupine Brook	Friends Group, restoration works, water quality monitoring
Yule Brook	Friends Group, water quality monitoring

Figure 4: Waterways within the Shire of Kalamunda



In recognition of the ecological function of waterways, a target for waterways has been drafted. This target is detailed in **Box 8**.

Box 8: Preferred Target for Rivers, creeklines and other channel waterways

Retain and protect riparian vegetation and upland vegetation in moderate or better condition associated with rivers, creeklines, other channel waterways and floodplain areas. Retain sufficient buffer distance to maintain the ecological function of the watercourse. Where practicable, enhance natural areas containing waterways to maintain and improve biodiversity values.

8.3 Maintaining Ecological Processes

8.3.1 Ecological Linkages

Ecological linkages are non-contiguous natural areas that connect larger natural areas by forming stepping stones that allow the movement over time of organisms between larger areas. Habitat fragmentation is a key threatening process leading to the loss of biodiversity (refer to **section 4.4**). Survival of species within natural areas will depend on well planned and managed ecological linkages.

Regional ecological linkages link protected regionally significant natural areas (RSNAs) by retaining the best condition Local Natural Areas (LNAs) available between them that can act as stepping stones for flora and fauna. This increases the long-term viability of the RSNAs as well as the LNAs in the link. To be effective the linkages should incorporate the major variation in plant communities and fauna habitat typical of the region so that the widest range of flora and fauna possible can use the links.

Regional ecological linkages for the Perth Metropolitan Region (PMR) have been identified by the Perth Biodiversity Project (PBP) with input from Department of Environment and Conservation (DEC) and Department for Planning and Infrastructure (DPI). It is proposed that the Regional Ecological Linkages identified by PBP are accepted for inclusion into the Local Biodiversity Strategy. On-ground assessment will however be required prior to making planning decisions enforcing the proposed linkage target.

Local ecological linkages are also an important part of improving the viability of natural areas that may be too small or in too poor shape or condition to be viable on their own if isolated. The Shire of Kalamunda identified a number of local ecological linkages as part of the development of the Wildlife Corridors Strategy 1998.


Local ecological linkages should aim to link protected Locally Significant Natural Areas (LSNAs) to other LSNAs, protected regionally significant natural areas and Regional Ecological Linkages. The linkages recognised in the Wildlife Corridors Strategy should be assessed to ensure that these linkages meet current criteria for local ecological linkages. Regional ecological linkages and wildlife corridors are detailed in **Figure 5** below.

Figure 5: Regional Ecological Linkages and Wildlife Corridors in the Shire of Kalamunda



The importance of both regional ecological linkages and wildlife corridors in improving the viability of local natural areas has been recognised in the development of an ecological linkage target. This target is detailed in **Box 9**.

Box 9: Preferred Target for Ecological Linkages



Retain and protect viable natural areas that occur within regional linkages and wildlife corridors. Where practicable, enhance natural areas which form linkages. Seek opportunities to add linkages to maintain and improve biodiversity values.

9 Representational Targets

Representational targets focus on retaining and protecting a proportion of each of the characteristic ecological communities found within the Shire. Retaining and protecting a representative sample of each ecological community helps halt the rapid species decline that is associated with clearing and development. These targets also ensure that ecological communities that are characteristic of the area - and therefore provide a sense of place - will remain as an integral part of the Shire's landscape into the future.

Ecological communities with similar representation characteristics have been grouped together under the same target.

Examples of how these targets will be achieved are detailed in **Section 13.2**.

9.1 Vegetation Complexes and Protection Levels

The Shire of Kalamunda comprises three distinct land areas:

- The **Swan Coastal Plain** – consisting of the major landforms of the Pinjarra Plain, the Foothills and the Bassendean Sands,
- The **Darling Scarp**, and
- The **Darling Plateau**.

As vegetation is often linked to soil type, landform and climate this has created a very unique and diverse environment within the Shire of Kalamunda. Vegetation across the landscape varies across the Swan Coastal Plain, the Darling Scarp and the Darling Plateau. These can be easily recognisable such as the difference between the Banksia woodlands on the Swan Coastal Plain and the Jarrah forests of the Darling Plateau, or, they can be very subtle differences that are more difficult to distinguish.

This variation across the landscape is the reason behind the high number of vegetation complexes that occur. Vegetation complexes are a collection of different vegetation groupings identified through the dominant plant species, often named after the soil type on which they grow.

Vegetation complexes are used in the Perth Metropolitan Region to define the broad boundaries of ecological communities. A target has been defined for each of the 14 vegetation complexes that occur within the Shire (the extent of these vegetation complexes was previously shown in **Figure 1**). The targets have either been expressed as an area of a vegetation complex in hectares or as a general overarching target. Retaining original vegetation communities also provides habitat for fauna species local to the area.

Current science indicates that retaining 30% of the original extent of an ecological community is required to prevent exponential loss of species (Smith and Siversten 2001). Protection of 30% of the original extent of each vegetation complex occurring within the Shire is therefore the ideal target.

In the Shire past clearing means that this target cannot be achieved for the majority of the of the vegetation complexes on the Swan Coastal Plain. However, for the complexes in the Darling Plateau and the Darling Scarp this target is achievable due to the level of retention of native vegetation, in good or better condition, and the higher levels of protection within Regional Parks and National Parks. Consideration of current protection was therefore given when the representational targets were drafted.

The remaining extent and current protection of vegetation complexes in the Shire of Kalamunda is summarised in **Table 11** (protection is explained in **Section 5.2.3**).

Table 11: Current vegetation extent with current protection and retention levels (PBP, 2005, unpub.)						
Swan Coastal Plain						
Vegetation Complex	Pre-European (ha)	Total Remnant (ha)	Protected (ha)	Local Retention (%)	Local Protection (%)	LNA (ha)
Forrestfield	1925	219	74.5	11.4	3.8	134.3
Guildford	91	22.7	22.2	25.3	24.3	0.5
Southern River	2319	262	161.9	11.3	7.0	68.0
Swan	33	32.6	31.9	98.8	98.8	-
Darling Scarp						
Vegetation Complex	Pre-European (ha)	Total Remnant (ha)	Protected (ha)	Local Retention (%)	Local Protection (%)	LNA (ha)
Darling Scarp	1420	980	914	69.0	64.3	62.3
Darling Plateau						
Vegetation Complex	Pre-European (ha)	Total Remnant (ha)	Protected (ha)	Local Retention (%)	Local Protection (%)	LNA (ha)
Cooke	274	274	273.7	100	99.9	0.5
Dwellingup 2	13407	11279	4488.3	84.1	33.5	842.3
Helena 1	407	384	364.1	94.3	89.5	20.1
Helena 2	1879	1604	1176.6	85.3	62.6	330.1
Murray 1	1997	1664	1007.6	83.3	50.5	266.7
Murray 2	3578	3416	1113.6	95.5	31.1	15.7
Swamp	56	56	0	100	0.0	35.4
Yarragil 1	4479	3395	1286.8	75.8	28.7	297.1
Yarragil 2	489	489	0	100	0.0	105.3

9.2 Opportunities and Constraints to achieving representational targets

9.2.1 Land Zoning

When drafting representational targets, it was important to consider the land zoning of remaining natural areas to ensure that the proposed targets for protection were achievable.

The various land zonings within the Shire provide differing opportunities and constraints with regard to biodiversity conservation. Examples of this are detailed in **Table 12** below.

Zoning in LPS3	Opportunities	Constraints	Overall position for LNA protection
Parks and Recreation	Reserved under the Metropolitan Regional Scheme	Approval of the Local Government is not required for development approval	High level opportunity
Local Open Space	Any development application on a reserve is assessed by the Shire. The Shire has to take into account the purpose of the reserve and the natural environment.	The purpose of the reserves zoned local open space is rarely for conservation.	High level opportunity
Special Rural	Private land conservation and subdivision for conservation may be applied (refer Section 11.7).	Small rural lot sizes allowed which can lead to the degradation of natural areas.	Constrained
Rural Agriculture	Conservation of natural areas is supported to a certain extent under the objectives of the zone. Private land conservation incentives could be used in this zone.	Historical degradation may have occurred. Horticultural use is supported.	Opportunity
Rural Conservation	Conservation of natural areas is supported by the objectives of the zone. Retention of larger lot sizes may help limit degradation of natural areas through private land conservation initiatives.		Opportunity
Rural Landscape Interest	Conservation of natural areas is supported by the objectives of the zone. Retention of larger lot sizes may help limit degradation of natural areas through private land conservation initiatives.		Opportunity
Rural Composite	Environmental qualities of the land should not be adversely affected.	Small rural lot sizes allowed which can lead to the degradation of natural areas.	Constrained
Residential	The objectives of the zone	Much of the land is	Constrained

	includes encouraging the retention of remnant vegetation	already developed.	
Urban Development	Structure planning is required. This zoning is associated with some land yet to be developed so protection of some local natural areas may be possible through public open space provisions.	Clearing and degradation of public open space provisions often occurs during development.	Constrained
Residential Bushland	The objectives of the zone includes encouraging the retention and rehabilitation of remnant vegetation	Much of the land is already developed. Clearing often has to occur in order to develop the properties.	Constrained
Light Industry		Limited scope for preservation of local natural areas.	Highly constrained
Mixed Use		Limited scope for preservation of local natural areas.	Highly constrained
Private Clubs and Institutions	Private land conservation initiatives could be applied.	Limited scope for preservation of local natural areas.	Constrained
Public Purposes	Natural areas often retained.	Land development in this zoning is normally outside of the scope of Local Government.	Highly constrained

Opportunities and constraints to achieving the drafted targets are discussed further in **Sections 9.3 to 9.9** and a summarised table is provided in **Table 13** below.



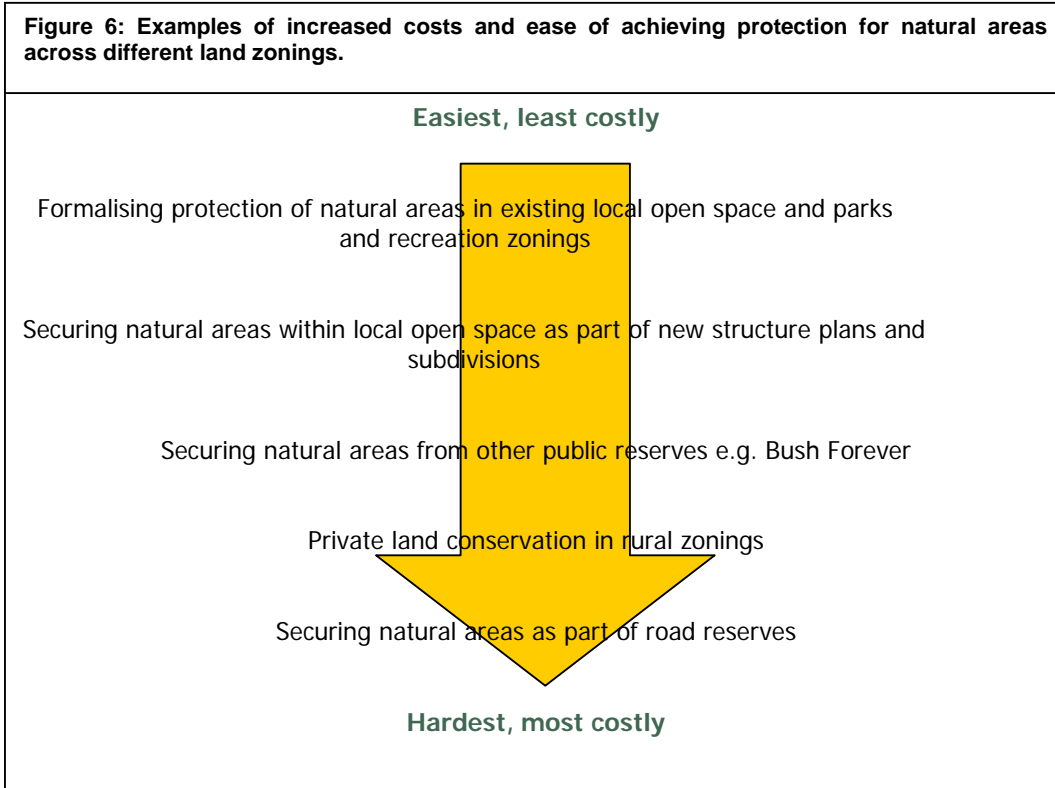
Melaleuca scabra (Rough Honey myrtle)

Table 13: Summary of the remaining LNA in the Shire of Kalamunda split by land zoning for the assessment of achievable targets, 2007

Vegetation Complex	Protection (%)	Local Open Space (ha)	Parks & Recreation (ha)	Special Rural (ha)	Rural Composite (ha)	Private Clubs & Institutions (ha)	Residential (ha)	Urban Development (ha)	Roads (ha)	Public Purposes (ha)	Mixed Use (ha)	Light Industry (ha)	Rural Agriculture (ha)	Rural Conservation (ha)
Swan Coastal Plain														
Forrestfield	3.80%	17.8	-	98.5	-	2.7	4.9	5.5	6	-	-	-	-	-
Southern River	7.00%	1.9	-	24.8	2.4	-	-	2.8	16.3	1.8	1.7	1.7	-	-
Swan	98.80%	LNA < 0.5ha												
Guildford	24.30%	LNA < 0.5ha												
Darling Scarp														
Darling Scarp	64.30%	3.2	4.2	20.2	-	-	22	-	12	-	-	-	-	-
Jarrah Forrest														
Cooke	99.90%	LNA < 0.5ha												
Dwellingup 2	33.50%	Over 30% of original extent protected												
Helena 1	89.50%	Over 30% of original extent protected												
Helena 2	62.60%	Over 30% of original extent protected												
Murray 1	50.50%	Over 30% of original extent protected												
Murray 2	31.10%	Over 30% of original extent protected												
Swamp	0.00%	-	-	-	-	-	-	-	-	-	-	-	-	35.4
Yarragil 1	28.70%	4.2	1	8.3	-	-	15.3	-	20.6	-	-	-	110.3	27.9
Yarragil 2	0.00%	-	-	-	-	-	-	-	-	-	-	-	-	102

9.2.2 Costs associated with protecting natural areas

The ease in which natural areas can be protected has associated costs; financial and time. Protecting natural areas in certain land zonings is easier than in others and also has fewer financial costs. Examples of this are summarised in **Figure 6** below.



The ease in which LNAs can be conserved has therefore also been a consideration in the development of the representation targets.

9.3 Guildford, Swan and Cooke Vegetation Complexes

The presence of the Guildford, Swan and Cooke vegetation complexes in the remaining Local Natural Areas of the Shire is limited (less than 0.5ha for each vegetation complex). These three complexes have therefore been grouped into the combined target which is detailed in **Box 10** below.

The Guildford and Swan vegetation complexes are associated with the Pinjarra Plain; the flat plain that gently rises to the east to meet the Foothills.

The Guildford complex is described as a mixture of open forest to tall open forest of *Corymbia calophylla* - *Eucalyptus wandoo* - *Eucalyptus marginata* and woodland of *Eucalyptus wandoo* (with rare occurrences of *Eucalyptus lane-pooler*). Minor components include *Eucalyptus rudis* - *Melaleuca raphiophylla*.

The Swan complex is described as fringing woodland of *Eucalyptus rudis* – *Melaleuca raphiophylla* with localised occurrence of low open forests of *Casuarina obesa* and *Melaleuca cuticularis*.

Both the Guildford and Swan complexes are regionally rare with less than 10% protection in Bush Forever sites across the Perth Metropolitan Region (Bush Forever: Volume 1 Policies, Principles and Processes, 2000).

The Guildford complex is also locally rare with less than 30% protection of the original extent of this vegetation. However, the remaining extent of this vegetation complex is protected within National Park and Bush Forever and the presence of Local Natural Areas is limited (refer to **Table 12**).

Locally, the Swan vegetation complex is well protected with nearly 100% of the original extent protected within the Shire. As with the Guildford complex, the presence of LNA containing the Swan complex is limited and so there is little opportunity to further preserve this vegetation complex (refers to **Table 12**).

The Cooke vegetation complex is associated with the uplands of the Darling Plateau. The Cooke vegetation complex is not regionally or locally rare with 64.2% protection in the National Park and 35.4% retention in State Forest. This complex is also not present to a great extent within Local Natural Areas (refer to **Table 12**).

Box 10: Preferred Target for the Guildford, Swan and Cooke Vegetation Complexes

Retain existing protected areas of the Guildford, Swan and Cooke Vegetation Complexes by working co-operatively with DEC and other State Government departments to ensure that identified threatening processes are addressed and the conservation of biodiversity values is maintained.

9.4 Helena 1, Helena 2, Murray 1, Murray 2 and Dwellingup 2 Vegetation Complexes

Helena 1, Helena 2, Murray 1 and Murray 2 vegetation complexes are all associated with the valleys of the Darling Plateau. The Dwellingup 2 vegetation complex is associated with the uplands of the Darling Plateau.

These vegetation complexes are not considered to be locally or regionally rare, all having greater than 30% protection within the Conservation Estate.

Large portions of Local Natural Area in the Shire are retained for each of these complexes. The Shire could look at protecting these LNAs should any opportunity arise. This information is summarised in **Table 10** and has been used to draft the target detailed in **Box 11** below.

Box 11: Proposed Target for the Helena 1, Helena 2, Murray 1, Murray 2 and Dwellingup 2 and Vegetation Complexes

Retain existing protected areas of the Helena 1, Helena 2, Murray 1, Murray 2 and Dwellingup 2 vegetation complexes and endeavour to protect additional natural areas in good or better condition that also meet additional criteria, such as diversity, rarity and connectivity.

9.5 Forrestfield Vegetation Complex

The Forrestfield complex is associated with the Foothills lying to the east of the Swan Coastal Plain before the Darling Scarp.

The Forrestfield complex vegetation ranges from open forest of *Corymbia calophylla* - *Eucalyptus wandoo* – *Eucalyptus marginata* to open forest of *Eucalyptus marginata* - *Corymbia calophylla* - *Allocasuarina fraseriana* - Banksia species. Fringing woodland of *Eucalyptus rudis* appear in the gullies that dissect this landform.

The Forrestfield complex is regionally rare with only 7.4% of the original extent remaining across the Perth Metropolitan Region (PMR) (PBP, 2005). In 2000, 2% of the original extent of the Forrestfield vegetation complex in the PMR was protected within the Conservation Estate with Bush Forever proposing to increase protection to 5% (Bush Forever, 2000).

The Forrestfield complex is also locally rare with only 11.6% of the original extent remaining in the Shire. Of this, only 3.8% is protected in the Conservation Estate or Bush Forever. The remaining Local Natural Area (LNA) - 7.0% of the original extent - is threatened by clearing, subdivision and development.

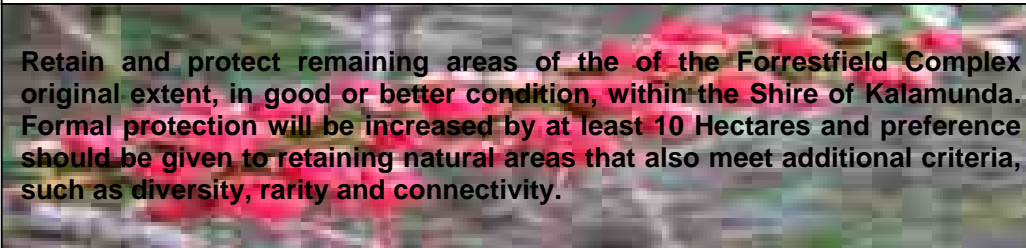
The retention and protection of Forrestfield vegetation complex is highly constrained by land zoning and this was a large consideration when drafting the target for protection. The opportunity and constraints analysis with regard to protection of the Forrestfield vegetation complex is summarised in **Table 14** below.

LPS3 Zone		Area of LNA (ha)	Opportunities	Constraints
Local Open Space		17.8 (previously 11.9 but 5.9ha has been reclassified as Forrestfield during the reserve assessments)	<ul style="list-style-type: none"> Minimal cost of increasing protection Protection can be increased by changing the vesting purpose of the reserve 	<ul style="list-style-type: none"> A balance needs to be achieved between conservation and recreation
Special Rural		98.5	<ul style="list-style-type: none"> Mechanisms such as building envelopes can be used during subdivision Use of revolving funds and private land conservation mechanisms can be explored. 	<ul style="list-style-type: none"> LNA is highly fragmented Subdivision of larger lots theoretically allowed under LPS3 Mechanisms such as building envelopes do not provide strong protection for the remaining vegetation
Private Clubs and Institutes		2.7		<ul style="list-style-type: none"> Shire has minimal input unless development approval required. The purpose of the zone does not detail strong consideration of the environment
Residential		4.9		<ul style="list-style-type: none"> Mostly fully developed Structure plans often completed already
Urban Development		5.5	<ul style="list-style-type: none"> Protecting LNA in local open space can be 	<ul style="list-style-type: none"> A balance needs to be achieved between

		explored during future subdivisions.	conservation and recreation <ul style="list-style-type: none"> • Structure plans may already be complete
Roads	6.0		<ul style="list-style-type: none"> • The Shire has minimal input into protection of bushland on roads

This information was used to draft the target detailed in **Box 12** below. Due to large amounts of LNA occurring on land zonings which are highly constrained, such as Special Rural, the target for further protection is low. This should be considered as a minimum target and if it is achieved the Shire can look at increasing the target area for protection.

The target has been changed from that drafted with the Steering Group to recognise the change in 5.9ha of Southern River vegetation to Forrestfield vegetation following the on-ground reserve assessments.

Box 12: Proposed target for protection of the Forrestfield vegetation complex
 <p>Retain and protect remaining areas of the of the Forrestfield Complex original extent, in good or better condition, within the Shire of Kalamunda. Formal protection will be increased by at least 10 Hectares and preference should be given to retaining natural areas that also meet additional criteria, such as diversity, rarity and connectivity.</p>

9.6 Southern River Vegetation Complex

The Southern River vegetation complex is characterised by being in the transition between the Pinjarra Plain and the Bassendean Dunes. This vegetation is described as open woodland of *Corymbia calophylla* - *Eucalyptus marginata* - Banksia species with fringing woodland of *Eucalyptus rudis* - *Melaleuca rhapsiophylla* along creek beds.

The Southern River vegetation complex is regionally rare with only 12.4% of the original extent remaining across the Perth Metropolitan Region (PMR) (PBP, 2005). In 2000, 5.7% of the original extent of the Southern River vegetation complex in the PMR was protected within the conservation estate with Bush Forever proposing to increase protection to 10% (Bush Forever, 2000).

The Southern River vegetation complex is also locally rare with only 11.0% of the original extent remaining in the Shire. Of this, only 7.0% is protected in the conservation estate or Bush Forever. The remaining Local Natural Area (LNA) consists of only 4.2% of the original extent, which is threatened by clearing, subdivision and development.

The retention and protection of Southern River vegetation complex is highly constrained by land zoning and this was a large consideration when drafting the target for protection. The opportunity and constraints analysis with regard to

protection of the Southern River vegetation complex is summarised in **Table 15** below.

Table 15: Summary of rationale for determining the Southern River target			
LPS3 Zone	Area of LNA (ha)	Opportunities	Constraints
Local Open Space	1.9 (previously 7.8, 5.9ha have been reclassified as Forrestfield)	<ul style="list-style-type: none"> Minimal cost of increasing protection Protection can be increased by changing the vesting of the reserve 	<ul style="list-style-type: none"> A balance needs to be achieved between conservation and recreation
Special Rural	24.8	<ul style="list-style-type: none"> Mechanisms such as building envelopes can be used during subdivision Use of revolving funds and private land conservation mechanisms can be explored. 	<ul style="list-style-type: none"> LNA is highly fragmented Subdivision of larger lots theoretically allowed under LPS3
Rural Composite	2.4		<ul style="list-style-type: none">
Public Purposes (Commonwealth Government)	1.8		<ul style="list-style-type: none"> The Shire has minimal input to development on Commonwealth lands
Urban Development	5.7 (previously 8.7, 2ha have been cleared)	<ul style="list-style-type: none"> Protecting LNA in local open space can be explored during future subdivisions. 	<ul style="list-style-type: none"> A balance needs to be achieved between conservation and recreation
Roads	16.3		<ul style="list-style-type: none"> The Shire has minimal input into protection of bushland on roads
Mixed Use	1.7		<ul style="list-style-type: none"> The purpose of the zone supports residential and commercial development. There is limited scope for consideration of the environment
Light Industry	1.7	<ul style="list-style-type: none"> Environmental conditions can be applied to development. 	<ul style="list-style-type: none"> The zoning supports the development of industry

This information was used to draft the target detailed in **Box 13** below. Due to large amounts of LNA occurring on land zonings which are highly constrained, the target for further protection is low. If this target is achieved the Shire can look at increasing the target area for protection.

This target has been altered from that drafted with the Steering Group due to the reserve assessments revealing some vegetation mapped as Southern River was actually Forrestfield vegetation complex. There has also been some clearance of native vegetation within the urban zoning (refer to **Table 15** above).

Box 13: Proposed target for protection of the Southern River vegetation complex

Retain and protect remaining areas of the of the Southern River complex original extent, in good or better condition, within the Shire of Kalamunda. Formal protection will be increased by at least 7 Hectares and preference should be given to retaining natural areas that also meet additional criteria, such as diversity, rarity and connectivity.

9.7 Darling Scarp Vegetation Complex

The Darling Scarp vegetation complex is, not surprisingly, associated with the Darling Scarp. This vegetation complex is characterised by the loams, sands, gravels, quartzite sands and exposed granites on which it occurs.

On a regional scale, 44.1% of this vegetation complex remains over the PMR but less than 15% is present in the Jarrah Forest IBRA subregion¹. Locally, the Darling Scarp vegetation complex has 64% protection.

As this vegetation complex is not rare locally, but some of the remaining Local Natural Areas can be easily protected in the Local Open Space or Park and Recreation zonings (refer to **Table 13**), and this complex is rare in a regional context, the target detailed in **Box 14** has been drafted.

Box 14: Proposed target for protection of the Darling Scarp vegetation complex

Encourage retention of remaining areas of the of the Darling Scarp complex original extent, in good or better condition, within the Shire of Kalamunda. Formal protection will be increased within Shire reserves. Preference should be given to recognising the values of natural areas that meet additional criteria, such as diversity, rarity and connectivity and provide a management buffer to the existing reserves.

9.8 Yarragil 1 Vegetation Complex

The Yarragil 1 vegetation complex is associated with the valleys of the Darling Plateau.

¹ IBRA Bioregion or subregions as determined by the Interim Biogeographic Regionalisation for Australia (IBRA), are regions defined by a combination of biological, social and geographical criteria. Region descriptions seek to describe the dominant landscape scale attributes if climate, lithology, geology, landforms and vegetation (Commonwealth of Australia 2001). A subregion is a subregion of a bioregion which contains distinctive geomorphic units that closely align with land capability and development potential (Commonwealth of Australia 2001).

Regionally, 60.5% of the Yarragil 1 vegetation complex is retained across the Perth Metropolitan Area. In the Shire of Kalamunda however only 29% of the original extent of this vegetation complex remains, falling short of the 30% target. Within the Shire of Kalamunda the LNAs containing the Yarragil 1 vegetation complex are located largely across the rural land zonings. A further 58.7ha of the Yarragil 1 complex would require protection in order to meet the 30% protection target.

When drafting the target detailed in **Box 15** the above information was considered.

Box 15: Proposed target for protection of the Yarragil 1 vegetation complex

Encourage retention of remaining areas of the of the Yarragil 1 complex original extent, in accordance with the local town planning scheme zonings and policies, within the Shire of Kalamunda. Work co-operatively with DEC and other State Government Departments to ensure that identified threatening processes are addressed and the conservation of biodiversity values are maintained.

9.9 Yarragil 2 and Swamp Vegetation Complexes

Across the PMR, 96.2% of the original extent of the Yarragil 2 complex and 93.5% of the original extent of the Swamp vegetation complex is retained. Of the remaining extent, 100% of each of these vegetation complexes is retained however none of the remaining extent is considered to be protected. The remaining extent of both these complexes in the Shire is owned by the State Government. Due to these similar characteristics these two vegetation complexes have been grouped together to draft the target detailed in **Box 16**.

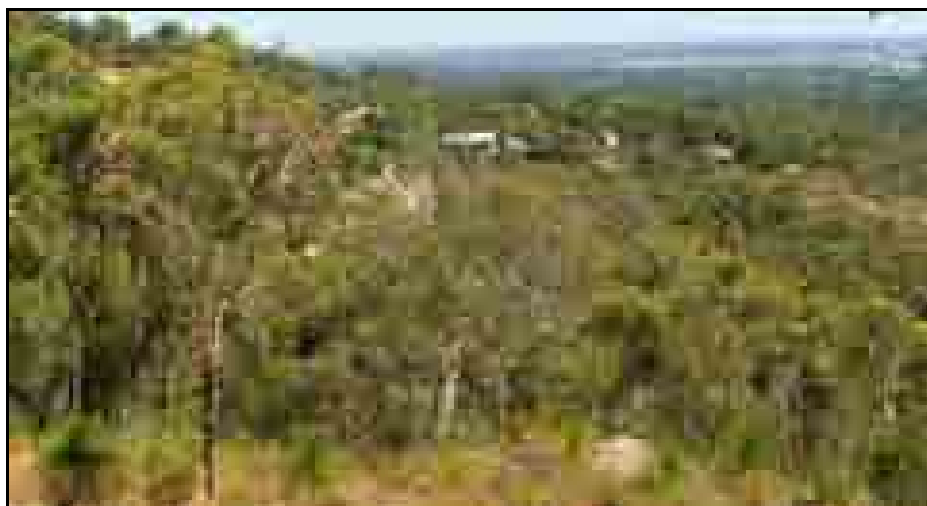
The Yarragil 2 vegetation complex is associated with the valleys of the Darling Plateau. The Swamp vegetation complex is associated with the drier shallow depressions at the head of drainage lines of the Darling Plateau.

Box 16: Proposed target for the protection of the Yarragil 2 and Swamp vegetation complexes

Encourage retention of remaining areas of the of the Yarragil 2 and Swamp Vegetation complex original extent, in accordance with the local town planning scheme zonings and policies, within the Shire of Kalamunda. Work co-operatively with DEC and other State Government Departments to ensure that identified threatening processes are addressed and the conservation of biodiversity values are maintained.

10 Application of Targets

By adopting the Local Biodiversity Strategy the Shire of Kalamunda will agree to apply the targets detailed in **Sections 8** and **9** throughout its operation. The application of these targets will ensure that the Shire is meeting legislative requirements with regard to biodiversity. Maintaining viable natural areas will also protect rare species and ensure common species stay common. This will not only protect biodiversity but also maintain a sense of place.



The natural environment provides a sense of place within the Shire of Kalamunda

Theoretically, a specific representational target detailing a set area or percentage of increased protection could have been drafted for each vegetation complex. This is however only the case for the Forrestfield and Southern River vegetation complexes. This is either because the other vegetation complexes already have greater than 30% protection or because further protection of LNA is impossible or outside of the scope of Local Government.

Examples of how each target is expected to be achieved are detailed in **Section 13**.

The targets set a minimum area for protection. In this way the targets remain realistic whilst also allowing for initiatives such as private land conservation and revolving funds to be explored. It should also be noted here that to achieve the targets developers may be required to increase consideration of the natural areas to ensure their protection during development and may be required to increase the amount of designated public open space.

It is envisaged that when assessing LNAs for protection, the following criteria will be applied:

- Protected LNAs will usually meet a representational target and at least one specific biodiversity feature target,
- Areas meeting a greater number of targets will generally have a higher priority for protection,
- All natural areas proposed for protection will be assessed in terms of viability and management needs (refer to **Section 10.1**),

- Where options exist to protect natural areas during development preference is given to areas in good or better condition with high ecological viability,
- Preference will be given to protect natural areas within local or regional ecological linkages, and
- Where development is proposed over a LNA, an expert ecological assessment will be required prior to any alteration to the natural environment (process to be formalised in a Local Planning Policy – refer to **Section 11.3**).

Comment on these criteria is sought during the public review period. These criteria have been adopted from the Town of Kwinana's Local Biodiversity Strategy, Stage One: Draft Public Discussion Paper (Ironbark Environmental (2007), Town of Kwinana).

Other factors to be considered during the assessment of Local Natural Areas for protection include:

- Approved development plans e.g. approved structure plan for Forrestfield urban development,
- Cost of protection and ongoing management, and
- Meeting multiple objectives of the Shire.

These criteria have been adapted from the Town of Kwinana's Local Biodiversity Strategy, Stage One: Draft Public Discussion Paper (Ironbark Environmental (2007), Town of Kwinana).

When applying the targets and implementing mechanisms for their achievement, State Government agreement may also be required. It is also important to gain State Government commitment to achieving the targets especially over the more highly constrained land zonings. The Shire should therefore seek the support of the Department for Planning and Infrastructure (DPI), the Western Australian Planning Commission (WAPC) and the Department of Environment and Conservation (DEC) for the proposed targets and for the proposed actions (refer to **Part C**) to achieve these targets. This will be especially important in protection of natural areas during subdivision as WAPC make the final decision and Local Government can only make recommendations.

Refusals to development applications made on the basis of biodiversity principles will also have more weight in the event that the decision is appealed if the Biodiversity Strategy has also been endorsed by DPI and WAPC.

It should also be noted that unless the protection of a LNA is required by State or Federal law or is a condition of subdivision or development, the achievement of the targets is voluntary. The Shire will strive to work with developers to consider natural areas for protection as part of new developments. Private land care incentives will also be devised for residents without development aspirations.

10.1 Ecological Viability

Ecological viability will be an important consideration in the determination of which LNAs should be protected. Even if an area meets one or a number of ecological criteria, it is important to also assess whether these ecological values can be maintained in the long-term.

Viability depends on the inherent resilience² of the ecological community and is greatly influenced by the level of management input. It is important to consider whether the level of management required to make an area viable is worth the potential biodiversity outcomes anticipated.

Viability of natural areas should be undertaken using the desktop and field assessments developed by PBP prior to increasing protection. These assessments can then be used in prioritising the management of these areas.

Any assessment of viability will only ever be a relative estimate; however, priority will be given to natural areas meeting the following components of viability:

- An area greater than 4ha,
- Compact shapes with a low perimeter to area ratio,
- Have at least 75% of the vegetation in good or better condition, and
- Are within 500m of another protected area and within an ecological linkage.

These components are adopted from the viability estimate detailed in the Natural Area Assessments provided in the Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region (Western Australian Local Government Association and Perth Biodiversity Project, 2004).

The above components should only be used as a guide and exceptions should be made where threatened species or ecological communities exist. It should also be recognised that remaining areas on the Swan Coastal Plain where the Forrestfield and Southern River vegetation complexes occur are highly fragmented. In order to meet the targets for these two complexes, areas not meeting all the viability criteria listed above will need to be protected.



Hypocalymma augustifolium (White Myrtle)

² Resilience is the natural ability of a community to resist or recover from disturbance, for example, weed invasion, fire, diseases, pests and other threats (Perth Biodiversity Project, 2004).

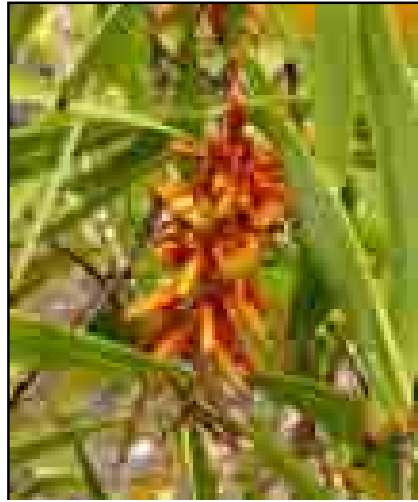
Part C: Implementation



11 Potential Biodiversity Conservation Actions

Mechanisms to increase the protection of natural areas will need to be developed for implementation by the Shire in order to meet the targets detailed in **Part B**. These mechanisms aim not only to retain local native vegetation and other natural areas but also to protect them in perpetuity.

Potential mechanisms to increase biodiversity protection within the Shire are detailed below. The most suitable mechanisms recommended for implementation by the Shire are detailed in **Section 12**. Support for the targets and implementation mechanisms from the community, rural area land owners, urban land developers and State Government will increase the effectiveness of the biodiversity protection.



Persoonia longifolia (Snottygobble) flower

11.1 Protection and Management of Local Reserves

11.1.1 Increasing Protection of Existing Bushland Reserves

The Shire of Kalamunda manages 266 reserves, of these, 102 have been assessed using the Natural Area Assessments detailed in the Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region (WALGA and PBP, 2004). These assessments have been used to rank the reserves with regard to standard ecological criteria and viability. This information is summarised as a prioritisation table which can be found in **Appendix A**.

The reserve assessments can now be used to determine reserves of high biodiversity value that would benefit from increased protection status. Protection of reserves can be improved by changing the vesting purpose of reserves to include the purpose of 'conservation', 'protection of rare flora' or similar to recognise biodiversity values.

Changing the purpose of the reserve will officially recognise the ecological significance of these reserves and provide a clear Council position with regards to their use.

Local Planning Scheme No. 3 also states that a person must not use a local reserve or commence or carry out development on a reserve without prior planning approval. Use or development could be large scale, such as buildings or ovals on purely recreational reserves but would also include pathways, bird watching huts etc. that can be developed on bushland reserves with minimal impact to the environment.

In determining an application for planning approval the Shire is required to have regard to the natural environment and the purpose intended for the reserve (Local Planning Scheme No. 3, Shire of Kalamunda 2007). Changing the purpose of the

reserve to include biodiversity conservation will give the Shire more scope to limit development within ecologically significant reserves.

Changing the purpose of reserves can be done by Ministerial Order under the *Land Administration Act 1997* if the reserve is an 'A' Class reserve under this Act or if the reserve is subject to the *Conservation and Land Management Act 1984*. The Shire of Kalamunda currently manages two 'A' Class Reserves: Hartfield Park and part of Railway Reserve.

In order to protect reserves created during subdivision - formally known as Section 20A reserves – a strong argument will need to be prepared in order to change the vesting purpose or to add a new purpose.

The Shire should liaise with the DPI when looking into changing the purposes of reserves.

Improving the protection of reserves will help to meet the biodiversity representation targets presented in **Part B**. Examples of how this will help meet the targets are described in **Section 13.2**. Improving the protection of reserves will also improve the protection of any biodiversity features associated with the reserve. The prioritisation table (**Appendix A**) can be used to determine the most viable reserves to protect in order to meet the targets. An example of this - using the reserves containing the Forrestfield vegetation complex - is detailed in **Table 16** below. All reserves containing natural areas need to be assessed in this way to determine which reserves to protect in order to meet the biodiversity targets.

Improving the protection status of reserves by amending the zoning of the Metropolitan Regional Scheme (MRS) is another method of increasing biodiversity protection. Zoning reserves Parks and Recreation under the MRS, due to their regional ecological significance, would recognise their environmental value at a State level. However, once the reserve becomes a regional reserve, the approval of the local government would not be required for the commencement or carrying out of any use or development on the reserve (Local Planning Scheme No.3, Shire of Kalamunda 2007). The Shire would therefore have less control over the reserve.



Increased protection of Shire reserves will help protect the Shire's unique environment into the future

Table 16: Example of how the reserve assessments can be used to determine which reserves should be protected in order to meet the biodiversity feature and representation targets

Reserve	Area	Viability	Veg Complex	Veg Condition Good or Better?	DRF	TEC	Regional Linkage	Wildlife Corridor	CCW	REW	Waterway
14088, 49122 - Maida Vale Reserve & adjoining BF site (bushland only)	11.1	11.6	Forrestfield	✓	✓	✓	x	✓	x	x	x
37650 - Crumpet Creek	4.8	10.6	Forrestfield	✓	✓	x	x	✓	x	x	✓
39218 - Fleming Reserve	5.9	9.94	Forrestfield	✓	✓	x	x	x	x	x	x
34364, 34600,31347 - 71 Moira Road, 121 Lewis Road, 17 York Street	15.6	9.5	Forrestfield	x	x	x	x	x	x	x	✓
31954 - Millson Reserve (inc Hewson Park)	1.1	8.3	Forrestfield	x	x	x	✓	✓	x	x	x
27566 - 31 Edinburgh Road	0.9	8.15	Forrestfield	x	x	x	x	x	x	x	x
38541 - Bugendore Street Reserve	0.2	8	Forrestfield	x	x	x	x	x	x	x	x
38489 - Casuarina Road Reserve	0.3	8	Forrestfield	x	x	x	x	✓	x	x	x
41480 - Kalamunda Road Reserve	1.7	8	Forrestfield	x	x	x	x	x	x	x	x
36492, 37323 - Poison Gully Reserve	5.4	7.54	Forrestfield	x	x	x	✓	✓	x	✓	✓
37219 - 126 Ridgehill Road	6.2	7.5	Forrestfield	x	x	x	x	✓	x	x	✓
37762 - 125 Ridgehill Road	3.9	7.5	Forrestfield	x	x	x	✓	✓	x	x	✓
41731 - John MacLarty Reserve	0.5	7.4	Forrestfield	x	x	x	x	x	x	x	x
40275 - Hawtin Road Reserve	1.1	7.3	Forrestfield	x	x	x	x	✓	x	x	x
33433, 32230, 32108 - Berry Drive Reserve	1.2	7.2	Forrestfield	x	x	x	✓	✓	x	x	✓
32613 - Booralie Way Reserve	2.3	7.1	Forrestfield	x	x	x	✓	✓	x	x	✓
36344 - Jubilee Way Reserve	0.3	6.75	Forrestfield	x	x	x	x	x	x	x	x
32108, 29519 - Nestle Brae Reserve	2.5	6.7	Forrestfield	x	x	x	✓	✓	x	x	✓
48084 - Myerson Crescent Reserve	1.8	6.4	Forrestfield	x	x	x	✓	✓	x	x	✓
39253 - 236 Hartfield Road	0.2	6	Forrestfield	x	x	x	✓	x	x	x	x
35209 - Nestle Brae Creek Reserve	1.0	5.5	Forrestfield	x	x	x	✓	✓	x	x	✓
35017 - Hartfield Road Reserve	1.1	5	Forrestfield	x	x	x	✓	✓	x	x	✓
33262 - Casuarina Road Reserve (Preschool)	0.4	5	Forrestfield	x	x	x	x	x	x	x	x
45989 - Tree fern Green Reserve	2.4	4.75	Forrestfield	x	x	x	✓	✓	x	x	✓
40245 - Oxford Court Reserve	0.4	3.5	Forrestfield	x	x	x	x	✓	x	x	x
33433 - Scenic Drive	0.4	3.5	Forrestfield	x	x	x	✓	✓	x	x	✓

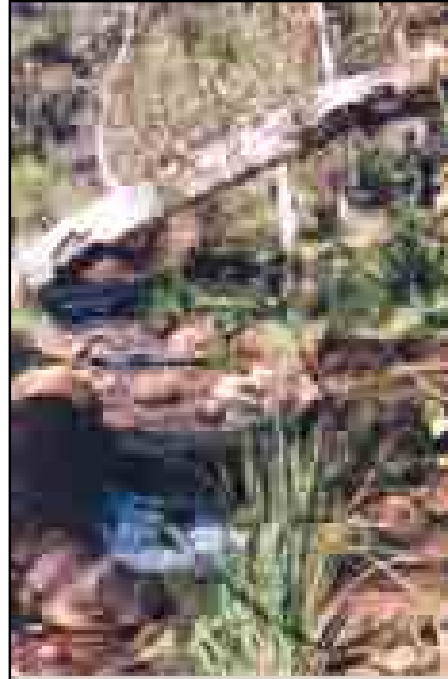
Reserves that should be protected in order to meet the Forrestfield representational target, other reserves could be protected to meet the biodiversity feature targets.

11.1.2 Improved Reserve Management

The reserve assessments have helped to improve the knowledge and understanding of biodiversity values on Shire managed land. This increased knowledge is already being used to improve the management of these reserves. An opportunity also exists to further formalise and coordinate reserve management within the Shire by developing a Reserves Masterplan.

It is suggested that this plan incorporates all Shire reserves so that the various reserve values - conservation, recreation, parks, drainage - are considered. The development of a Reserves Masterplan should involve the following Shire departments:

- Environmental Services,
- Parks and Gardens,
- Ranger Services (fire),
- Planning Services,
- Community Services, and
- Health Services (waste management).



Coordinated reserve management will help to protect natural areas such as this brook in Forrestfield

In order to improve reserve management co-ordination, regular meetings of the above departments, to discuss management options that address the objectives of each department in the long term, are recommended.

A Reserves Masterplan may also reveal reserves that are not important for conservation or recreation and these reserves could be considered for sale. In order for reserves to be sold, under-utilised reserves would be transferred to freehold title with the ownership made over to the Shire - subject to a purchase price determined by Landgate (Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region, 2004). The profit from such a venture could then be used to purchase reserves of high biodiversity significance or other value. This mechanism would need to be investigated through liaison with Landgate and the Department for Planning and Infrastructure.

Reserves with the potential to be sold could, for example, include reserves under 0.5ha with vegetation condition in degraded or worse condition and which contain no other biodiversity features (examples of this can be found in **Table 15** above). It would however need to be considered whether such reserves are used for any other purpose such as drainage or are important to the community.

As part of a reserves management plan, reserves of limited value could also be assessed for development potential. If the Shire owns land that could be developed to generate an income, the Shire would be less reliant on rates to fund projects. The amount of Shire owned land suitable for development would need to be investigated carefully.

Public consultation will be required as part of this process especially with regards to selling off or developing public lands.

The Reserves Masterplan should also investigate the most strategic way to allocate funds from the public open space contributions.

11.2 Land Purchase

11.2.1 Purchase of Reserves

In order to increase the protection of high priority viable natural areas, Council could consider the purchase of land that is currently privately owned for incorporation into its reserve system.



Verticordia huegelii (Variegated Feather Flower)

It is likely that funds for this would need to be supplied from Council budget as grant funds are unlikely to be available. Council has been successful in the past in liaising with the Department of Planning and Infrastructure to purchase locally significant natural areas, for example, a site on Brae Road. Similar opportunities may exist for the purchase of other natural areas; this will need to be investigated as part of the implementation of this strategy.

As previously discussed in **Section 11.1.2** development of a Reserves Masterplan may reveal reserves without viable natural areas, and with no other uses such as recreation or drainage. These reserves could be sold and the funds used to purchase locally significant natural areas for incorporation in the Shire reserve system.

Any property that is considered for purchase and amalgamation into the Shire reserve system should undergo ecological assessment prior to the sale taking place. Reservation should include a vesting purpose for biodiversity conservation (**Section 11.1.1**).

Cash given in-lieu of public open space contributions can also be used to purchase public open space. The major constraint with this is that the purchase of the public open space would need to be in the locality of the subdivision for which the in-lieu contribution was made (adapted from the WAPC Planning Bulletin No.21 Cash in-lieu of Public Open Space, 1997).

11.2.2 Revolving Funds

The development of a revolving fund is another option for Council to consider with regard to the protection of natural areas. This would involve the Shire purchase of high priority viable natural areas, placing a conservation covenant or new zoning over the site and then reselling the property. Funds generated from the on-sale of properties would be used to purchase further properties.

Covenants are registered on the Certificate of Title and bind current and future land owners. Conservation covenants control the uses of land so as to protect the remaining vegetation. Activities such as clearing, collection and removal of firewood, wildflower collection and location of buildings are strictly controlled by the agreement (Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region, 2004).



Protecting more natural areas provides habitat for the Shire's fauna such as this Echidna. Photo provided by the Australian Wildlife Conservancy.

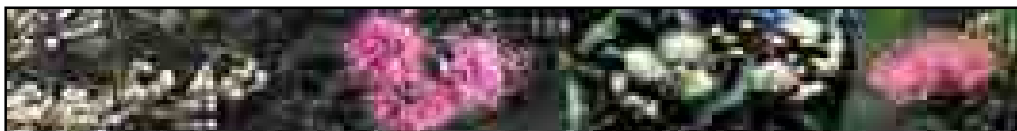
It would be important to ensure that any proposed purchase is investigated to ensure that a covenant could be applied over the property. Advice should therefore be sought from a covenanting body, for example the National Trust or the Department of Environment and Conservation, prior to purchase. It may be feasible to make the possibility of the application of a conservation covenant a condition of sale. An ecological assessment should also be undertaken prior to sale, to ensure long-term ecological viability.

To make the on-sale of a property with a conservation covenant more appealing, the Shire could also produce an accompanying management plan. This would ensure future owners are aware of their responsibilities regarding the property and protection of the environment.

Assigning a new zoning to properties purchased for on-sale is likely to require an amendment to the Local Planning Scheme. It is envisaged that any new zoning would limit the clearance of native vegetation and future development potential and could be applied retrospectively across any existing land zoning.

It is likely that initial start-up funds will be allocated from Council budget or from the sale of reserves that offer no biodiversity or other value. Council will be eligible for a tax deduction for any decrease in land value where it is attributable to entering into a conservation covenant. Any tax return given for reduced property value should be put back into the fund to ensure further properties can be purchased.

An offsets program could also be investigated to fund a revolving fund process. The most appropriate application of offsets would be where developers cannot protect any priority natural areas as part of their development. However, as there is currently only one planned development area (Kewdale-Hazelmere, refer to **Section 11.6.1**) which contains natural areas that could be protected through planning mechanisms this is not currently considered to be a productive mechanism to utilise for increased biodiversity protection. In the future if more land is released for development then the feasibility of an offsets program could be investigated.



Flora species found within the Shire of Kalamunda. Photos from FloraBase

11.3 Utilisation of the Current Local Planning Scheme

The aims of current Local Planning Scheme include:

- Making provisions for conservation of places of natural significance, and
- Preserving and enhancing the natural environment whilst managing future development.

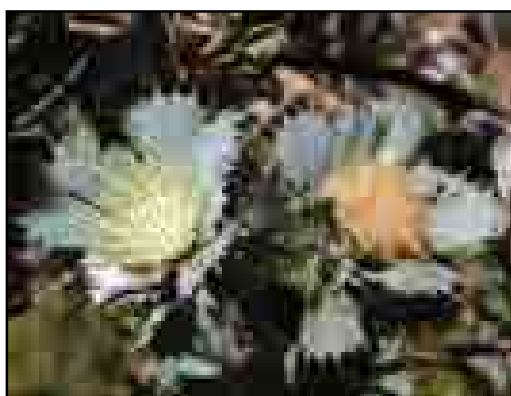
The development of the Local Biodiversity Strategy supports these aims.

Conservation of native vegetation and natural areas is also supported by the objectives of the Rural Landscape Interest and the Rural Conservation zonings and to some extent the Residential Bushland zone.

Further to this clause 5.19 of the current Local Planning Scheme states that:

“Native vegetation shall not be damaged, destroyed or removed unless it is in accordance with relevant state legislation, acts, regulations and guidelines.”

This clause can be used in order to help protect native vegetation throughout the Shire. For example, clearing not aligned with the State’s native vegetation clearing regulations is prohibited and the EPA’s Guidance Statement No.33: Environmental Guidance for Planning and Development supports retention and protection of native vegetation according to biodiversity principles.



Dryandra sessilis (Parrot Bush) is part of the Shire’s native vegetation which provides important fauna habitat

11.4 Policy Development

In order to ensure that biodiversity is adequately considered in the land use planning decisions made by the Shire, Local Planning Policies (LPP) should be developed. Production of LPPs will provide a process by which natural areas facing impact by development can be assessed. This will ensure all development proposals are assessed in a consistent manner.

11.4.1 Local Planning Policy (LPP) for Biodiversity Conservation

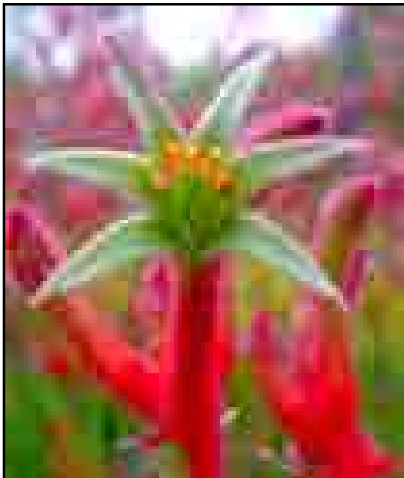
Development of a LPP for biodiversity conservation will ensure that the biodiversity values potentially affected by development proposals are adequately addressed and where possible retained and protected. It is intended that this policy should be applied when a development or subdivision application is received that may impact on a natural area. While the development may be for private land, the impact of development activities may frequently affect public land.

This policy will detail the level of information to be provided by the proponent. Completion of Natural Area Initial Assessments could be required in order to ensure that adequate information to assess ecological viability is supplied.

The LPP for biodiversity conservation will also be used to guide structure plans and outline development plans. The LPP will be applied to identify, prioritise and designate natural areas occurring within the structure or outline development plan area to be protected. Mechanisms that could be applied to protect natural areas include nominal Public Open Space (POS), POS via shared infrastructure costs or tax concession land donations made by the developer (refer to **Section 11.4**).

The targets established in **Part B** will provide guidance as to which natural areas should be retained and if possible, protected.

11.4.2 LPP for Tree and Vegetation Preservation



Currently the Shire of Kalamunda has a Tree Preservation Policy that requires proponents to apply for planning approval if they want to remove more than 5 mature trees in one year. In order to fully align with Local Planning Scheme No.3 and current legislation, this policy should be reviewed and updated.

As previously stated in the **Section 11.3** the local planning scheme states that native vegetation should not be damaged, destroyed or removed unless it is in accordance with relevant state legislation, acts, regulations and guidelines.

Adapting the Tree Preservation Policy will provide improved protection for all Shire native plant species.

The *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* provide the State Government legislation regarding the removal of native vegetation. The application of these regulations in the Shire of Kalamunda is a requirement of law. Guidance is also provided by the State Government with regard to protection of the environment and biodiversity.

The (Draft) Guidance Statement No.33: Environmental Guidance for Planning and Development 2005 for example, details the EPAs broad principles for protection of native terrestrial vegetation and flora. These principles can be used in the assessment of removal of vegetation within the Shire.

Using the State clearing regulations and environmental guidance as a guide, it is recommended that the Tree Preservation policy be updated in the following ways:

- The policy should refer to all vegetation not just trees – this will align it with clause 5.19 in the local planning scheme and State legislation,
- The policy should relate only to native vegetation,
- The policy should align with the EPAs broad principles for protection of terrestrial vegetation and flora which include but are not limited to:

- Maintaining biodiversity at sustainable levels (greater than 30% of the ecological extent) where possible,
- Conserving biodiversity in situ, and
- Preventing loss of biodiversity (especially ecological communities with less than 10% of the original extent remaining), and
- The policy should apply to all residents in the Shire as does the State legislation.

11.5 Amendments to the Local Planning Scheme

The ability to meet the biodiversity targets will be improved by making some adjustments to the Local Planning Scheme.

Amendments could include altering the objectives of the Special Rural Zone to include protection of the environment. In this way the Forrestfield vegetation complex and occurrences of DRF and TEC that occur in this zoning have a higher likelihood of protection.

It may also be prudent to alter the scheme to reflect the requirement for planning approval for all clearance of native vegetation. This will add weight to the current requirements of the Tree Preservation Policy and the proposed Tree and Vegetation Preservation Policy (refer to **Section 11.3.2**).

The current Local Planning Scheme could also be strengthened by adding the requirement for a full ecological assessment for all subdivision and development applications on rural land. This amendment would be especially important in helping enable the protection of the rare Forrestfield and Southern River vegetation complexes on Special Rural land. It would also add more weight to the proposed Local Planning Policy for Biodiversity Conservation.

Section 11.5.3 discusses the potential of cluster developments. Cluster developments would ideally be supported through the Local Planning Scheme. An example of this is detailed in **Box 17** which is an abstract from the City of Swan's Local Planning Scheme. Refer to **Section 11.5.3** for more information on cluster developments.

Box 17: Extract from the City of Swan Local Planning Scheme: Cluster Development within the General Rural, Rural Residential and Landscape Zones

8.2.8.1 The intent of this subclause is to address the possibility of strata cluster subdivisional development being approved as an alternative to conventional subdivisional development in the General Rural, Rural Residential, and Landscape Zones. To that end the following paragraphs apply.

8.2.8.2 For the purpose of this subclause, the terms "conventional subdivision" and "cluster subdivision" are explained by the following examples:

- a) A conventional subdivision might involve a 100 hectare lot being subdivided into five lots each of 20 hectares where 20 hectares is the minimum lot size stipulated by a particular Rural Strategy where such a strategy is adopted by the Council and the Commission as a Clause 2.4A Policy.
- b) A strata cluster subdivision in the same circumstances would involve five small strata lots clustered perhaps on one 5 hectare portion of the 100 hectare original lot, leaving 95 hectares in a single lot, protected from further subdivision and development.

8.2.8.3 Consistent with the intent of this subclause and the aim of preserving the rural and landscape character of the general rural, rural residential, and landscape zones, cluster subdivision shall only occur in the following circumstances:

- a) Subdivision and development shall be in accordance with an Outline Development Plan formulated for the locality and approved by the Council.
- b) Strata cluster subdivision shall not occur otherwise than for the purpose of permitting residential development on the strata cluster lots.
- c) In the General Rural, Rural Residential and Landscape Zones the number of lots produced by strata cluster subdivision shall not exceed the number of lots which could have been produced by conventional subdivision under any relevant Clause 2.4A Policy as adopted by the Council and the Commission, plus a bonus of either:
 - (i) additional strata cluster lots equal to the number of additional lots which could have been produced by conventional subdivision under the relevant Clause 2.4A Policy if the original lot area was increased by 10%; or
 - (ii) an additional strata cluster lot for each five lots which could have been produced by conventional subdivision under any relevant Clause 2.4A Policy as adopted by the Council and the Commission whichever the applicant nominates.

8.2.8.4 Where strata cluster subdivision takes place in accordance with the provisions of subclause 8.2.8, no further strata subdivision shall take place in the area of the original lot (from which the strata cluster subdivision was created) otherwise than in accordance with the following provisions:

- (i) The total of all strata lots created by the first strata cluster subdivision and any subsequent subdivision shall not exceed the total number of lots which could have been produced from the original lot by conventional subdivision in accordance with the relevant adopted Clause 2.4A Policy, together with any bonus approved pursuant to sub-clause 8.2.8.3(c).

City of Swan Town Planning Scheme No.9

11.6 Urban Development

Urban development in the Shire of Kalamunda, and across the wider Perth Metropolitan Region, has led to large scale clearing of native vegetation and habitat fragmentation.

By raising the issue of biodiversity conservation before urban development occurs, the Shire has the opportunity to plan new subdivisions in a way that helps protect natural areas.

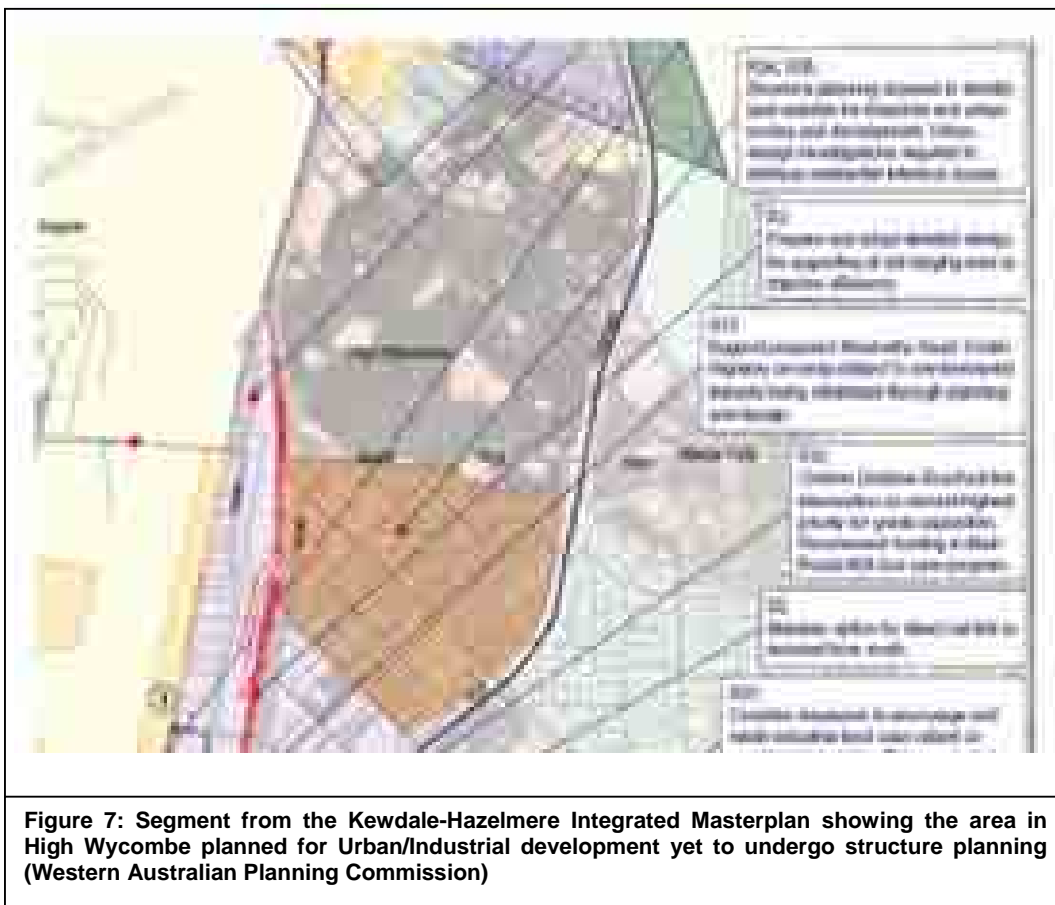
11.6.1 Public Open Space

The WAPC's normal requirement in residential areas is that where practicable, 10% of the gross subdivisible area be given up free of cost by the subdivider and vested in the Crown under the provisions of Section 152 of the *Planning and Development Act 2005* as a Reserve for Recreation (WAPC 2005).

This requirement can be utilised in order to protect natural areas in new subdivisions. The Shire is likely to need to provide a strong argument for the vesting purpose to be Recreation and Conservation or similar.

Presently there is one area in High Wycombe zoned for urban development that has not undergone structure planning. Structure planning should be undertaken to ensure the protection of viable natural areas, or important biodiversity features in the public open space contribution.

The Kewdale-Hazelmere Integrated Masterplan also details an area of urban and industrial development - the part of the plan relevant to the Shire is detailed in **Figure 7** below. Structure planning for this area has also not taken place. Opportunities exist in this area to protect natural areas in the public open space contributions.



In order to protect viable natural areas, the public open space contributions will need to be carefully negotiated. Natural areas to be protected in public open space should be large (greater than 4ha if possible) with a compact shape (e.g. square). Some landowners may need to be compensated for providing a greater than 10% allocation of their land for public open space in order for this to occur. A robust process involving cash in-lieu contributions from some landowners being provided to landowners giving up more than 10% of their land will need to be developed.

11.6.2 Tax Concessions available to the Developer

The Government allows a tax deduction to donors for gifts of property made to certain funds, authorities and institutions where the gift:

- Is valued by the Commissioner at more than \$5,000,
- Is made on or after the 1st July 1999,
- Is not a testamentary gift, and
- Was not purchased by the donor during the 12 months before making the gift.

The tax deduction available to the donor will then be the value of the property as determined by the Commissioner, as at the date of the donation.

Developers may be able to take advantage of this tax benefit by using the tax deduction for gifting a natural area to offset Capital Gains Tax.

The Shire should promote this tax benefit with developers during the structure planning phase. It is only likely to appeal to a developer if they own land that can be developed as a number of residences. Only large natural areas (greater than 4ha) in good condition or land areas attached to the Public Open Space allocation to increase its area should be encouraged for gifting.

11.7 Private Land Conservation

Of the remaining Local Natural Areas (LNA) occurring within the Shire, 1475ha of vegetation occur on privately owned land (Perth Biodiversity Project, unpub. 2003). This represents a 67.7% of the remaining LNAs, especially with regards to the threatened Forrestfield and Southern River vegetation complexes that occur on the Swan Coastal Plain.



Calothamnus rupestris (Mouse Ears)

Natural areas on private land are often fragmented and degraded. There are opportunities for natural areas covering a number of properties to be grouped together to form a viable natural area. Local Natural Areas on private land can also provide a buffer to the biodiversity on reserves or National/ Regional Parks.

In order to improve the protection of biodiversity, private landholders will need to be encouraged to take-up sound conservation management practices. This will involve the development of a private land conservation incentives strategy by the Shire.

A private land conservation incentives strategy will detail a package of planning, financial and non-financial incentives that could be made available to landholders who voluntarily choose to protect and manage biodiversity values on their property. An incentives strategy is essential for raising landholder awareness and capacity to identify, protect and manage resources. Furthermore, in many cases it will only be through an incentives strategy that strategic on-ground assessment of the biodiversity resource will occur.

Private land conservation also provides a variety of benefits in addition to environmental outcomes. For example, economic benefits of retaining vegetation include prevention of wind and water erosion, improved management of salinity, provision of shade and shelter and a natural means of controlling pests.

An important step in the development of the private land conservation incentives strategy will be to survey residents about the types of incentives that would be taken up. In this way resources can be focused on incentives that are most likely to appeal to the residents.

A private land conservation strategy could include, but is not limited to, the following initiatives.

11.7.1 Extension and Review of Existing Programs

The Shire of Kalamunda currently supports a number of initiatives that support biodiversity conservation. There are also a number of initiatives provided by the Federal and State Governments. These are summarised in **Table 17** below.

Initiatives provided by the Shire of Kalamunda		
Initiative	Summary	Positive Outcome
Plants to residents program	The Plants to Residents Program aims to encourage revegetation of residential and rural properties with locally native trees, shrubs and groundcovers by giving these plants to residents for free. Residents are encouraged to select from species that are most suited to the part of Kalamunda that they live in, i.e. Swan Coastal Plain, Darling Scarp or Darling Plateau. In 2007 approximately 10,000 plants were provided to the residents of the Shire.	The program is available to everyone. The planting of locally native species will help reduce the number of weed species planted in gardens and increase revegetation on private property.
Eastern Hills Catchment Management Program	The EHCMP is a partnership project where the Shire of Kalamunda works together with the EMRC, the Shire of Mundaring and the City of Swan. This initiative aims to improve land and water quality and maintain biodiversity in Perth's Eastern Hills by drawing together a range of stakeholders to achieve common outcomes for protecting and managing the environment.	The provision of technical advice, on property meetings and assessments and the provision of hard copy information that can be provided by trained officers.
Bush Skills for the Hills	Bush Skills for the Hills is a series of free, hills-focused workshops for the community which provide a mix of information and hands-on experience. Some of the Bush Skills workshops applicable to private land conservation include bush regeneration, weed	Free training to help with the conservation of biodiversity values.

	management, habitat creation and creekline restoration.	
Other educational programs	The Shire supports a number of other environmental educational programs such as fauna awareness in collaboration with Kanyana Wildlife Centre and Great Gardens with the State Government.	Improved awareness of environmental issues including biodiversity conservation.
Initiatives provided by the Federal Government		
Initiative	Summary	Positive Outcome
Grants	E.g. Envirofund, Community groups and individuals can apply for grants of up to \$50,000 (GST inclusive) to carry small scale projects aimed at conserving biodiversity and promoting sustainable resource use. There has to be a benefit to the wider community to be eligible.	Biodiversity conservation activities do not have to be funded by the land owner.
Tax Concessions	Certain conservation covenants may allow a property owner to be entitled to an income tax deduction for any decrease in land value that has resulted from entering into the Conservation Covenant. Where a conservation covenant is entered into, capital gains tax provisions will apply as if it were a sale or gift of the land. Activities on land which is primary production business or a business for the purpose of producing assessable income from the use of rural land, except a business of mining or quarrying are eligible for some tax deductions.	Tax benefits for biodiversity conservation
Initiative provided by the State Government		
Initiative	Summary	Positive Outcome
Grants	E.g. Community Conservation Grants, Healthy Wetland Habitats, Swan Alcoa Landcare Program, Lotterywest.	Landholder can undertake biodiversity conservation activities at minimal cost.
Bush Bank	Revolving fund supported by both the Federal and State Governments	Natural areas on private land are protected.
Technical Advice	Through the Urban Nature program and the Species and Communities Branch (Department of Environment and Conservation).	Technical advice can give landowners the confidence to undertake conservation initiatives.
Land for Wildlife	Land for Wildlife is a voluntary scheme that aims to encourage and assist private landholders in Western Australia to provide habitats for wildlife on their property. Land for Wildlife offers advice about planning and managing private bushland.	Private landholders are encouraged to manage the attributes of natural areas on their property.
Educational programs	E.g. Skills for Nature	Provides improved awareness of environmental issues including biodiversity conservation.

The preparation of a private land conservation incentives strategy should include a review of these existing programs to establish:

- Awareness of the programs,
- Success of the programs,
- Barriers to the uptake of incentives, and
- Gaps in the incentives offered.

11.7.2 Conservation Grants Scheme

Access to State and Federal grants is currently facilitated by Shire environmental staff and the Eastern Hills Catchment Management Program (EHCMP). This service could be complimented by the development of a Shire biodiversity conservation grants scheme to provide assistance to private landholders ineligible for other grant funding.

This scheme would have to be developed as part of the private land conservation strategy. It is currently envisaged that the administration costs of such a program could be absorbed into existing environmental budgets. Funds of at least \$10,000 per annum would need to be made available by Council for the individual grants.

Grant applications would be prioritised based on the following standard ecological criteria:

- Representation of ecological communities,
- Diversity,
- Rarity,
- Maintaining ecological processes or natural systems – connectivity, and
- Protecting wetland, streamline and estuarine fringing vegetation.



Grant applications could be made to protect natural areas, such as waterways, on private property

It is envisaged that preference would be given to residents offering a higher level of protection such as entering into a 5 year voluntary management agreement or

placing a conservation covenant over the property to the natural areas contained on their properties.

11.7.3 Subdivision for Conservation

As previously discussed in **Section 4.4** habitat fragmentation is a serious threat to biodiversity. In the Shire of Kalamunda, the threat of habitat fragmentation is especially apparent on land zoned for special rural use where lots can be subdivided down to 1ha lots.

The threat of habitat fragmentation could be addressed through a number of subdivision concessions. These include:

- Subdivision incentives,
- Strata Title subdivisions, and
- Cluster developments see **Section 11.5.3**.

Subdivision incentives would involve allowing a land owner to create additional lots above that which would normally be allowed if the land owner is prepared to protect remaining natural areas as part of the subdivision. It is envisaged that protection would be in the form of a conservation covenant. Any decrease in market value as a result of entering into the conservation covenant would be tax deductible and the covenant would be unlikely to cover the whole property so that some development, for example house construction could occur.

WAPCs Development Control Policy 3.4: Subdivision of Rural Land supports subdivision of rural land if it is supported by the Local Planning Scheme or a Local Planning Policy. Subdivision for conservation is also supported by this policy however there are a number of criteria that need to be met in order for subdivision for conservation to occur. Included in these criteria is the requirement that the extra lot should be greater than 40ha.

The private land conservation incentives strategy would therefore need to determine how many lots within the Shire would meet these criteria before changes to the Local Planning Scheme are made or a new Local Planning Policy is developed. If this option is deemed viable, it will also be important to survey eligible residents to determine the likely take-up of such an initiative.

The *Strata Titles Act 1985* can also be used where only a portion of the land to be subdivided has natural areas. The natural area could be made the Common Property and administered by the Strata Company as a collective. Implementation of this option would need to align with the Local Planning Scheme and the WAPCs Development Control Policy 1.3: Strata Titles (Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region).

Cluster developments are an extension of utilisation of Strata Titles for the protection of natural areas. Cluster developments can be used where most of the land to be subdivided consists of natural areas. The principle of cluster developments is to cluster buildings and infrastructure in one or two locations. This can be done in two ways:

- i. To make the common property very large and residential lots much smaller and clustered near each other,

- ii. To have larger individual lots with building envelopes clustered near to each other.
- (Adapted from the Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region)

Cluster developments could be implemented using the *Strata Titles Act 1985* or as a special zone produced through an amendment to the Local Planning Scheme (refer to **Section 11.4**).



Kennedia coccinea (Coral Vine)

11.7.4 Rate Rebates

Annual or once off rebates on rates are another potential incentive that could be offered to land owners who voluntarily agree to protect natural areas. The value of the rebate could be tied to the size of the natural area to be protected, the condition of the natural area and/or the management actions implemented by the landholder (Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region). It is envisaged that to be eligible for a rate rebate, landholders would be required to sign a voluntary conservation agreement for a minimum of 5 years and rebates would be an annual long-term incentive provided by Council. Higher rebates could be made available to landholders entering into conservation covenants in perpetuity.

Funding for rate rebates would be out of general revenue and therefore the viability and likely uptake of this incentive should be carefully considered as part of any private land conservation incentives strategy.

11.8 Development of the Shire's Environmental Service

Over the past 10 years the Shire of Kalamunda has employed Environmental Officers on a part-time basis through the Eastern Metropolitan Regional Council (EMRC). Traditionally an Environmental Officer and a Bushcare Officer have been employed to undertake the environmental duties as required by the Shire.

In 2005 an Environmental Reserves Officer was employed on a part-time basis through EMRC. In this year access to a Bush Regeneration Team to implement on-ground environmental activities on reserves was also provided to environmental staff for half the year.

The Eastern Hills Catchment Management Program has been supported for by the Shire for a number of years.

Most recently, in 2007, the Shire has directly employed an Environmental Coordinator. This has enabled coordination of the management of the Environmental Service and improved the integration of the Service into Council operations.

In order to reduce the threats to biodiversity and implement biodiversity protection mechanisms, the Shire could consider the employment of further environmental staff (refer to **Sections 11.6.1** and **11.6.2** below).

11.8.1 Full-Time Bush Regeneration Team

Access to an on-ground Bush Regeneration Team has provided an invaluable service to the Environmental staff within the Shire. The Bush Regeneration Team carry out the following activities on Shire reserves:

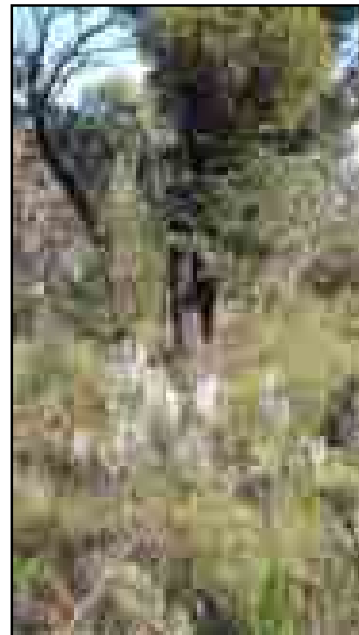
- Weed control,
- Dieback treatment,
- Creekline restoration,
- Direct seeding,
- Requests made by Friends Groups, and
- Revegetation.

Over recent years, it has become apparent that there are enough environmental activities required on reserves for the Bush Regeneration Team to work with Environmental Services for a full year. This is apparent from limited amount of time there is to complete the number of requests made by Friends Groups and the fact that they are never short of other activities to undertake.

In 2007, the Shire also had to employ the services of a Greencorp team to undertake some of the activities that the Bush Regeneration Team does not have time to complete.

The employment of a full time Bush Regeneration Team would enable more coordinated management of bushland reserves. This would mean that more threat abatement activities such as weed control could be undertaken. Follow-up work can also be planned in the years preceding the activities to ensure that the threat continues to be controlled at a lower cost to the Shire and more work can be achieved.

Reserves on which the Bush Regeneration Team can focus their activities can be determined through the Reserves Masterplan recommended in **Section 11.1.2**.



A full time Bush Crew would enable more on-ground action on bushland reserves. Maida Vale reserve shown above

11.8.2 Environmental Reserves Officer

The Environmental Reserves Officer (ERO) has been employed on a part-time basis through EMRC. The ERO has responsibility for the coordination of the Bush Regeneration Team to implement on-ground environmental activities on reserves.

The ERO is also responsible for the encouragement and support of “Friends Group” involvement in bushland reserve management, the coordination and assistance in the Plants to Residents Program, providing advice to “Friends Groups” of their responsibilities and obligations consistent with the Shire of Kalamunda’s Friends Group Manual, to monitor and evaluate the progress of bushland management activities being undertaken by “Friends Groups” and work on various other community projects.

In order to plan for sustainable future and be able to successfully manage the bushland reserves in the Shire and coordinate the “Friends Groups” in each of them, a Shire employed ERO would enable a more coordinated approach to the position. The position could remain part-time, however the employment of the ERO could be undertaken by the Shire to make the position more financially viable.

The successful implementation of this strategy is likely to take up a considerable amount of time and the Shire should consider the employment of the Environmental Reserves Officer.

11.8.3 Environmental Planner

In order to plan for sustainable development the Shire needs to plan for the improvement of social, economic and environmental aspects of the community. This will include the protection of the natural areas which are critical to the quality of life in the community.

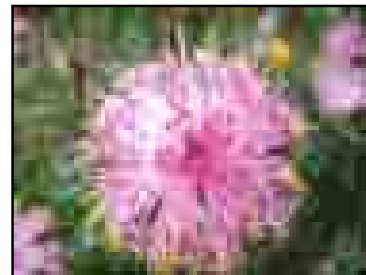
The Shire currently does consider the environment during planning decisions however, as the pressure for higher development increases, the importance of protecting natural areas is likely to be increased.

This strategy offers some ways in which the natural environment can be considered whilst also encouraging development. The successful implementation of this strategy is likely to take up a considerable amount of time and the Shire should consider the employment of an Environmental Planner with qualifications in both planning and environmental disciplines. The creation of this position will also allow more officer time and expertise in providing environmental advice on planning/development approvals and development of planning policy.

The Shire could consider outsourcing this position in a similar way as to how it currently works with the EMRC.

11.9 Actions to reduce threats to biodiversity

The Shire of Kalamunda currently undertakes many activities to reduce the threats to biodiversity. These activities include:



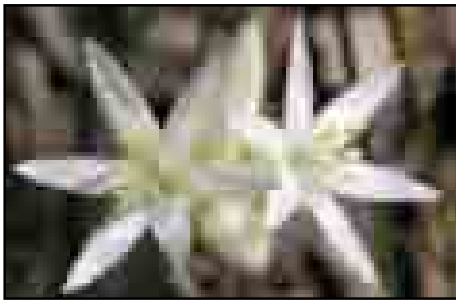
Reducing threats will help maintain the Shire’s diverse environment

- Weed control,
- Revegetation,
- Development of reserve management plans,
- Fencing, and
- Plants to residents.

A number of activities are planned that will help reduce the threats to biodiversity. These include the review of the District Conservation Strategy and the development new reserve management plans. There are further activities that could be considered for implementation by the Shire to increase biodiversity protection.

A number of activities are detailed below. Further initiatives should be considered if the opportunities arise.

11.9.1 Planting verges



Conostylis setosa (White Cottonhead)

The Shire could trial the planting of verges with local native species. This will reduce the amount of grass species grown within the Shire which can invade into native bushland areas, create a fire hazard and out-compete native species. The added benefit of having less grassed areas to mow will save officer time and Shire funds.

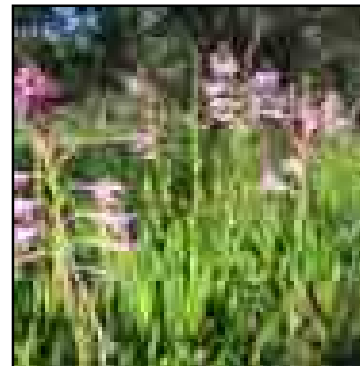
The trialling of planting verges should not compromise road safety or infrastructure such as powerlines, and may require consultation with public and industry representatives. The verges that should be trialled initially should be those which are close to bushland reserves or Regional or National Parks or within regional ecological linkages or wildlife corridors.

The possibility of entering into a partnership with Main Roads (Western Australia) should also be investigated. Encouraging the State Government to also plant local native species on the verges they are responsible for will ensure both levels of Government are working towards the same goal – reduction of threats to and general improvement of biodiversity.

11.9.2 Targeted Weed Control and Update of the Weed Control Strategy

The Shire's Weed Control Strategy was produced in 2002 with the recommendation to review and update after 5-10 years. Five years have elapsed since the production of the Weed Control Strategy and it is now due for review.

The Weed Control Strategy is largely implemented on a site-specific basis. This approach could be expanded to target specific weed species across the Shire. As the weed control would occur on Shire land a



Watsonia is a weed requiring targeted weed control. Photo by Craiq Wansbrough

corresponding educational campaign should also be run in order to encourage residents to also control the specific weed.

In order to expand the implementation of the Weed Control Strategy in this way, officer time (possibly from the proposed full time Bush Regeneration Team) and increased budget would be required.

11.9.3 Expansion of the use of the Geographic Information System (GIS)

The introduction of the GIS has been invaluable to the Environmental Services staff. This technology has enabled comprehensive desktop assessment of many environmental attributes of sites before undertaking a site visit. This has been important in development and subdivision approvals where information such as the presence of rare species, which may not be flowering, is less likely to be missed.

The GIS has also been useful during the production of this strategy. During the reserve assessments, desktop assessments were undertaken to determine expected environmental attributes. These attributes could then be ground truthed during the on site assessment.

In order to expand the use of the GIS, the Shire should consider introducing the use of Global Positioning System (GPS) or Personal Digital Assistant (PDA) systems to collect field data for immediate download into the GIS.

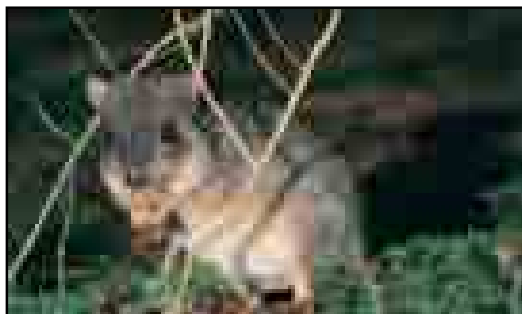
GPS would allow the Shire officers to pinpoint biodiversity features or threats so that they could be entered onto the GIS. This information will assist in the management of Shire land. For example, if the Shire decided to target a particular weed species, officers could be trained to record this information whilst they are out in the field. This information could then be uploaded onto the GIS so that targeted weed control could be planned effectively.

Utilisation of a PDA system would enable area polygons to be drawn whilst out in the field and then uploaded onto the GIS system. This would be especially useful when mapping vegetation condition or undertaking weed mapping at Shire reserves. PDAs also have a memory function so information such as species lists would also be able to be taken in the field and kept as an electronic record.

11.9.4 Review of the Wildlife Corridor Strategy

The Shire's Wildlife Corridor Strategy was produced in 1998. This Strategy delineated a network of corridors to assist in the conservation of native flora and fauna.

The importance of maintaining ecological linkages is also included in this strategy and is described in **Section 8.3.1**. The Wildlife Corridor Strategy should be



Connecting natural areas improves the resilience of the biodiversity to survive disturbance. Photo by the Australian Wildlife Conservancy

reviewed to ensure that the wildlife corridors developed in 1998 meet the criteria for local linkages as detailed in the Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region (WALGA, PBP 2004).

A review of the Wildlife Corridor Strategy will also show progress on recommendations and whether any of the recommendations should be adapted to become more achievable. Following review of the recommendations, an action plan would provide clear guidance on how the recommendations will be met.

11.9.5 CarbonSMART

There are other programs which may help to reduce the threats to biodiversity. One such program is Landcare Australia's CarbonSMART program. This program is an example of a national carbon pool to support Australia's biodiversity. Through this program farmers and landholders can earn money by planting and maintaining vegetation for biodiversity. Individuals and businesses can then buy carbon credits from these landholders (a management and brokerage fee is taken by Landcare).

The basic criteria to participate in the CarbonSMART NSW Pool ensure that the land and revegetation meet the GGAS requirements. These criteria include:

- The site must have been predominantly clear of vegetation (that is, have had less than 20% tree cover) on 31 December 1989,
- The site must have been revegetated after 1 January 1990,
- The site must have been revegetated by seeding or other human action,
- When mature, the vegetation must attain a height of at least two metres,
- When mature, the vegetation's top layer must reach a crown (shade) covering of greater than 20%,
- The site must be at least 0.2 hectare, and
- The carbon will remain on site for at least 100 years after the final trade of that carbon.

Other criteria include that the landholder has the rights to the carbon in the trees and that the amount of carbon can be accurately measured.

This program is currently run in NSW however Landcare are looking to expand nationally once a national carbon trading system is initiated.

Although biodiversity can never be recreated, planting cleared land with species local to the area will benefit natural areas by reducing the threats from weeds and helping to buffer existing natural areas. Programs such as this should be supported in the event that a carbon trading system is initiated by the Federal Government.

The Shire of Kalamunda may also benefit from such a scheme in that they may be able to plant out cleared reserves and receive and income from carbon credits.

11.10 Environmental Levy

Section 6.38 of the *Local Government Act 1995* allows Councils to impose a service charge on a landowner or occupier to meet the cost of providing a prescribed service for the land. An opportunity exists for Council to consider introducing such a levy to raise funds for environmental programs such as biodiversity conservation, acquisition of assets and general management and improvement expenditures.

An example of a successful levy is the Bushland Preservation Levy introduced by the City of Brisbane. The levy is \$30 a year from each rateable property. The Council has used funds from this levy to purchase and restore over 1600ha of natural bushland.

The introduction of an environmental levy to fund biodiversity conservation initiatives should be investigated by the Shire. Community consultation will be required in order to determine whether the community would support such a program.

12 Biodiversity Conservation Actions for Implementation

A number of options for the implementation of the targets proposed in **Part B** and to improve biodiversity conservation across the Shire were discussed in **Section 11**. The options considered most viable for the implementation by the Shire are detailed in the action plan in **Table 18** below.

Table 18: Action Plan for the Implementation of the Local Biodiversity Strategy	
Action	Comment
2008-2009	
Endorse Local Biodiversity Strategy including targets and action plan by: <ul style="list-style-type: none"> • Ensuring endorsement by Council, and • Working with DPI, WAPC and DEC to gain State Government endorsement of the Strategy. 	Assistance in gaining State Government support will be supplied by DPI
Improve the protection and management of local reserves by: <ul style="list-style-type: none"> • Investigating the possibility of changing the vesting purpose of local reserves to recognise biodiversity conservation, • Forming a reserves management committee, and • Developing a Reserves Masterplan. 	There will be officer time to start investigating changing reserves purposes this financial year. The current environmental projects budget could be adapted in order to produce a Reserves Masterplan in the 2008-09 financial year.
Develop supporting Local Planning Policies (LPP) to support decision making under the current local planning scheme, including: <ul style="list-style-type: none"> • Biodiversity Conservation LPP, and • Tree and Vegetation Preservation LPP. 	Funding for the development of a LPP for Biodiversity Conservation could be sought through DPI. The adaptation of the Tree Preservation policy can be absorbed into current officer time.
Protect existing natural areas in new urban areas by: <ul style="list-style-type: none"> • Protecting natural areas in public open space contributions of new developments, full ecological assessments should be conducted prior to structure planning, • Ensuring natural areas are protected as development the new areas takes place, i.e. by fencing during subdivision so the area is not cleared and undertaking spot checks to ensure builders rubble etc is not dumped in the reserve, 	This action should largely be absorbed into standard operations however the cost of ecological assessment for large developments should be absorbed by the developer. This will be helped by the formalisation of the process required in a LPP for biodiversity conservation.

<ul style="list-style-type: none"> Ensuring viable ecological areas are protected by requiring ecological assessment prior to development taking place, and Promoting tax concessions to developers for gifting of land. 	
<p>Developing a Private Land Conservation (PLC) Strategy including:</p> <ul style="list-style-type: none"> Undertaking a survey of residents to determine initiatives that will be successful, The likely uptake of initiatives detailed in Section 11.5 should be surveyed together with awareness of existing programs. Following assessment of survey results the PLC Strategy can be developed. Also include public opinion with regards to Environmental Levy in survey 	Funding for the production of a Private Land Conservation Strategy should be sought from the Perth Biodiversity Project.
<p>Development of the Shire's Environmental Service including:</p> <ul style="list-style-type: none"> Full-time Bush Regeneration Team 	Allocating a full time bush crew to implement environmental on-ground actions should be considered in the 2008-09 budget.
<p>Other actions to reduce threats to biodiversity:</p> <ul style="list-style-type: none"> Undertake a trial to determine the success of planting verges with native species, and Investigate forming a partnership with Main Roads WA to determine whether they could also be encouraged to plant local native species on the road verges they are responsible for. 	Undertaking a native plant verge trial could be absorbed into current budgets if the officer time is available. This trial could be allocated to the Bush Crew should they be available for the full year.
2009-2011	
<p>Purchase natural areas by:</p> <ul style="list-style-type: none"> Following completion of the Reserves Masterplan, sell reserves that serve no public or ecological function and use the revenue to purchase viable natural areas, Utilising the public open space contributions, and Liaising with DPI. 	This work could possibly be absorbed into the current consulting budget or the employment of an environmental planner could be considered.
<p>Determine future of purchased natural areas:</p> <ul style="list-style-type: none"> Determine whether the purchased natural areas should become reserves or form the beginning of a revolving fund, NOTE: Any land purchased by DPI is unlikely to be able to be used to start a revolving fund. NOTE: Reserves purchased using public open space contributions would have to go into the Shire reserve system. 	This work could possibly be absorbed into the current consulting budget or the employment of an environmental planner could be considered.
<p>Development of the Shire's Environmental Service including:</p>	It is likely to become apparent during the implementation of this Strategy whether an

<ul style="list-style-type: none"> • Environmental Reserves Officer • Environmental Planner 	<p>environmental planner will be required. If required the Shire create this position or employ a consultant to undertake this activity.</p>
<p>Implement Private Land Conservation Strategy:</p> <ul style="list-style-type: none"> • Actions will be developed in consultation with the community 	<p>New budget funds are likely to be required to implement the PLC Strategy. Specific budgets will be developed as part of the Strategy. Grant funding could be sourced for the implementation of some PLC activities although Council is likely to have to contribute some funds.</p>
<p>Amend the Local Planning Scheme to support the protection of natural areas by:</p> <ul style="list-style-type: none"> • Including protection of the environment in the objectives of the Special Rural zone, • Requiring planning approval for the removal of native vegetation, • Requiring a full ecological assessment for all subdivision and development on rural land, • Allowing cluster developments in rural land zonings. 	<p>Development of Shire policy to guide decision making is more important initially. Following the development of more robust policy, if it is deemed necessary to further strengthen the ability of the Shire to protect natural areas, the following scheme amendments should be made. Further amendments to the Local Planning Scheme should be considered as necessary.</p>
<p>Other:</p> <ul style="list-style-type: none"> • Determine success of verge planting trial and continue program if appropriate, • Update weed strategy, • Utilisation of PDA and/or GPS, • Review of Wildlife Corridors Strategy, • Investigate appropriateness of joining/promoting a program such as CarbonSMART, • If confirmation of public support has been gained introduce Environmental Levy 	<p>Updating the Weed Strategy could be absorbed into the Environmental Project budget. It is likely that to implement further weed control activities a budget increase will be required.</p> <p>Updating the Wildlife Corridor Strategy could be absorbed into the current Environmental Project budget however funds to implement the strategy may be required.</p> <p>Officer time would need to be dedicated in order to investigate new projects or levies.</p>
Further Actions	
<p>Monitor and review:</p> <ul style="list-style-type: none"> • Track the progress of the implementation of the Strategy so that progress and achievements can be reported to Council. • Review and update the Local Biodiversity Strategy to ensure it remains up to date and any new mechanisms can be implemented. • Monitor a review the successfulness of the PLC strategy, adapt if necessary, • Review the effectiveness of the Local Planning Policies, adapt if necessary, • If land is rezoned, use structure planning to protect natural areas, and • Continue to update and review Strategies as required, e.g. Wildlife Corridor, Weed Strategy. 	

13 Examples of How Implementing Biodiversity Actions will meet Biodiversity Feature and Representation Targets

Targets are important to the success of the Local Biodiversity Strategy as they provide a guide to the Shire and prospective developers as to the direction that will be taken with regards to biodiversity conservation. The targets can therefore be used by the Shire to guide decision making and future activities.

Examples of how the implementation of actions proposed in **Section 12** will help meet the targets proposed in **Part B** are detailed below.

13.1 Biodiversity Feature Targets

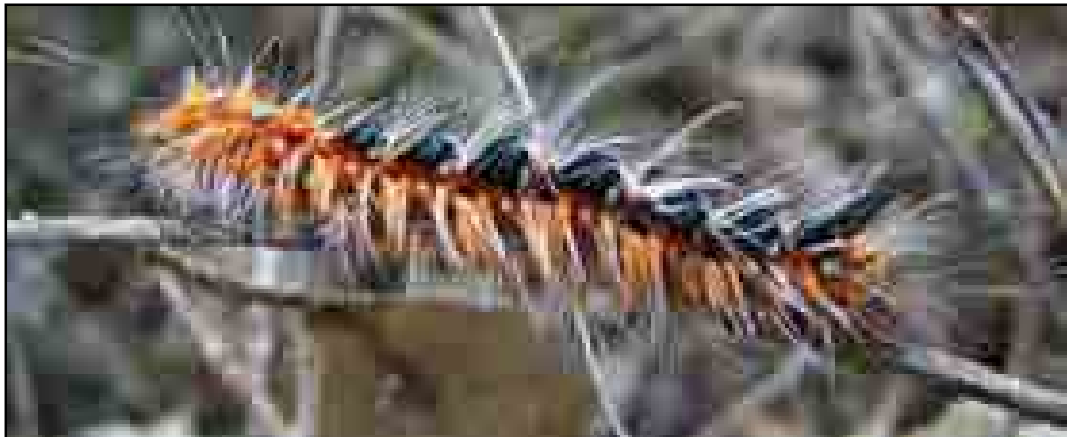
Altering or including additional reserve purposes will help to improve the protection of biodiversity features that occur on reserves. This will also provide clear Council direction with regards to the use of Shire reserves.

The important biodiversity features that are found on Shire reserves are summarised in **Table 19** below. The Shire should increase protection of these reserves in order to recognise the importance of these features.

Priorities for protection of reserves that contain a large number of biodiversity features or features that are require protection under Federal or State law. Reserves with higher viability may also be given high priority for protection as they are more sustainable in the long-term.

Protection of biodiversity features will also be improved through the implementation of the following:

- Local Planning Policy for Biodiversity Conservation,
- Implementation of a Private Land Conservation Strategy,
- Review of existing policies, and
- Employing innovative subdivision solutions.



Achieving the targets will help to protect the Shire's unique biodiversity

Table 19: Summary of biodiversity features occurring on Shire reserves											
Reserve	Area	Viability	DRF	Priority Species	TEC	SPF	Regional Linkage	Wildlife Corridor	CCW	REW	Waterway
22502 – Norwood Reserve	2.4	11.8	✓	x	x	x	x	✓	x	x	✓
14088, 49122 - Maida Vale Reserve & adjoining BF site (bushland only)	11.1	11.6	✓	x	✓	x	x	x	x	x	x
37650 - Crumpet Creek	4.8	10.6	✓	x	x	x	x	✓	x	x	✓
39218 - Fleming Reserve	5.9	9.94	✓	x	x	x	x	x	x	x	x
34364, 34600,31347 - 71 Moira Road, 121 Lewis Road, 17 York Street	15.6	9.5	x	✓	x	x	x	x	x	x	✓
31954 - Millson Reserve (inc Hewson Park)	1.1	8.3	x	x	x	x	✓	✓	x	x	x
38489 - Casuarina Road Reserve	0.3	8	x	x	x	x	x	✓	x	x	x
38541 - Bugendore Street Reserve	0.2	8	x	✓	x	x	x	x	x	x	
36492, 37323 - Poison Gully Reserve	5.4	7.54	x	x	x	x	✓	✓	x	✓	✓
37219 - 126 Ridgehill Road	6.2	7.5	x	x	x	x	x	✓	x	x	✓
37762 - 125 Ridgehill Road	3.9	7.5	x	x	x	x	✓	✓	x	x	✓
40275 - Hawtin Road Reserve	1.1	7.3	x	x	x	x	x	✓	x	x	x
33433, 32230, 32108 - Berry Drive Reserve	1.2	7.2	x	x	x	x	✓	✓	x	x	✓
32613 - Booralie Way Reserve	2.3	7.1	x	x	x	x	✓	✓	x	x	✓
32108, 29519 - Nestle Brae Reserve	2.5	6.7	x	x	x	x	✓	✓	x	x	✓
48084 - Myerson Crescent Reserve	1.8	6.4	x	x	x	x	✓	✓	x	x	✓
39253 - 236 Hartfield Road	0.2	6	x	x	x	x	✓	x	x	x	x
35209 - Nestle Brae Creek Reserve	1	5.5	x	x	x	x	✓	✓	x	x	✓
35017 - Hartfield Road Reserve	1.1	5	x	x	x	x	✓	✓	x	x	✓
45989 - Tree fern Green Reserve	2.4	4.75	x	x	x	x	✓	✓	x	x	✓
40245 - Oxford Court Reserve	0.4	3.5	x	x	x	x	x	✓	x	x	x
33433 - Scenic Drive	0.4	3.5	x	x	x	x	✓	✓	x	x	✓
17098 - Hartfield Park (bushland only)	69.5	17.9	✓	x	✓	x	x	x	x	x	✓
41156 - Pioneer Park	51.6	12.5	✓	x	✓	x	✓	✓	✓	✓	✓
43068 - Ollie Worrell Reserve	2.9	8.75	x	x	x	x	x	✓	x	x	✓
40228 - Poison Gully West Reserve	3.6	5.75	✓	x	x	x	✓	✓	x	✓	✓

Reserve	Area	Viability	DRF	Priority Species	TEC	SPF	Regional Linkage	Wildlife Corridor	CCW	REW	Waterway
26063 - Markham Road Reserve	0.8	5.5	x	✓	x	x	x	x	x	x	x
42573 - Reynolds Road	1	5	x	x	x	x	✓	✓	x	✓	✓
38597, 32912 - Dawson Avenue Reserve	1.3	4.5	x	x	x	x	x	✓	x	x	✓
9093 - 93 Kalamunda Road	4.8	21.1	✓	x	x	x	✓	✓	x	x	✓
28735 - Quenda Creek Reserve	2.5	11.9	x	✓	x	x	x	✓	x	x	✓
38964 - Katta Place Reserve	0.2	11	x	x	x	x	x	x	x	x	✓
27946 - 18 The Boulevard	1.4	6.5	x	x	x	x	✓	x	x	x	✓
27154 - Ledger Road Reserve	50.77	20.8	x	x	x	x	✓	x	x	x	x
31996 - George Spring Reserve (Bush Section only)	4.1333	18.3	x	x	x	x	✓	x	x	x	x
16922 - 21 Nimbin Road	8.4984	16.8	x	x	x	x	✓	✓	x	x	✓
22576, 28545 - Part of Railway Reserve	5.6506	14.7	x	x	x	x	✓	x	x	x	x
23040 - 50 Hill Street	4.0469	14.5	x	x	x	x	✓	x	x	x	x
34183 - 54 Chiselhurst Road (Hugh Sanderson Reserve)	1.5732	11.2	x	x	x	x	✓	x	x	x	x
27899 - 71 Huntley Street	0.9795	10.8	x	x	x	x	x	✓	x	x	x
40367 - Railway Reserve	3.429	9.8	x	x	x	x	x	✓	x	x	x
45099 - Wallis Park	3.6456	8	x	x	x	x	x	✓	x	x	x
29757 - Flora Terrace	1.9228	7.1	x	x	x	x	x	✓	x	x	x
27589 - 34 Zamia Road	1.4763	6.5	x	x	x	x	✓	✓	x	x	✓
35412 - East Terrace Reserve	5.3567	13.3	x	x	x	x	✓	✓	x	x	x
9311 - 771 Canning Road	20.4263	19.1	x	x	x	x	✓	x	x	x	x
Jorgenson Park	61.874	17.4	x	x	x	x	x	✓	x	x	x
24130 - 24 Crocus Road	2.3764	7.5	x	✓	x	x	x	x	x	x	x
17343 - 161 Hummerston Road	8.0937	19.6	x	x	x	x	x	✓	x	x	✓
33340 - 116 Orange Valley	0.3979	3.5	x	x	x	x	x	✓	x	x	x
33453 - Spring Road Reserve	0.4441	10.8	x	x	x	x	✓	x	x	x	x
29107 - Verrallen Way	0.3323	9.5	x	x	x	x	x	x	x	x	x
25188 - 5 Silversdale Road	0.8245	8.5	x	x	x	x	x	✓	x	x	x
27792 - Hawtin Road Reserve	1.0904	4.75	x	x	x	x	✓	✓	x	x	✓

13.2 Biodiversity Representation Targets

Altering or including additional reserve purposes will help improve protection of local reserves (as described in **Section 11.1**). When setting the targets it was envisaged that increasing the protection of reserves would help to achieve the following representation targets:

- The Helena 1, Helena 2, Murray 1, Murray 2 and Dwellingup 2 representation target,
- The Forrestfield representation target,
- The Southern River representation target,
- The Darling Scarp representation target, and
- The Yarragil 1 representation target.

Please refer to **Part B** for specific target wording.

Reserves containing 75% or more vegetation in good or better condition are required to meet the targets related to the Helena 1, Helena 2, Murray 1, Murray 2, Dwellingup 2, Forrestfield, and Southern River vegetation complexes.



Acacia pulchella (Prickly Moses) over *Xanthorrhoea preissii* (Grass Tree)
characteristic plants of many vegetation complexes found in the Shire

13.2.1 Helena 1, Helena 2, Murray 1, Murray 2 and Dwellingup 2 Representation Target

In order to meet this target the Shire should endeavour to increase the protection of reserves containing good or better condition containing the Helena 1, Helena 2, Murray 1, Murray 2 and Dwellingup 2 vegetation complexes.

Increasing the protection of the following reserves by changing the reserve purpose will ensure these targets are met:

- 27154 - Ledger Road Reserve – Dwellingup 2
- 31996 - George Spring Reserve (Bush Section only) - Dwellingup 2
- 22576, 28545 - Part of Railway Reserve – Dwellingup 2
- 30142 - Old Yorna – Dwellingup 2
- 34393 - Banksia Reserve – Dwellingup 2
- 26127 - Ray Owen Reserve – Dwellingup 2

- 34183 - 54 Chiselhurst Road (Hugh Sanderson Reserve) – Dwellingup 2
- 27899 - 71 Huntley Street – Dwellingup 2
- 26557 - 13 Mary Drive Reserve – Dwellingup 2
- 27817 - 91 Gladys Road – Dwellingup 2
- 34076 - 14 Trott Road – Dwellingup 2
- 29873 - 39 Sanderson Road – Dwellingup 2
- 35412 - East Terrace Reserve - Dwellingup 2/ Darling Scarp
- 15470 - 121 Carmel Road - Dwellingup 2
- 9311 - 771 Canning Road - Dwellingup2/ Yarragil 1
- Jorgenson Park - Dwellingup2/ Yarragil 1
- 17343 - 161 Hummerston Road – Helena 1

The Shire will have less power to change the purpose of the reserves zoned Regional Parks. Liaison with WAPC will determine actions in this case.

13.2.2 Forrestdfield Representation Target

The reserve assessment revealed that four reserves – 24.2ha - containing Forrestdfield vegetation in good or better condition. If the purpose of these reserves can be altered the shire will meet the Forrestdfield representation target.

The reserves proposed for increased protection to meet the Forrestdfield target are:

- R22502 – Norwood Reserve
- R14088, R49122 - Maida Vale Reserve & adjoining Bush Forever Site,
- R37650 – Crumpet Creek, and
- R39218 – Fleming Reserve.



Diuris longifolia (Common Donkey Orchid) Photo by Lesley Thomas

As there are no guarantees that the reserve purpose can be changed, it is important to also:

- Protect part of the Kewdale-Hazelmere Integrated Masterplan urban development area – a minimum of **5ha** of Forrestdfield vegetation should be protected in public open space with strict conditions on the developer to limit damage to the vegetation during building,

- Implement a private land conservation strategy across the Special Rural Zoning – a minimum of **10ha** should be protected ,
- Investigate land purchase, and
- Employ innovative subdivision solutions.

13.2.3 Southern River Representation Target

According to data collected in the reserve assessments it is not possible to meet the Southern River target by increasing the protection of reserves. This is because the vegetation on local reserves containing Southern River vegetation is highly degraded.

Hartfield Park contains Southern River in good or better condition but as this is a regional reserve changes to the reserve purpose to include conservation will have to be made by the WAPC. For this reason this reserve should not be included in the Shire target.

To meet the Southern River target, protection of this vegetation complex will include:

- Part of the Kewdale-Hazelmere Integrated Masterplan urban development area – minimum **5ha** Southern River vegetation should be protected in public open space with strict conditions on the developer to limit damage to the vegetation whilst building occurs,
- Implementation of a private land conservation strategy across the Special Rural Zoning – a minimum of **2ha** should be protected as part of the implementation of the Private Land conservation Strategy,
- Innovative subdivision solutions, and
- Land purchase.

13.2.4 Darling Scarp Representation Target

Improving the protection of reserves and implementing a private land conservation strategy will meet the Darling Scarp representation target.

The reserves in good or better condition that should be protected further by altering the reserve purpose are:

- R9093 – 93 Kalamunda Road,
- R29013 – 29013 - 12 Marie Way (crumpet creek),
- R4948 – Basildon Reserve, and
- 36372 – 50 Lascelles Parade.

13.2.5 Yarragil 1 Representation Target

The target relating to the Yarragil 1 encourages retention of this vegetation complex. To encourage private landholders to retain the vegetation on their property it is important for the Shire set an example by protecting the occurrences of this vegetation complex under its own management.

The Shire should therefore increase the protection of the following reserves which contain Yarragil 1 vegetation in good or better condition:

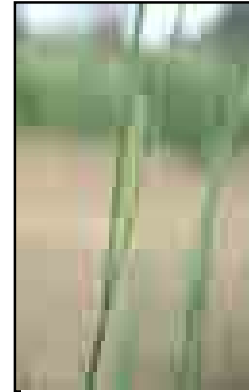
- 33453 - Spring Road Reserve
- 29107 - Verrallen Way.

Once these reserves are protected the target relating to the Yarragil 1 vegetation complex can be met by implementing a Private Land Conservation Strategy.

13.2.6 Swan, Guildford, Cooke, Yarragil 2 and Swamp Representation Targets

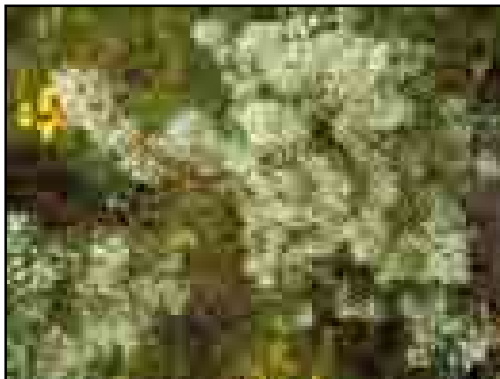
In order to meet the targets related to the Swan, Guildford, Cooke, Yarragil 2 and Swamp vegetation complexes the Shire should work cooperatively with DEC and other State Agencies to reduce processes that threaten biodiversity and maintain biodiversity values.

The Shire is currently in the process of forming a partnership with DEC to control outbreaks of **Tribolium uniolae*. In order to meet this target the Shire should continue its current practice and take up further opportunities as they arise.



**Tribolium uniolae*

14 Conclusion



Hakea trifurcata (Two-leafed Hakea)

The Shire of Kalamunda has the opportunity to plan for the retention and protection of Local Natural Areas. The implementation of the action plan detailed in **Table 18** will improve the protection of Local Natural Areas in the long-term and also encourage retention of areas that cannot formally be protected.

In order to fully implement the Local Biodiversity Strategy the following will also have to be produced and implemented:

- A Reserves Masterplan including a plan to purchase further natural areas and achieving increased protection of biodiversity on current reserves,
- A Private Land Conservation Strategy,
- A Local Planning Policy for Biodiversity Conservation, and
- A Local Planning Policy for Tree and Vegetation Preservation.

The production of these further documents will integrate biodiversity conservation into land use planning and decision making within the Shire. This will be an important step in achieving biodiversity protection.

The Shire of Kalamunda has a unique environment. By acting now in a strategic and consistent manner, this biodiverse landscape will be maintained long into the future for many generations to come.

Referencing

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Western Australian Planning Commission	www.wapc.wa.gov.au
Western Australian Local Government Association	www.walga.asn.au
Australian Valuation Office	www.avo.gov.au
Landcare CarbonSMART	www.carbonsmart.com.au

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The Paper is authored by Nicola Hoey on behalf of the Shire of Kalamunda. This document should be referenced as, The Shire of Kalamunda Draft Local Biodiversity Strategy, Shire of Kalamunda (2007).

Appendix A

Name of Area	Area (Ha)	Criteria Score	Overall Priority	Vegetation complex
9093 - 93 Kalamunda Road	13.1	1A	21.1	Darling Scarp/ Dwellingup 2
27154 - Ledger Road Reserve	50.7	1A	20.8	Dwellingup 2
17343 - 161 Hummerston Road	8.1	1A	19.6	Helena 2
29013 - 12 Marie Way (crumpet creek)	0.6	1A	19.5	Darling Scarp
9311 - 771 Canning Road	20.4	1A	19.1	Dwellingup2/ Yarragil 1
31996 - George Spring Reserve (Bush Section only)	4.1	2	18.3	Dwellingup 2
17098 - Hartfield Park	158.6	1A	17.9	Southern River
Jorgenson Park	61.9	2	17.4	Dwellingup2/ Yarragil 1
16922 - 21 Nimbin Road	8.5	1A	16.8	Dwellingup 2
15470 - 121 Carmel Road	2.1	2	15.6	Dwellingup2
22576, 28545 - Part of Railway Reserve	5.7	1A	14.7	Dwellingup 2
23040 - 50 Hill Street	4.0	1A	14.5	Dwellingup 2
30142 - Old Yorna	3.7	2	13.5	Dwellingup 2
24948 - Basildon Reserve	0.8	1A	13.5	Darling Scarp
35412 - East Terrace Reserve	5.4	1A	13.3	Dwellingup 2/ Darling Scarp
41156 - Pioneer Park	51.6	1A	12.5	Southern River
34393 - Banksia Reserve	0.8	2	12.5	Dwellingup 2
26127 - Ray Owen Reserve	14.0	2	12.05	Dwellingup 2
28735 - Quenda Creek Reserve	2.5	1A	11.9	Darling Scarp
22502 - Norwood Reserve	2.4	1A	11.77	Forrestfield
14088, 49122 - Maida Vale Reserve & adjoining BF site (bushland only)	11.1	1A	11.6	Forrestfield
37174 - Alan Anderson Park	3.6	1A	11.5	Dwellingup 2
34364, 34600,31348, 27559 - Anderson Reserve	15.6	1A	11.4	Forrestfield
39218 - Fleming Reserve (bushland only)	5.9	1A	11.4	Forrestfield
34183 - 54 Chiselhurst Road (Hugh Sanderson Reserve)	1.6	2	11.2	Dwellingup 2
36372 - 50 Lascelles Parade	0.6	1A	11.1	Darling Scarp
38964 - Katta Place Reserve	0.2	1A	11	Darling Scarp
33453 - Spring Road Reserve	0.4	1A	10.8	Yarragil 1
27899 - 71 Huntley Street	1.0	1A	10.8	Dwellingup 2
37650 - Crumpet Creek	4.8	1A	10.6	Forrestfield
23383 - Eversden Reserve	4.3	2	10	Dwellingup 2
34394 - 15 Lesmurdie Road	0.2	2	9.9	Dwellingup 2
26754 - 597 Kershaw Avenue Reserve	0.6	3	9.9	Dwellingup 2
40367 - Railway Reserve	3.4	2	9.8	Dwellingup 2
26531 - Trafalgar Road (Pagotto Park)	0.9	2	9.7	Dwellingup 2/ Darling Scarp
29107 - Verrallen Way	0.3	2	9.5	Yarragil 1
28212 - 5 Granby Street	1.2	2	9.5	Dwellingup 2
43068 - Ollie Worrell Reserve	2.9	1A	8.75	Southern River
26557 - 13 Mary Drive Reserve	0.5	2	8.6	Dwellingup 2

Name of Area	Area (Ha)	Overall Criteria Ranking	Total Viability	Vegetation complex
25188 - 5 Silversdale Road	0.8	2	8.5	Yarragil 1
27817 - 91 Gladys Road	1.0	2	8.5	Dwellingup 2
35663, 35663 - Andrew McRae Reserve	2.3	2	8.4	Dwellingup 2
25574 - Norma Road Reserve	0.5	3	8.4	Dwellingup 2
31954 - Millson Reserve (inc Hewson Park)	1.1	1A	8.3	Forrestfield
27566 - 31 Edinburgh Road	0.9	1A	8.15	Forrestfield
34076 - 14 Trott Road	0.6	2	8.1	Dwellingup 2
32507 - Bill Shaw Reserve	3.3	3	8.1	Dwellingup 2
38541 - Bugendore Street Reserve	0.2	1A	8	Forrestfield
38489 - Casuarina Road Reserve	0.3	1A	8	Forrestfield
41480 - Kalamunda Road Reserve	1.7	1A	8	Forrestfield
29947 - 14 Ryan Way	0.4	2	8	Dwellingup 2
45099 - Wallis Park	3.6	2	8	Dwellingup 2
45099 - 25 Sing Gardens	3.6	2	8	Dwellingup 2
29873 - 39 Sanderson Road	0.3	2	8	Dwellingup 2
38569 - Neil Tonkin Park	1.9	2	8	Dwellingup 2
37452 - 9 Peoples Avenue	0.5	2	7.7	Dwellingup 2
36492, 37323 - Poison Gully Reserve	5.4	1A	7.54	Forrestfield
37219 - 126 Ridgehill Road	6.2	1A	7.5	Forrestfield
37762 - 125 Ridgehill Road	3.9	1A	7.5	Forrestfield
24130 - 24 Crocus Road	2.4	2	7.5	Dwellingup2/ Yarragil 1
41731 - John MacLarty Reserve	0.5	1A	7.4	Forrestfield
35230 - Blackbutt Way Reserve	0.5	1A	7.35	Darling Scarp/ Forrestfield
40275 - Hawtin Road Reserve	1.1	1A	7.3	Forrestfield
33433, 32230, 32108 - Berry Drive Reserve	1.2	1A	7.2	Forrestfield
31842 - 19 Dixon Road	0.4	2	7.1	Yarragil 1
32613 - Booralie Way Reserve	2.3	1A	7.1	Forrestfield
29757 - Flora Terrace	1.9	2	7.1	Dwellingup 2
34809 - 52 Joyce Street	0.5	2	7.1	Dwellingup 2
17358 - 29 Union Road	1.9	2	7	Yarragil 1
37395 - Stone Road Reserve	0.2	3	6.84	Yarragil 1
36344 - Jubilee Way Reserve	0.3	1A	6.75	Forrestfield
32108, 29519 - Nestle Brae Reserve	2.6	1A	6.5	Forrestfield
27589 - 34 Zamia Road	1.5	1A	6.5	Dwellingup 2
32713 - 41 Nelson Crescent	0.3	1A	6.5	Darling Scarp
27946 - 18 The Boulevard	1.5	1A	6.5	Darling Scarp
48084 - Myerson Crescent Reserve	1.8	1A	6.4	Forrestfield
45157 - 37 Lawnbrook Road West	0.3	2	6.4	Dwellingup 2
30693 - Nicholson Crescent	1.1	2	6.1	Dwellingup 2
39253 - 236 Hartfield Road	0.2	1A	6	Forrestfield
39948 - 23 Lawnbrook Road	0.5	2	6	Dwellingup 2
40228 - Poison Gully West Reserve	3.6	1A	5.75	Southern River
42914 - Ravenswood Road Reserve	0.2	1A	5.75	
26063 - Markham Road Reserve	0.8	1A	5.5	Southern River
30540 - Bandalong Way Reserve	0.2	1A	5.5	Southern River
35209 - Nestle Brae Creek Reserve	1.0	1A	5.5	Forrestfield
27730 - Anthony Heslop Reserve	0.5	2	5.5	Dwellingup 2
36241 - 25 Petunia Street	0.4	N/A	5.5	Dwellingup 2

Name of Area	Area (Ha)	Overall Criteria Ranking	Total Viability	Vegetation complex
28858 - 45 Lesmurdie Road	0.4	2	5.5	Dwellingup 2
34115 - Magnolia Way Reserve	0.3	1A	5.05	Southern River
36297 - 40 Swan Road	0.5	1A	5	Southern River
42573 - Reynolds Road	1.0	1A	5	Southern River
35017 - Hartfield Road Reserve	1.1	1A	5	Forrestfield
33262 - Casuarina Road Reserve (Preschool)	0.4	1A	5	Forrestfield
33235 - 1 Currawong Drive	0.3	1A	5	Darling Scarp
45989 - Tree fern Green Reserve	2.4	1A	4.75	Forrestfield
27792 - Hawtin Road Reserve	1.1	1A	4.75	
38597, 32912 - 14a / 17 Dawson Avenue Reserve	1.3	1A	4.5	Southern River
28787 - 80 Traylen Road	0.3	2	4.5	Dwellingup 2
35468 - 406 Lesmurdie Road (Mick Conti Park)	1.5	2	4	Yarragil 1
33340 - 116 Orange Valley	0.4	2	3.5	Helena 2
40245 - Oxford Court Reserve	0.4	1A	3.5	Forrestfield
33433 - Scenic Drive	0.4	1A	3.5	Forrestfield