

# Local Biodiversity Strategy

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## Disclaimer

This is a report produced for the Shire of Murray for the purposes of conserving biodiversity within the Local Government area.

The report recommendations and protection targets are the professional judgement of the author and do not form Council policy until endorsed by Council. They are based on available regional-scale datasets and information provided by the Shire and do not include on-ground assessment or surveys. All reasonable efforts have been made by Ironbark Environmental to ensure the accuracy of information presented in the report.

Any decision, investment or development proposal relating to a specific vegetated natural area(s) in the Shire should be supported by site-specific ecological assessments, and should not rely on the information provided in this report.



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## Contents

Contents.....	3
Summary .....	8
Part A: Background .....	11
1. Introduction .....	11
2. Vision and objectives .....	13
2.1 Vision.....	13
2.2 On-ground conservation objectives.....	14
2.3 Protection versus retention .....	15
3. Local Biodiversity Strategies .....	16
3.1 An introduction to local biodiversity strategies.....	16
3.2 Methodology.....	16
4. Values and benefits of conserving biodiversity .....	18
4.1 General benefits.....	18
4.2 Species diversity in the Shire of Murray .....	19
4.3 Ecological communities and habitats .....	20
4.4 Landscapes and the Peel-Yalgorup Ramsar Site .....	20
4.5 Natural areas and trees .....	22
5. Threats to bushland and biodiversity in the Shire .....	23
5.1 Long-term impacts and degradation .....	23
6. Legislative and government protection of natural areas .....	24
6.1 Federal Legislation .....	24
6.1.1 EPBC Act and the Perth-Peel Strategic Assessment .....	24
6.2 State legislation and policy .....	25
6.2.1 Wildlife Conservation Act (1950, Western Australia).....	25
6.2.2 Swan Bioplan – Peel Regionally Significant Natural Areas (EPA, 2010).....	26
7. The Shire’s natural areas.....	27
7.1 Vegetation complexes .....	30
PART B: BIODIVERSITY CONSERVATION TARGETS.....	37
8. Ecological and planning framework.....	37

8.1 Regional Framework for Local Biodiversity Conservation Priorities in Perth and Peel.....	37
8.2 Biodiversity planning precincts and precinct protection targets .....	41
9. Targets to achieve objective 1: Specific biodiversity feature targets.....	48
9.1 Further information on Target BF8: Wetland protection .....	55
9.2 Further information on Target BF9: Riparian zone protection.....	55
10. Targets to achieve Objectives 2 and 3 .....	57
10.1 Background to precinct target-setting.....	57
10.2 Summary of Precinct Protection Targets .....	59
11. Targets to meet Objective 4: Ecological linkage .....	74
11.1 Proposed targets to protect ecological connectivity .....	77
12. Targets to meet Objective 5: Bushland in local reserves.....	80
12.1 Existing local reserves managed by the Shire .....	80
12.2 Target for protection of bushland in existing local reserves. ....	81
12.3 Future POS .....	81
13. Achieving bushland protection .....	84
13. 1 Ecological information in the planning system.....	84
13.2 Protection mechanisms .....	85
13.2.1 Existing Regional Open Space reservations .....	85
13.2.2 Future ROS Reservation and/or Government acquisition .....	85
13.2.3 Ceding of Conservation Category Wetlands and riparian foreshores .....	86
13.2.4 Public Open Space .....	86
13.2.5 Cluster-living and conservation living zone .....	88
13.2.6 Conservation zone .....	88
13.3 Private land conservation incentives .....	89
13.4 Recommended changes to the Shire’s planning system .....	90
13.4.1 Proposed Tree, Bushland and Biodiversity Local Planning Policy .....	91
14. Strategy monitoring and review .....	93
15. Action Plan .....	94
16. Glossary.....	97
References .....	100

|

## List of Tables

Table 1: Proposed mechanisms and biodiversity value triggers to achieve the proposed LNA protection target .....	9
Table 2: Benefits of conserving natural areas and biodiversity .....	18
Table 3: Natural areas in the Shire of Murray (based on 2010 native vegetation extent, excluding those areas identifies as cleared or approved to be cleared).....	27
Table 4: Natural and Local Natural areas as per Peel Region Scheme .....	27
Table 5: Extent of vegetation complexes in the Shire of Murray.....	35
Table 6: Summary of ecological values used in the prioritisation of the Shire’s natural areas. ....	38
Table 7: Biodiversity planning precinct categories.....	41
Table 8: Description of biodiversity planning precincts .....	44
Table 9: Specific biodiversity feature targets .....	49
Table 10: Summary of proposed levels of protection and retention in the Shire of Murray. ....	59
Table 11: Summary of LNA protection by category of Precinct .....	60
Table 12: Category A, B and C precincts with 15% or more of the precinct area covered by LNA proposed for protection.....	63
Table 13: Proposed protection targets by precinct.....	64
Table 14: LNA Protection percentages by precinct .....	67
Table 15: Precinct Protection Targets by vegetation complex.....	70
Table 16: Future vegetation complex protection levels resulting from Strategy implementation .....	73
Table 17: Recommended actions to implement this Local Biodiversity Strategy .....	94

## List of Figures

Figure 1: General approach to local biodiversity planning and conservation in Western Australia.....	16
Figure 2: Opportunities to integrate conservation into land planning processes .....	17
Figure 3: Bungarra, or sand goanna, Coolup .....	<b>Error! Bookmark not defined.</b>
Figure 4: Barragup Swamp, Barragup Swamp Reserve, an important refuge for waterbirds in summer.....	<b>Error! Bookmark not defined.</b>
Figure 5: Palusplains and damplands are seasonally waterlogged areas. With proper management these areas serve to protect groundwater resources .....	21
Figure 6: An example of a parkland cleared area. Note the lack of diversity in understorey vegetation.....	22
Figure 7: Rubbish dumping in public bushland can introduce weeds and dieback and gives the impression of neglect.....	23
Figure 8: Local natural areas in the Shire of Murray (west) .....	28
Figure 9: Local natural areas in the Shire of Murray (east) .....	29
Figure 10: Vegetation complexes (west) .....	31
Figure 11: Vegetation complexes (east) .....	32
Figure 12: Native vegetation cover and diversity of native species.....	33

Figure 13: Regional-scale indicative ecological prioritisation (west) .....	39
Figure 14: Regional-scale indicative ecological prioritisation (east) .....	40
Figure 15: Biodiversity planning precincts .....	43
Figure 16: Freshwater mussels found in a watercourse near South West Highway. They are an indication of good water quality and a healthy watercourse. ....	56
Figure 17: Ecological Linkages North.....	75
Figure 18: Ecological Linkages South.....	76
Figure 19: Example of integrating bushland protection into development for the purpose of maintaining ecological linkage. ....	78
Figure 20: Local reserves (west) .....	82
Figure 21: Local reserves (east) .....	83

## Acronyms

CCW	Conservation Category Wetland
DEC	Department of Environment and Conservation (now Department of Parks and Wildlife, DPAW)
DoP	Department of Planning
DPAW	Department of Parks and Wildlife
SEWPC	Federal Government Department of Sustainability, Environment, Water, Population and Communities
DPAW	Department of Parks and Wildlife
DSP	District Structure Plan
EPBC	Environment Protection and Biodiversity Conservation Act 1999
IBRA	Interim Bioregionalisation of Australia
LBS	Local Biodiversity Strategy
LPS	Local Planning Strategy
LNA	Local Natural Areas
MUW	Multiple Use Wetland
NAIA	Natural Area Initial Assessment (template)
NES	Matters of National Environmental Significance
ODP	Outline Development Plan
PBP	Perth Biodiversity Project
PEC	Priority Ecological Community
PHCC	Peel-Harvey Catchment Council
POS	Public Open Space
PPT	Precinct Protection Target
REW	Resource Enhancement Wetland
ROS	Regional Open Space
RSNA	(Peel) Regionally Significant Natural Area
RR	Rural residential
SCA	special control area
SRF	Mandurah – Pinjarra Sub Regional Framework
SWBP	South West Biodiversity Project
SWREL	South West Regional Ecological Linkage
TEC	Threatened Ecological Community
WALGA	Western Australian Local Government Association
WAPC	Western Australian Planning Commission

## Summary

**Bushland**, wetlands, rivers and other natural areas are key assets of environmental, social and economic value to the Shire of Murray. They add to the character and identity of the Shire and attract visitors, new residents and investment. Natural areas underpin the health of our environment and communities, the agricultural viability of farmlands and the quality of water flowing into the Murray River and Peel-Harvey Estuary. The protection of natural areas is fundamental to the sustainable development of the Shire.



This strategy is aimed at protecting bushland, wetlands and rivers as the Shire enters a significant growth phase. By 2021 it is estimated that the Shire will grow to 30,000 residents, at an average growth rate of 5.4% per annum. This level of growth provides an opportunity to protect bushland while also acting as a threat to its protection.

A key benefit of the Strategy is that it clearly establishes the Shire's natural area protection and retention objectives incorporating state and federal government requirements. This adds a greater level of certainty to the planning and development process for the community, developers and government. It also enables natural area protection objectives to be considered alongside the achievement of other public policy and development objectives, such as development densities, community cohesion, access to transport options and employment centres.

The Strategy focuses on Local Natural Areas. These are areas of bushland and wetland outside of lands managed by the Department of Parks and Wildlife (DPAW, formerly Department of Environment and Conservation). They include local reserves, private lands and bushland managed by other State Government agencies. They are the areas of bushland over which the Shire has some level of influence as development is planned and designed.

Of the 92,087 ha of vegetated natural areas in the Shire, only 15,568 ha are Local Natural Areas. Most (12,738 ha of 15,568 ha or 82%) Local Natural Areas in the Shire are located on the Swan Coastal Plain where on average 80% of the original vegetation has been cleared.

The Strategy sets targets for the long-term protection of bushland and wetlands, to be achieved largely through the land use planning process. By assessing current and proposed development across the coastal plain, a target has been set to protect 4,527 ha of vegetated LNA (bushland, wetland and riverine environments). This protection target takes account of the 883 ha of vegetation which currently exists in the shire but which has been approved for clearing as part of various developments. The remaining 10,158 ha of LNA is assumed to be



retained, but not protected, and may be subject to proposals to clear and develop in the future.

The protection target of 4,527 ha is to be achieved through a range of mechanisms, mostly linked to land use planning and development, or the eventual protection of land reserved in the Peel Region Scheme as Regional Open Space. These mechanisms and the amount of bushland that they are proposed to protect are included in Table 1.

Table 1 refers to the protection of LNA within precincts. The precincts (Biodiversity Planning Precincts) have been developed in this Strategy to assist integrate bushland protection into the land use planning system.

**Table 1: Proposed mechanisms and biodiversity value triggers to achieve the proposed LNA protection target**

<b>Protection mechanism</b>	<b>Precincts</b>	<b>Proposed LNA protection (ha)</b>
Protection of bushland in Regional Open Space reserves, currently on private lands <sup>1</sup>	All precincts	1920
Public Open Space proposed in draft and approved Outline Development Plans and structure plans	Precinct Categories A, B & C	368
Conservation Category Wetlands (CCW)	Categories A & C	345
Swan Bioplan sites	Categories A & C	470
Riparian vegetation (riparian foreshores)	Categories A & C	117
Resource Enhancement Wetlands (REW)	Categories A & C	135
Priority One Vegetation Complexes in Category A & C precincts	Categories A & C	104
Private land conservation (rural) incentives (indicative target)	Category E	518
Alcoa precinct (indicative target)	Category F, Precinct 6	89
Mineral sand mining offset	Category F, Precinct 3	65
Local reserves		396
<b>Total LNA protection target</b>		<b>4527</b>

Category A (key strategic biodiversity planning areas with high potential for development pressure) & Category C (rural residential) precincts are where an Outline Development Plan (or similar) has not yet been approved. These precincts offer a significant potential to protect Conservation Category and Resource Enhancement Wetlands, Swan Bioplan Sites, riparian vegetation, and Priority One Vegetation Complexes. Priority One Vegetation

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<sup>1</sup> Regional Open Space on private lands is currently reserved in the Peel Region Scheme but has not yet been acquired/transferred to the Crown. The protection of ROS is an existing WAPC/ state government commitment.

Complexes are vegetation types that have been extensively cleared on the Swan Coastal Plain and are a high priority for protection.

The Strategy also proposes that the Shire will work with landholders and industry to encourage voluntary protection of bushland on rural lands. An indicative protection target of 518 ha of the 9465 ha of LNA on rural lands where no broadscale land use change is proposed (Category E precincts) is included. Further indicative protection targets of 65 ha and 89 ha are proposed for sand mining and heavy industry precincts respectively, based on offset commitments and approved land use plans.

In terms of existing local reserves under the Council's control, the Strategy proposes that 80% of the bushland on these reserves should be formally protected in the long-term. This would require a review of the long-term use and purpose of these reserves, and the creation of Local Conservation reserves where appropriate.

Future development of urban, light industrial and rural residential areas where a draft or approved ODP exists (Category A, B and C precincts) may add a further 368 ha of LNA to either local POS, or to a lesser extent, regional reserves. A further 1224 ha of LNA will need to be protected upon the full development of all urban, light industrial and rural residential precincts to meet the targets proposed in this strategy. Potentially, this future and proposed LNA protection means that an additional 1592 ha of bushland, wetland and foreshore may be included in Crown reserves. Management of a large portion of this LNA is likely to rest with the Shire. The Shire needs to plan strategically for this significant asset management issue, and should commence dialogue with the State and Federal Governments in regards to resourcing requirements. Most of this 1592 ha of LNA is likely to be of state and national environmental significance.

Implementation of the Strategy and achievement of the protection targets will require a proactive approach by the Shire, and the support of State Government. To this end, the Strategy includes a proposed Action Plan which outlines how the Shire can implement the plan.

Critically, the Shire should recognise that the current growth projections for the Peel region, and the EPBC Act Strategic Assessment Process, offer a significant opportunity to protect a lasting natural legacy for current and future generations.

## Part A: Background

### 1. Introduction

The Shire has commissioned this local biodiversity planning project to achieve the best possible outcome for our community and environment as the Shire enters a significant period of growth. By 2021, the Shire is estimated to have a population of 30,000, representing an annual growth rate of 5.44% over the 2011 population of 16,687 (Shire of Murray, 2012a). This population growth places significant stresses on natural resources, including bushland and biodiversity.

The strategy's aim is to protect bushland, wetlands and rivers so that biodiversity is conserved and can continue to provide a multitude of benefits. Bushland, wetlands, rivers and other natural areas are key assets of environmental, social and economic value to the Shire of Murray. They add to the character and identity of the Shire and attract visitors, new residents and investment. Natural areas underpin the health of our environment and communities, the agricultural viability of farmlands and the quality of water flowing into the Murray River and Peel-Harvey Estuary. The protection of natural areas is fundamental to the sustainable development of the Shire

A key benefit of the Strategy is that it clearly establishes the Shire's natural area protection and retention objectives incorporating state and federal government requirements. This adds a greater level of certainty to the planning and development process for the community, developers and government.

Biodiversity is the natural variety of life at all levels<sup>2</sup>. It includes species of native plants and animals, rivers, bushland, micro-organisms and the genes that make up natural variation in species. Biodiversity helps provide us with clean air, water and soil, supports agriculture and provides us with interesting places to live and recreate. The conservation of biodiversity is fundamental to sustainable development.

Biodiversity conservation in the Shire cannot be achieved solely through the protection of national parks and nature reserves. Local natural areas need to be retained, and where possible protected too. Indeed, the decline in a number of key species in the south west of Australia, such as Carnaby's Black Cockatoo, shows that current levels of protection may not be sufficient to prevent local, if not total extinction, of some species.

Local natural areas are areas of bushland, wetland, foreshore that are outside of the Department of Parks and Wildlife (DPAW) managed lands, and under some degree of planning control of the Local Government.

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<sup>2</sup> Technical definition: **Biodiversity** is the variety of all life forms – the different plants, animals and micro-organisms, the genes they contain, and the ecosystems of which they form a part. Biodiversity is not static, but constantly changing; it is increased by genetic change and evolutionary processes and reduced by processes such as habitat degradation, population decline and extinction (Commonwealth of Australia 1996).

The Shire's expected growth will put pressure on land to be developed for urban and industrial purposes. For land under development pressure, the planning system offers a range of measures to protect local natural areas under the structure planning process. This is, however, usually not the case for rural zoned land that is not identified for development or further intensification. A planning response to protect local natural areas is very limited.

Local natural areas in rural zoned land within the Shire are often the result of responsible farming practises by the landowner/farmer. Historically, large areas of land were clear-felled or parkland cleared for agricultural purposes, often with incentives from the Government of the day.

Traditional farming continues as the mainstay of a number of farmers in the rural areas of the Shire of Murray. The Shire acknowledges that the farming sector, however, is undergoing significant changes in the present and well into the future and is committed to work with rural landholders to enhance sustainable land management and best practice management of local natural areas on private properties in the rural zone. The Shire also supports farmers and rural landholders in diversifying their industry

The protection of local natural areas in rural zoned land that is not subject to development pressure is best achieved through voluntary agreements and incentives, such as the creation of local conservation zones. The Shire is committed to work with rural landholders to achieve a sustainable outcome for the management of local natural areas on rural zoned land.

## 2. Vision and objectives

### 2.1 Vision

This strategy helps deliver the Shire's Vision to be a.....

*"...vibrant and progressive (Shire) with a strong community identity. We will promote sustainable development and diverse lifestyle opportunities in partnership with the community, while valuing our heritage and cultural and natural environment"* (Shire of Murray, 2013a).

Preparation of a local biodiversity strategy is a key action under the Shire's 2023 Strategic Community Plan and will "improve the level of protection and management provided to natural areas" (Shire of Murray, 2013a).

Implementation of the strategy also assists the Shire to meet the general objectives of the Shire of Murray Town Planning Scheme No. 4, namely:

- 2.1. (i) to preserve the integrity of the Shire of Murray and its identity;
- (ii) to ensure the orderly and proper development of the Scheme Area; and
- (iii) to secure the amenity, health and convenience of the Scheme Area and its inhabitants (Shire of Murray, 2013b).

The Strategy will do this through:

- Identifying the ecological values of local bushland, wetlands and other natural areas;
- Encouraging the protection of natural areas in new developments for economic, social and environmental benefits;
- Providing Council with the practical mechanisms to protect natural areas; and
- Ensuring the values of natural areas are considered as part of land use planning processes.

This strategy is proposed to achieve the following for the community and natural areas in the Shire:

- A network of local bushland, wetland and riverine natural areas have been protected and retained in reserves and private lands;
- Protected natural areas are connected by revegetation, rehabilitation of drains, and street tree planting; and
- The protection of specific habitats to conserve the full assemblage of local native species and vegetation types in the Shire.

## 2.2 On-ground conservation objectives

This Strategy aims to achieve five broad objectives:

**Objective 1:** To achieve targets for the **protection** of specific biodiversity features as listed in Table 9. This applies to all LNA, but particularly those in the urban and industrial zones, rural lands being converted to rural residential uses, and land managed by the Shire; Objective 1 assists in achieving Objective 2.

**Objective 2: Protect** natural areas on zoned lands that will maintain the current level of species and ecosystem diversity currently present in the Shire. This is described in Section 10 as it applies to specific areas in the Shire.

**Objective 3:** Maximise **retention** of all other LNA on zoned lands (rural and rural residential lands).

**Objective 4:** Protect and enhance ecological connectivity throughout the Shire. These linkages assist in the maintenance of species and biodiversity throughout the Shire by enabling native plants and animals to continue to survive, move, feed, reproduce, adapt and evolve.

**Objective 5:** Protect and manage LNA on local reserves to:

- a) maintain their current levels of species diversity, or where degraded, increase diversity through regeneration and revegetation;
- b) maintain or improve vegetation condition and maintain habitat diversity; and
- c) support and encourage compatible passive recreational uses.

These objectives have been used to develop the targets of the Strategy (Sections 9 to 12).

## 2.3 Protection versus retention

To understand the meaning of the objectives presented above, it is important to distinguish the 'protection' of natural areas from the 'retention' of natural areas.

The term “**Protection**” is used in this Strategy to mean that the natural area is covered by a secure mechanism providing the highest level of long-term protection. Secure protection mechanisms in Western Australia are considered to be:

- Public reserves vested for the purposes of conservation (e.g. DPAW managed conservation lands or Local Conservation Reserve),
- Land zoned for conservation or bushland protection, where this use has priority over all other uses (No such zoning currently exists in the Shire's Local Planning Scheme),
- Land under a conservation covenant registered with a recognised conservation organisation (e.g. National Trust or DEC), or
- Regional Open Space with a management plan which explicitly states that the area's vegetation is protected from clearing in perpetuity.

This definition of 'protection' is drawn directly from the Local Government Biodiversity Planning Guidelines (Del Marco *et al.*, 2004), with the exception of the inclusion of Regional Open Space.

**Retention** means that the natural area is retained on the site, but there is no mechanism which provides secure long-term protection to the natural area. Natural areas that are retained may or may not have laws which specifically prevent clearing within the natural area. Whilst most clearing in the Shire requires a permit from the Department of Environmental Regulation (DER), there are numerous exemptions under the *Environment Protection (Clearing of Native Vegetation) Regulations 2004* which effectively mean that the natural area is not protected in the long-term. Similarly, while many natural areas in the Urban Zone are subject to the provisions of the *Environment Protection and Biodiversity Conservation Act 1999* this does not necessarily mean that the natural area is eventually protected. Retention of natural areas on lands zoned rural residential eventually leads to degradation of the bushland through clearing for housing envelopes, fence lines and firebreaks and associated weed invasion, erosion, disease and other degrading processes.

Given the above, the Strategy makes the distinction between protection and retention so that a long-term view of conservation is encouraged, as is necessary to protect biodiversity.

## 3. Local Biodiversity Strategies

### 3.1 An introduction to local biodiversity strategies

Local Biodiversity Strategies have been recognised by the Western Australian Planning Commission and Environmental Protection Authority as useful planning instruments and taken into account by the State Administrative Tribunal (Department of Planning, 2012; Perth Biodiversity Project, 2012a).

For a Local Biodiversity Strategy to have greatest effect, it should form part of Council's statutory and strategic land use planning framework. Relevant parts of the Strategy should be included in the Shire's local planning scheme, and local planning strategies and plans. This approach is encouraged by the Western Australia Planning Commission and the Environmental Protection Authority. A strategy also guides the maintenance of natural areas on Council-managed lands and reserves.

### 3.2 Methodology

This Strategy has been prepared in accordance with the methodology recommended by the Western Australian Local Government Association (Del Marco *et al.*, 2004) and supported by the Environmental Protection Authority and Western Australian Planning Commission.

This methodology encourages local governments to take an integrated approach which brings together land use planning and environmental considerations to balance the needs of development and the environment (Figure 1). It is based on local governments setting targets for the protection of specific biodiversity features, such as rare species, as well as protection of representative amounts of each of the vegetation types that naturally occur within the local government area.

Being a strategy, the methodology also encourages local governments to focus efforts at the strategic end of the land use planning process, where there are the greatest opportunities to achieve sound biodiversity conservation outcomes. For local governments, this is the local planning strategy and scheme, local planning policy and structure plan/outline development plan stages (Figure 2, WAPC, 2011).

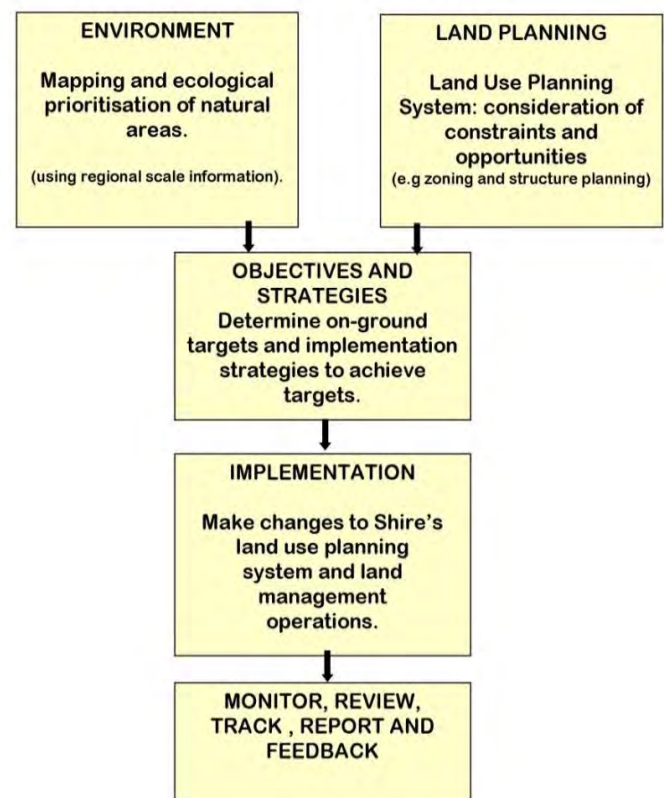
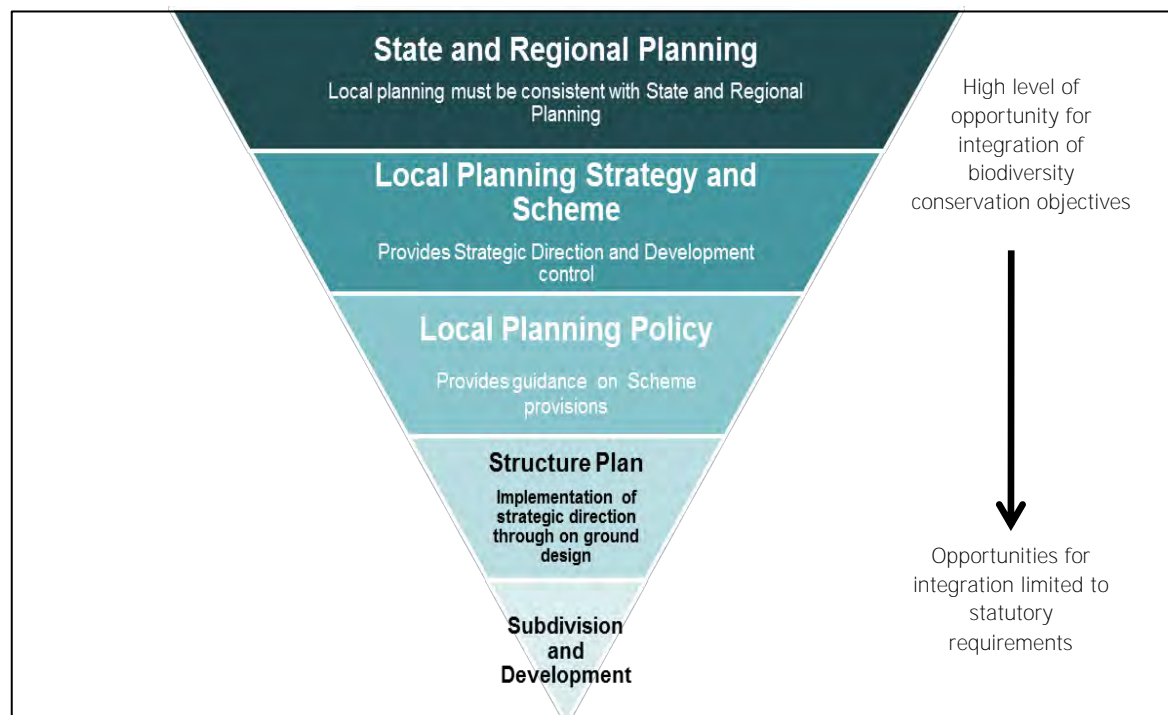


Figure 1: General approach to local biodiversity planning and conservation in Western Australia



Too often, efforts to protect bushland come late in the land use planning process such as the subdivision and development stages where it is more difficult to achieve win-win outcomes for development and environmental protection.



**Figure 2: Opportunities to integrate conservation into land planning processes (WAPC, 2011)**

In summary, the methodology includes:

1. A standard ecological prioritisation method – this allows a more objective and easier comparison of the environmental values of natural areas;
2. Targets for natural area protection to be implemented through the Shire’s planning system for specific biodiversity features and representative areas of vegetation types;
3. Mechanisms to protect and retain natural areas on zoned lands (urban, industrial and rural residential);
4. Protection and management strategies targeted at local reserves (Section 12);
5. Changes to the Shire’s Local Planning Scheme and Local Planning Strategy (Section 13.4); and
6. Database for information management and natural area reporting to Council and the community.

It is important to note that the above components complement the existing activities that the Shire undertakes to conserve biodiversity. This includes informal environmental assessment of development proposals, management of bushland in local reserves, and support to community groups managing local bushland.

A local biodiversity strategy also complements regional and state initiatives to conserve biodiversity. At the regional and state level, areas are protected through Regional Open Space reservations, Government acquisition and negotiated outcomes as part of planning approvals. The outcomes of the Perth and Peel Strategic Assessments process may also lead to the protection of natural areas to conserve matters of state or national significance.

## 4. Values and benefits of conserving biodiversity

### 4.1 General benefits

This strategy is aimed towards planning for the protection of natural areas in the Shire for the long-term benefit of all. Even though the strategy is based on environmental protection, it will support the continued enjoyment of environmental, social and economic benefits for the community, including the development of land. Table 2 lists a number of benefits that natural areas and biodiversity provide and how these are considered through the delivery of the Strategy.

**Table 2: Benefits of conserving natural areas and biodiversity**

<b>Benefit</b>	<b>How benefit is maintained through this Strategy</b>
<ul style="list-style-type: none"> <li>• Natural areas maintain the natural diversity of native species—plants and animals in the Shire</li> </ul>	<ul style="list-style-type: none"> <li>• The Strategy uses vegetation complexes and other mapped information to protect a wide variety of natural area types.</li> </ul>
<ul style="list-style-type: none"> <li>• Natural areas maintain and improve the quality of water resources, stormwater and Estuary water quality</li> </ul>	<ul style="list-style-type: none"> <li>• The protection of foreshores, wetlands and their buffer is a Strategy target and a criterion used to prioritise natural areas.</li> <li>• The Strategy aims to protect remaining significant bushland in existing rural residential areas, and encourage the retention of all other bushland areas, thus moderating run off in the catchments.</li> </ul>
<ul style="list-style-type: none"> <li>• Natural areas are important for passive recreation and nature play.</li> <li>• They provide areas for environmental education</li> </ul>	<ul style="list-style-type: none"> <li>• The Strategy leads to the protection of key natural areas within new subdivisions. These areas should be designed to be robust to protect habitats into the long-term and accommodate passive recreational use.</li> </ul>
<ul style="list-style-type: none"> <li>• Natural areas maintain the health of Peel-Harvey Estuary and Yalgorup National Park</li> </ul>	<ul style="list-style-type: none"> <li>• The Strategy aims to protect local natural areas adjacent to the Ramsar Site which will increase the health and resilience of foreshore habitats and Estuary wildlife.</li> <li>• The Strategy makes recommendations about the protection of bushland in the vicinity of the National Park</li> </ul>
<ul style="list-style-type: none"> <li>• Natural areas provide amenity and landscape for rural residential residents</li> </ul>	<ul style="list-style-type: none"> <li>• Strategy aims to protect remaining significant bushland in existing rural residential areas, and encourage the retention of all other bushland areas.</li> </ul>
<ul style="list-style-type: none"> <li>• Natural areas improve the amenity of residential areas, enhance urban landscapes, and increase property values.</li> </ul>	<ul style="list-style-type: none"> <li>• Local bushland parks will be managed in a more strategic manner in order to improve their condition.</li> <li>• Objectives for the protection of bushland in specific new residential areas are recommended in the Strategy.</li> </ul>
<ul style="list-style-type: none"> <li>• Natural areas support cultural values and uses for the community, especially Traditional Owners.</li> </ul>	<ul style="list-style-type: none"> <li>• The Strategy maximises opportunities to protect natural areas in new developments and enable Traditional Owner and other cultural values to be recognised.</li> </ul>

Some of these benefits are used to assign a preliminary, indicative prioritisation to each natural area in the Shire (See Section 8.1).

Biodiversity occurs at numerous scales in the environment, from the broad landscape and habitat levels through to the diversity of species and the genetic variation within species. By

protecting and managing natural areas and the habitats they contain, all levels of biodiversity are conserved effectively and most efficiently.

For these reasons, this strategy is targeted at the protection and management of natural areas and the habitats within them.

## 4.2 Species diversity in the Shire of Murray

The Shire has a great diversity of native flora and fauna given the wide range of landform and vegetation types: forests, rock outcrops and creeks of the Darling Plateau, escarpments of the Ridge Hill Shelf and bushland, forests and wetlands of the Swan Coastal Plain.

Characteristic native plant species in the Shire include trees such as the Marri, Tuart, Jarrah, and Freshwater Paperbark. Smaller trees and shrubs include various species of Banksia, Hakea, and Acacia.

Among the many species of native flora in the Shire are species of rare and threatened flora such as the Grand Spider Orchid (*Caladenia huegelii*), and critically endangered species *Synaphea* sp. *Fairbridge Farm* and *Synaphea* sp. *Pinjarra*. For a full list of conservation category flora see Appendix C.

In terms of fauna, a wide range of habitats and vegetation types supports great diversity of birds, mammals, reptiles (Figure 3, Bungarra), amphibians and fish.

Threatened species of fauna, with known or potential habitat in the Shire Species such as the Southern Brown Bandicoot (*Isodon obesulus fusciventer*), Western Grey kangaroo (*Macropus fuliginosus*) and bungarra (Gould's sand monitor), are found in numerous parts of the Shire.

Other species found in the Shire which are already at critically low numbers across their natural range are the Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*), Baudin's Black Cockatoo (*Calyptorhynchus baudinii*) and Forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*). These species are protected under the EPBC Act 1999 and the Wildlife Conservation Act 1950. Appendix D includes a list of the threatened fauna species found in

the Shire and listed under the EPBC Act 1999 and Wildlife Conservation Act 1950.

Knowledge of species diversity in the Shire of Murray is often limited to specific land parcels, or the most threatened species.



Figure 3: Bungarra, or sand goanna, Coolup

### 4.3 Ecological communities and habitats

Biodiversity conservation requires protection of the full range of ecological communities and habitats.

An ecological community is a collection of species that have a strong common association. Some ecological communities found in the Shire are rare and threatened and classified as Threatened Ecological Communities (TECs). TEC's known or likely to occur in the Shire are listed in Appendix E.

Other habitats in the Shire, which may appear common, uniform or similar to other areas, often provide a wide range of habitats and benefits. For example, whilst lakes and damplands are both types of wetlands, they are very different in form and function and the types of habitats they provide. Lakes provide drought refuges for waterbirds and other fauna (Figure 4), and have a high amenity value. Damplands and palusplains (seasonally waterlogged areas) in contrast are more important for groundwater recharge and the protection of water quality (Figure 5). Where vegetated, damplands provide dense habitat for bandicoots and reptiles which is not often associated with lakes or sumplands.



Figure 4: Barragup Swamp, Barragup Swamp Reserve, an important refuge for waterbirds in summer

### 4.4 Landscapes and the Peel-Yalgorup Ramsar Site

At the ecosystem and landscape scale, the shire supports numerous important natural assets, including the Peel-Harvey Estuary, Murray River, Serpentine Lakes System and the State Forests east of South West Highway. Conserving natural areas at the broad, landscape



level is critical for biodiversity conservation and the maintenance of ecological processes, (e.g movement of wildlife, seeds, escape from fire and predators).



**Figure 5: Palusplains and damplands are seasonally waterlogged areas. With proper management these areas can protect groundwater resources from diffuse pollution.**

At an even higher level, the Peel-Yalgorup Ramsar Site is an example of Murray's local biodiversity being linked to the rest of the world. Many of the waterbirds that visit the Estuary are migratory, and fly between the Shire of Murray and northern hemisphere countries such as China and Japan each year.

Ramsar Sites are wetlands identified around the world that are of international importance. The Australian Government is a signatory to the Ramsar Convention, and is obliged to manage Ramsar Sites in accordance with the convention. Some of the foreshore reserves to the Estuary are managed by the Shire.

## 4.5 Natural areas and trees

The above sections demonstrate that biodiversity conservation is much more than the protection of trees, or the planting of native vegetation.

Conservation of biodiversity requires sufficient natural areas to be protected and managed, such as is recommended in this strategy. The protection of mature trees and revegetation, whilst important in their own right, will not conserve biodiversity, but will provide habitat for a limited range of species and enhance residential and rural amenity.

As a result of this Strategy, the Shire will place a greater emphasis on the restoration and management of remaining natural areas (Figure 6a), than the revegetation of cleared areas (Figure 6b). This will complement the Shire's existing work to encourage revegetation of rural residential areas and waterways and retention of mature trees in road reserves where possible.

These three actions - protection of natural areas, revegetation, and retention of trees and other native vegetation - will conserve biodiversity, protect the environment, maintain agricultural productivity and enhance the amenity of the Shire.



Figure 6a: An example of a natural area, Forrestfield Vegetation Complex – (Photo K. Clarke)



Figure 6b: An example of a parkland cleared area. Note the lack of diversity in understorey vegetation.



## 5. Threats to bushland and biodiversity in the Shire

This strategy recognises that there are numerous threats to biodiversity and natural areas, but focuses on addressing the threats (and opportunities) within the land use planning system.

Changes in land use and development pose a potential major threat to biodiversity if not adequately planned and designed. Maintaining areas that provide significant habitat for threatened species is one way in which development can either threaten or conserve biodiversity. Other examples include protecting local parks which are representative of the local vegetation so that fauna can move across the landscape (e.g from State Forest to the Peel-Harvey Estuary).

This strategy proposes to integrate conservation targets into the Shire's higher land use planning levels, such as District Planning Scheme No. 4, the Southern Palusplain Precinct Plan and the various Outline Development Plans to be prepared to guide subdivision design.

### 5.1 Long-term impacts and degradation

While the Strategy does not overtly address the issue of long-term degradation of bushland and wetlands, or the impact of climate change, it is cognisant of the fact that the Shire's bushland is under significant pressure from clearing, external impacts, benign neglect and mis-management (Figure 7).

These impacts can be managed in part in local reserves through active management such as mapping and managing weeds and dieback, fencing and controlling access, and management of risk and responses.

In rural areas and rural residential estates, preventing gradual decline of bushland and vegetation is more difficult, given that the land is in private ownership and active management is the responsibility of the landowner. Land owners may require financial and technical support to improve management of local natural areas on private properties. The provision of incentives to landowners to actively manage local natural areas on their properties is included as a recommendation of this Strategy (Section 13.3).



**Figure 7: Rubbish dumping in public bushland can introduce weeds and dieback and gives the impression of neglect.**

## 6. Legislative and government protection of natural areas

A local biodiversity strategy (LBS) is primarily concerned with conserving local biodiversity within the local planning framework. However, LBSs uphold and complement the existing State and Federal laws and policies that relate to environmental protection and land use planning. Hence, they act to integrate environmental and planning considerations at all levels (level, regional and state), rather than create another layer of policy.

Such is the usefulness of LBSs that the Western Australian Planning Commission will give serious consideration to the targets and recommendations of a LBS where it has been integrated into the local government's land use planning framework (Western Australian Planning Commission, pg 111). The State Administrative Tribunal has also taken a published LBS into account when making a determination on a subdivision proposal (State Administrative Tribunal, 2010), demonstrating that a LBS will be given due consideration in planning approvals and appeals.

LBSs must take into account numerous pieces of legislation and government policy related to biodiversity conservation. Some of the key related legislation and policy includes the:

- *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*;
- *Wildlife Conservation Act 1950*;
- *Conservation and Land Management Act 1984*;
- *Environmental Protection Act 1986* (including Schedule 6 clearing permit exemptions), Swan Bioplan – Peel Regionally Significant Natural Areas (EPA, 2010)
- *Planning and Development Act 2005*
- Directions 2031 and beyond (WAPC & DoP, 2010); and
- Shire of Murray Town Planning Scheme No. 4.

A more comprehensive listing and description of the relevant legislation and policy is provided in the Local Government Biodiversity Planning Guidelines: Addendum to the South West Biodiversity Project Area (Molloy *et al*, 2007, pp 2-9) and the Directions Paper on the Integration of NRM into Land Use Planning (Western Australian Planning Commission, 2011, Section 7.4).

### 6.1 Federal Legislation

#### 6.1.1 EPBC Act and the Perth-Peel Strategic Assessment

The EPBC Act gives protection to biodiversity values and other environmental features that are considered to be of national significance. In the Shire, the Peel-Yalgorup Ramsar Site, species such as Carnaby's Black Cockatoo and ecological communities such as the Claypan Communities of the eastern side of the Swan Coastal Plain are EPBC Act matters of 'National Environmental Significance (NES).

The Act operates by giving authorisation to 'controlled actions', such as subdivisions, that may impact on a matter of NES. The Act is having a significant impact of the land use planning and development process in Western Australia, because of the rate of



development and the extent of protected natural areas, species and ecological communities in the Perth and Peel Regions.

To strategically assess the long-term projected growth of the Perth and Peel Regions, the Federal and State Governments are undertaking a Strategic Assessment, under section 146 of the EPBC Act, of a number of State Government proposals:

- Directions 2031 and Beyond – Regional Planning Framework for Perth and Peel;
- the Western Australian Planning Commission's (WAPC) forthcoming sub regional structure plans for the north-west, north-east, southern metropolitan and Peel sub-regions; and
- a revised State Planning Policy – Basic Raw Materials.

The Strategic Assessment of the Perth and Peel Regions aims to ensure responsible and sustainable development and a more co-ordinated and strategic approach to meeting biodiversity conservation objectives. It allows the Commonwealth Minister for Environment to approve actions or classes of actions without undertaking individual assessments of those actions, provided these are taken in accordance with the endorsed policy, plan or program (Department of Premier and Cabinet, 2011).

The Strategic Assessment process is being managed by the WA Department of Premier and Cabinet, with key input from the Department of Planning (preparation of a Matters of NES Plan), DPAW (preparation of an Impact Assessment Report) and the Office of the EPA (preparation of advice under section 16(e) of the *Environmental Protection Act 1986*).

It is unclear what impact the Strategic Assessment process will have on local government actions to conserve biodiversity. However, it is likely that the agreement that comes out of the strategic assessment will remain at a high-level and may provide only limited guidance for resolution of competing planning objectives at the local level.

The Shire should provide the agreed targets and recommendations for biodiversity conservation set under this LBS to the Department of Premier and Cabinet and the Department of Sustainability, Environment, Water Population and Communities. It is important to note that the Strategic Assessment is not charged with the responsibility of protecting locally significant natural areas.

## **6.2 State legislation and policy**

### **6.2.1 Wildlife Conservation Act (1950, Western Australia)**

The Act is the primary State legislation providing for the protection of native fauna and flora in Western Australia. Plants and animals listed as threatened under the Act appear in wildlife conservation notices published in the *Government Gazette*.

It is largely recognised by environmental experts as an out-dated piece of legislation which is in need of major reform. For example, the Act does not specifically provide for the protection of threatened ecological communities or habitats. However, a non-statutory list

is maintained for threatened ecological communities as endorsed by the Minister for Environment.

### **6.2.2 Swan Bioplan – Peel Regionally Significant Natural Areas (EPA, 2010)**

The Environmental Protection Authority has identified key natural areas of regional and higher significance in its Swan Bioplan – Peel Sector report and mapping (Environmental Protection Authority, 2010). Swan Bioplan –Peel Sector covers the Swan Coastal Plain portions of the Peel Region including the Shire of Murray.

Natural areas identified through this program, referred to as Regionally Significant Natural Areas (RSNA) have been recognised in the indicative ecological prioritisation used in this Strategy (See Section 8.1). A total of 4916 ha of vegetated LNA outside of Regional Open Space in the Shire have been recognised as RSNA in Swan Bioplan (Environmental Protection Authority, 2010).

It is the EPA's expectation that 'development proposals and planning scheme amendments that impact on the Peel RSNA's will require detailed investigations of their natural values' consistent with EPA Guidance Statements 10, 51 and 56' (Environmental Protection Authority, 2010).

## 7. The Shire's natural areas

In this Strategy, natural areas are identified through the mapping of native vegetation and wetlands. Most natural areas are identified through native vegetation mapping, but some may be non-vegetated natural areas, such as open waters of lakes and the Estuary, granite rock outcrops, and river foreshores.

Prior to European settlement, there were 170,111 ha of native vegetation in the Shire (Tables 3 and 4). In 2010, 92,087 ha or 54%, remained, as shown in Table 3 and Figures 8 and 9. Most of this, 71,533 ha is within State Forest and 4,959 ha occur within the DPAW-managed conservation estate, and managed for conservation. Most of the balance of the native vegetation, 15,568 ha, is vegetated Local Natural Areas (LNA) and is the focus of this Strategy<sup>3</sup>. Much of this LNA is also mapped as wetland.

**Table 3: Natural areas in the Shire of Murray (based on 2010 native vegetation extent, excluding those areas identifies as cleared or approved to be cleared)**

	Category of vegetated natural area in Shire	Area of vegetated natural area (ha)
A	Original extent	170,111
B	Current extent	92,087
C	DPAW managed State Forest	71,533
D	DPAW managed conservation estate	4,959
E	Other DPAW managed lands	27
F	Local Natural Areas (B-C-D-E)	15,568

**Table 4: Natural and Local Natural areas as per Peel Region Scheme**

Peel Region Scheme (PRS) Zoning/Reservation	Natural Areas (ha)	LNA (ha)
<b>Regional Reserves (PRS)</b>		
Public Purpose (Hospital)	0.38	0.38
Public Purpose (Public Utilities)	252.7	252.7
Primary Regional Roads	79.3	79.2
Railways	169.1	169.1
Regional Open Space (ROS)	6943.1	1987.0
Waterways	193.0	84.3
Other	25.5	0.6
<b>Zones PRS</b>	<b>Natural Areas (ha)</b>	<b>LNA (ha)</b>
Private Recreation	33.0	33.0
Industrial	157.8	156.1
Rural	12401.9	12381.4
Urban	297.9	296.2
State Forest	71534.1	128.2
<b>Total</b>	<b>92,087</b>	<b>15,568</b>



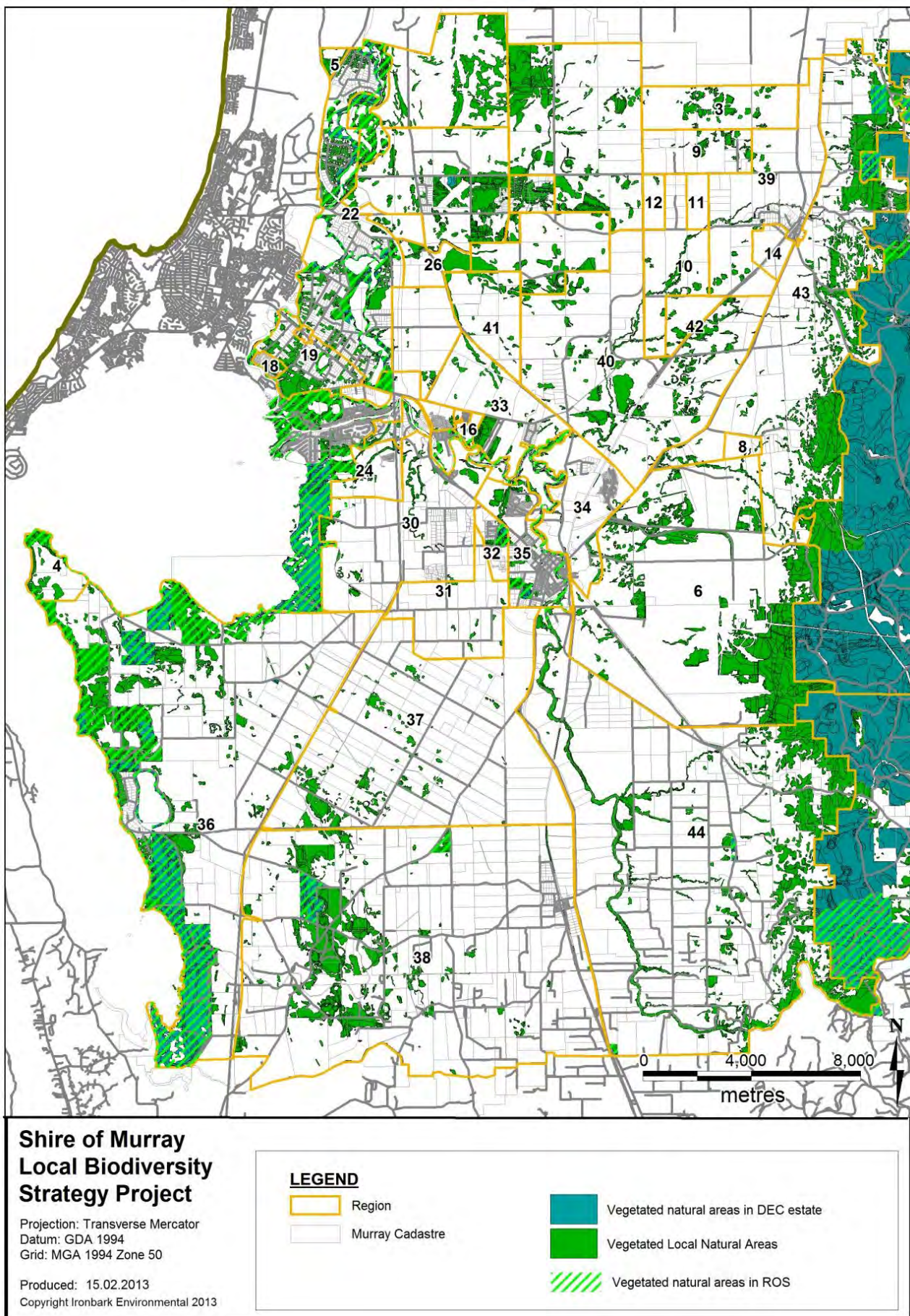


Figure 8: Local natural areas in the Shire of Murray (west)



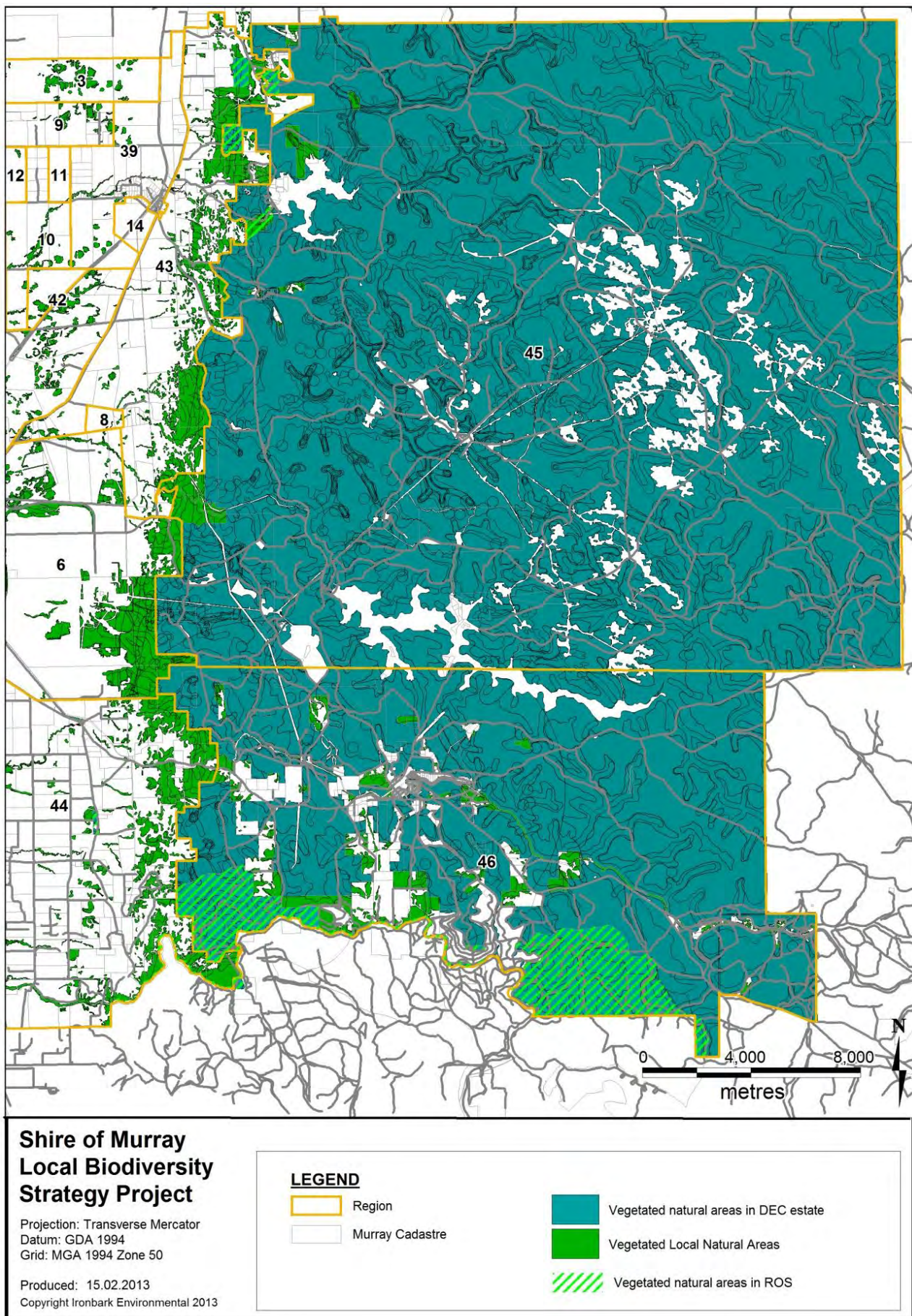


Figure 9: Local natural areas in the Shire of Murray (east)

## 7.1 Vegetation complexes

The Shire's vegetated natural areas can be categorised into very broad scale ecological groups referred to as vegetation complexes. Vegetation complexes are groups of vegetation that occur on similar underlying landforms and soils and are influenced by similar climatic influences (e.g. rainfall). Conservation of sufficient representative examples of each vegetation complex increases the chance that biodiversity will be conserved in a given local government area or region. Vegetation complexes are a significant aspect of planning for biodiversity conservation.

The vegetation complexes which occur in the Shire have been mapped across the Perth and Peel Regions. The mapping is recognised by the State Government and professional ecologists as a sound method of defining ecological community biodiversity and planning for biodiversity conservation [e.g. In Bush Forever (Government of Western Australia, 2000) and Swan Bioplan – Peel Sector (Environmental Protection Authority, 2010)].

There are twenty-one (21) vegetation complexes that occur in the Shire (Figures 10, 11 and Table 5). Vegetation within each of the complexes is not a uniform mix of species over the extent of the complex, but rather a collection of different plant and animal species that change with variations in soils, slope, rainfall and vegetation condition. Vegetation or floristic communities within each vegetation complex can be separately mapped through vegetation surveys if required. The natural variation and biodiversity within most vegetation complexes is one of the reasons why a broad selection of areas of each vegetation complex need to be protected across the landscape to protect the variety of species found within them.

Table 5 shows the amount of each of these vegetation complexes remaining and protected within the Swan Coastal Plain/Jarrah Forest (regional extent) and the Shire (local extent). The regional extent of each vegetation complex is shown in Columns 1 (% retained) and 2 (% protected), and the local extent is shown in Columns 4 and 6 of Table 5. These statistics are part of the 2013 native vegetation dataset released by the WA Local Government Association's Local Biodiversity Program (Local Biodiversity Program, 2013a & b).

These statistics enable State and local governments to determine whether sufficient areas of each vegetation complex are protected and retained across their regional natural range to conserve biodiversity. Research has shown that when the extent of each habitat or vegetation type falls below about 30% of its original extent, there is a significant fall in the diversity of native species (Figure 12) (Smith and Siversten, 2001). This '30% threshold' is generally accepted in government policy as the minimum conservation target to be achieved to conserve biodiversity (EPA, 2000; Department of Planning, 2012). Ten percent (10%) of the original extent of each vegetation type is regarded as the level representing endangered (EPA 2000).



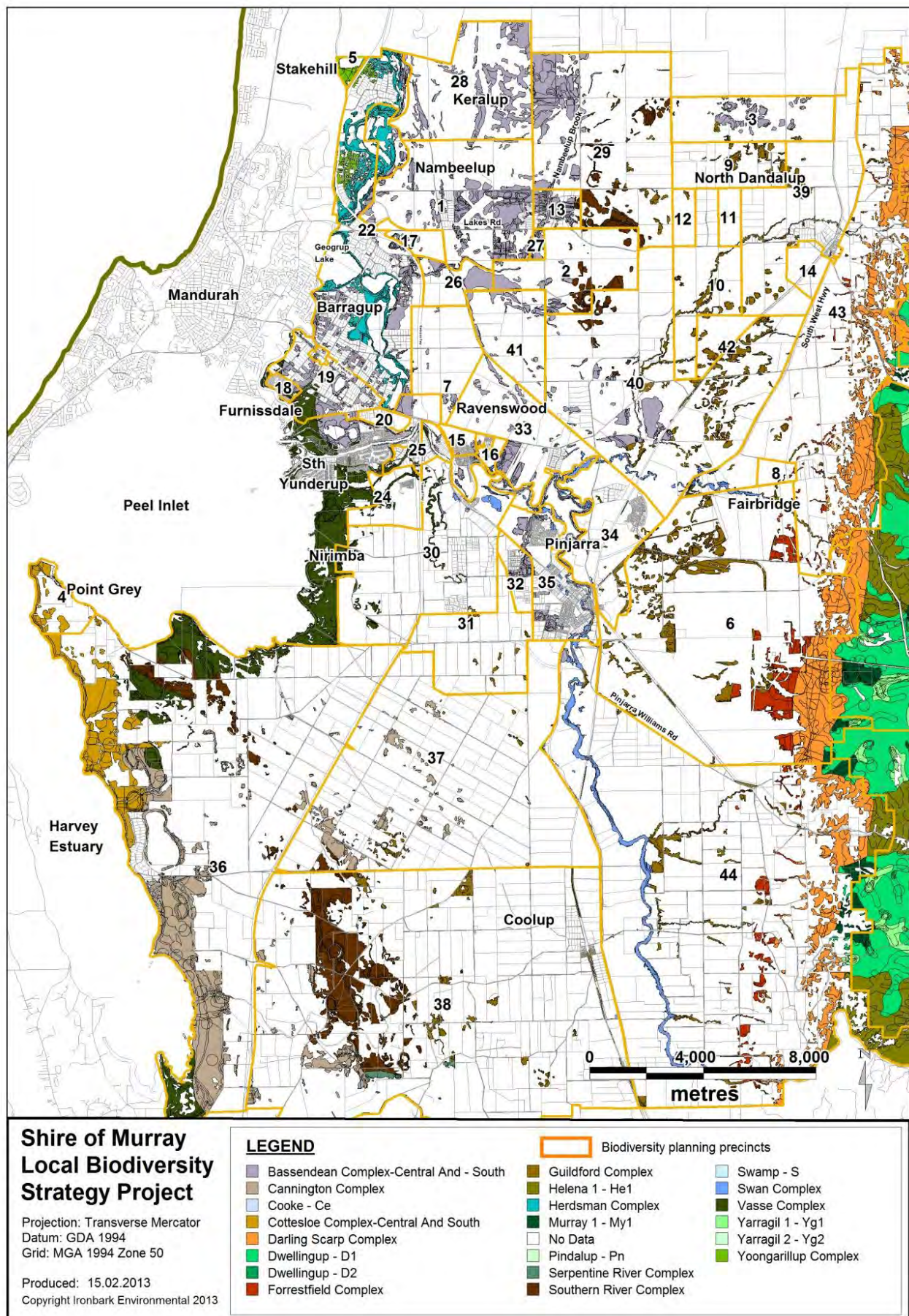


Figure 10: Vegetation complexes (west)



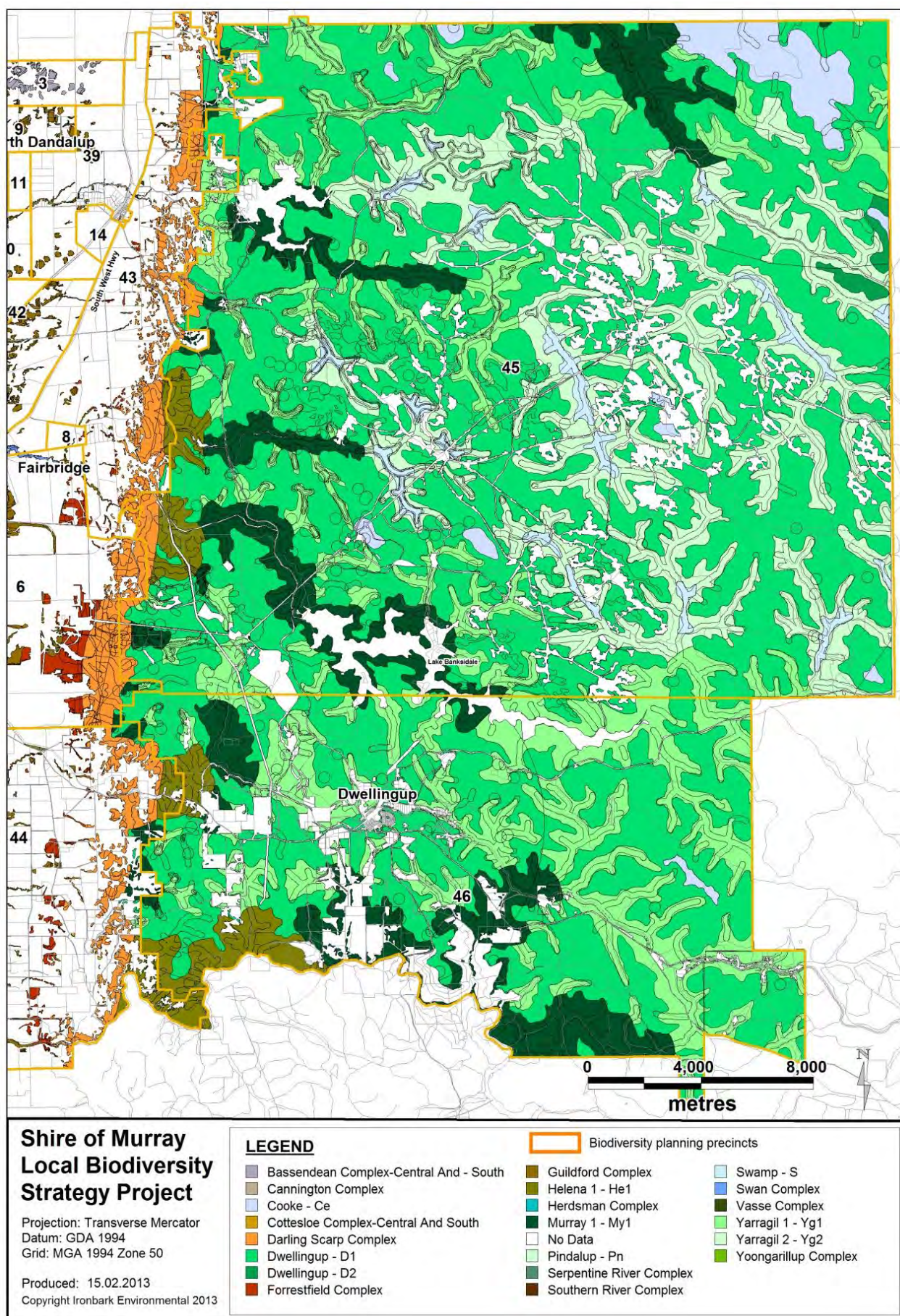
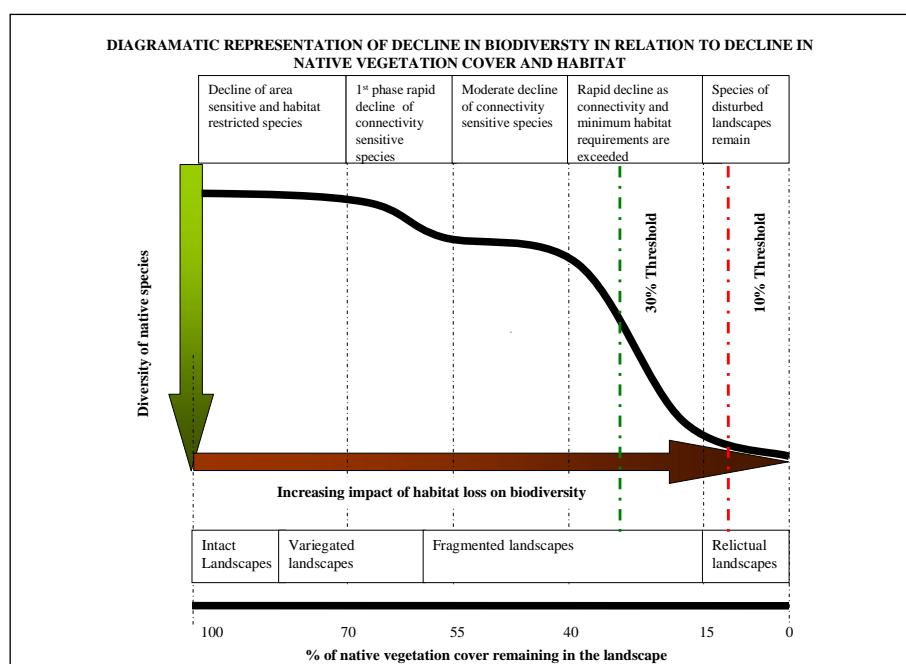


Figure 11: Vegetation complexes (east)





**Figure 12: Native vegetation cover and diversity of native species (Smith and Siversten, 2001).**

This means that at least 30% of each vegetation complex should be retained across its natural (regional) range to conserve biodiversity and at least 10% of the original extent of each vegetation complex should be formally protected for conservation. Formal conservation protection means a conservation reserve, land under a conservation covenant, or a conservation zone where the predominant land use is conservation.

Achieving the 30% and 10% regional targets is challenging in areas where there is severe competition for land, such as on the Perth and Peel Swan Coastal Plain regions. It is important to note that the 30% target is a minimum, and is based on all other requirements being optimised (e.g. good condition vegetation, active management, ideal location of reserves etc.).

Using the 30% protection threshold and 10% protection threshold, the vegetation complexes are shown in three priority categories in Table 5:

- **PRIORITY ONE** – vegetation complexes that are retained at the regional level at less than 10% (+ 5% buffer) and protected at the regional level at less than 10% (+5% buffer);
- **PRIORITY TWO** – vegetation complexes that are retained at the regional level at less than 30% (+10% buffer) OR protected at the regional level at levels less than 10% (+5% buffer)
- **PRIORITY THREE** – all other vegetation complexes.

Additional considerations are that some vegetation complexes (e.g. Bassendean Central and South, Cannington, Forrestfield, Vasse,) may be disproportionately located in the Shire of Murray at higher than average levels. This may have occurred through natural distribution, or current distribution following clearing. For example, about half of the pre-European extent of the Vasse Vegetation Complex is within the Perth and Peel regions and of that half over 70% is within the Shire of Murray (Zelinova *et al*, 2012).

Greater efforts should be made to retain and protect local examples of vegetation complexes which are disproportionally retained at high levels within the Shire, relative to their current regional extent.

Other vegetation complexes in the Shire may have already been cleared locally at levels below 30%, or even 10%, of their original local extent, or may have little or few local examples protected. For example, while the Yoongarillup Vegetation Complex is protected regionally at levels of 15.4 % and retained regionally at 38.7%, no local examples are protected. Additional effort to retain and protect these local examples should be made to conserve local biodiversity.

Table 5: Extent of vegetation complexes in the Shire of Murray

	REGIONAL REPRESENTATION		LOCAL REPRESENTATION – Shire of Murray							
Column	1	2	3	4		5	6	7	8	9
VEGETATION COMPLEX	Existing regional existing remaining (%) <sup>4</sup>	Existing regional extent protected	Pre-European extent (ha)	Remaining extent 2010 (ha)	Remaining extent 2010 (%)	DPAW <sup>5</sup> Conservation lands (ha)	% pre-European in DPAW Conservation lands	DPAW State Forest (ha)	DPAW Other lands (ha)	Local Natural Areas remaining (ha)
<b>PRIORITY ONE</b>										
Cannington	12.6	5.3	10497.0	1701.33	16	886.97	8.4	0.0	0.00	814.36
Forrestfield	11.9	1.2	5086.8	557.58	11	7.90	0.1	0.0	0.00	549.69
Guildford	5.8	0.2	28555.0	1681.56	6	5.82	0.0	0.0	0.34	1675.41
Serpentine River	10.8	2.6	493.0	41.97	9	0.00	0.0	0.0	0.00	41.97
Swan	13.8	0.5	4082.1	566.42	14	0.00	0.0	0.0	0.00	566.42
<b>PRIORITY TWO</b>										
Bassendean Central and South	27.7	2.5	13703.0	3057.42	22	66.86	0.4	0.0	0.00	2990.56
Cottesloe Central and South	35.2	12.7	1809.1	770.00	43	81.64	4.5	0.0	0.00	688.36
Darling Scarp	41.9	13.6	6651.0	2996.60	45	61.27	0.9	264.9	0.00	2670.41
Herdsmen	34.6	21.4	1550.1	595.05	38	253.78	16.3	0.0	0.00	341.27
Southern River	19.6	2.1	6556.4	1525.75	23	158.82	2.4	0.0	0.00	1366.93
Vasse	34.8	13.2	5128.9	1823.26	36	896.75	17	0.0	0.00	926.51
<b>PRIORITY THREE</b>										
Cooke	83.4	18.6	1713.4	1634.80	95	0.00	0.0	1634.8	0.00	0.00
Dwellingup 1	88.3	8.4	44419.0	40281.43	91	905.59	2.0	38797.93	0.00	577.90
Dwellingup 2	84.2	19.3	235.7	235.66	100	0.00	0.0	235.6	0.00	0.00
Helena 1	76.4	36.1	2399.3	2099.97	88	548.96	22.9	811.5	0.00	739.43
Murray 1	77.3	26.9	9264.9	6768.32	73	869.65	9.3	5203.0	26.48	669.19
Pindalup	77.3	14.4	89.2	89.27	100	0.00	0.0	89.2	0.00	0.00

<sup>4</sup> Local Biodiversity Program (2013a & b)

<sup>5</sup> DPAW: Department of Parks and Wildlife (formerly Department of Environment and Conservation)

	REGIONAL REPRESENTATION		LOCAL REPRESENTATION – Shire of Murray							
Column	1	2	3	4		5	6	7	8	9
VEGETATION COMPLEX	Existing regional existing remaining (%) <sup>1</sup>	Existing regional extent protected	Pre-European extent (ha)	Remaining extent 2010 (ha)	Remaining extent 2010 (%)	DPAW <sup>2</sup> Conservation lands (ha)	% pre-European in DPAW	DPAW State Forest (ha)	DPAW Other lands (ha)	Local Natural Areas remaining (ha)
Pindalup	77.3	14.4	89.2	89.27	100	0.00	0.0	89.2	0.00	0.00
Swamp	76.2	21.7	1252.5	1231.8	98	0.00	0.0	1231.8	0.00	0.00
Yarragil 1	82.0	10.1	15080.0	13424.1	89	193.62	1.2	12485.1	0.00	745.37
Yarragil 2	93.1	10.7	11271.0	10776.1	96	0.00	0.0	10776.1	0.00	0.00
Yoongarillup	38.7	15.4	273.3	106.5	39	0.00	0.0	0.00	0.00	106.57
No Data				121.66		20.96		2.57	0.00	98.14
<b>TOTAL (ha)</b>			<b>170110.8</b>	<b>92086.70</b>	<b>54</b>	<b>4958.60</b>		<b>71532.8</b>	<b>26.82</b>	<b>15568.46</b>

<sup>1</sup> Local Biodiversity Program (2013a & b)

<sup>2</sup> DPAW: Department of Parks and Wildlife (formerly Department of Environment and Conservation)

## **PART B: BIODIVERSITY CONSERVATION TARGETS**

### **8. Ecological and planning framework**

The Strategy is underpinned by two significant frameworks.

The first is the Regional Framework for Local Biodiversity Conservation Priorities for Perth and Peel, published by the Perth Biodiversity Project in 2012 (Perth Biodiversity Project, 2012b; Zelinova *et al*, 2012)

The second is the Biodiversity Planning Precincts framework created for the Shire as part of preparation of this local biodiversity strategy.

#### **8.1 Regional Framework for Local Biodiversity Conservation Priorities in Perth and Peel**

The ecological prioritisation of natural areas used in this Strategy is drawn directly from the Regional Framework for Local Biodiversity Conservation priorities in Perth and Peel (Perth Biodiversity Project, 2012b; Zelinova *et al*, 2012). This dataset creates a regional framework so that any natural area in the Shire can be compared with other natural areas through the Perth and Peel regions. The framework has been developed by the WA Local Government Association and Perth Biodiversity Project in partnership with the former Department of Environment and Conservation and Department of Planning.

The regional framework uses thirty-two (32) criteria based on broadly accepted ecological values of natural areas for which information exists across the whole Perth-Peel region (similar criteria have been used in Government of Western Australia, 2000; Del Marco *et al.*, 2004). Table 6 summarises the ecological values which these criteria represent. The 32 criteria are listed in Appendix B.

Many of the thirty-two (32) criteria have been reflected in the Specific Biodiversity Feature Targets proposed in this Strategy (Section 9). In this Strategy they are also referred to as 'local significance criteria' and are used to assign an 'indicative prioritisation' score to all LNA in the Shire.

Each natural area in the Shire has been scored against each of the thirty-two criteria, with a value of one (1) assigned to each criteria. (i.e. potentially, a natural area can be assigned a score of 32 if it meets each of the 32 criteria, a site that meets three criteria, is assigned a score of 3).

Figures 13 and 14 show the total scores of all local natural areas in the Shire. They show that generally, LNA on the Swan Coastal Plain meet more ecological significance criteria than areas in the Darling Ranges. This is due to the extensive historical clearing of the Swan coastal plain and consequently the occurrence of Priority One vegetation complexes, threatened ecological communities and rare flora. The details of which criteria are met by each natural area are included in a database held by the Shire of Murray.

Generally, the more criteria met by a natural area the greater will be its biodiversity value. However, the prioritisation scores for each LNA are indicative and should only be used as a preliminary indication of relative significance of any given natural area. The scores do not take account of site-specific information such as vegetation condition or local level ecological surveys. Where decisions are being made about individual sites, ecological assessment should occur at the site-specific scale by a qualified expert.

The remnant vegetation mapping on which the prioritisation has occurred has been produced by the Department of Agriculture and Food based on 2009 aerial photography and updated by the Perth Biodiversity Project and Shire of Murray in 2012. This native vegetation mapping has been intersected with other mapping representing the 32 ecological criteria (e.g. wetlands, rare species locations etc.) to create the most detailed mapping and database possible for the Shire.

**Table 1: Summary of ecological values used in the prioritisation of the Shire's natural areas.**

Ecological value	Description
Representation – Regional	Natural areas which are important or significant examples at the regional scale. This includes important or restricted ecological communities <sup>3</sup> , poorly protected ecological communities and natural areas over 20 ha. The regional scale refers to the ecological region of the Swan Coastal Plain and Northern Jarrah Forest.
Rarity	Natural areas which contain naturally rare or significantly cleared ecological communities, or flora or fauna which is rare or threatened. These are the rare and threatened components of biodiversity and the Shire's landscape
Ecological connectivity – maintaining ecological processes or natural systems	Natural areas that are within or touch the buffered South West Regional Ecological Linkages axis lines. These are shown in Figures 17 and 18. Ecological linkage is the term used to explain the relationship of natural areas in proximity to other natural areas. Biodiversity, flora and fauna, needs to be able to move across the landscape to survive and adapt.
Wetland, streamline, estuarine fringing and coastal vegetation	Natural areas which are Conservation Category Wetlands, Resource Enhancement Wetlands, Environment Protection (Swan Coastal Plain Lakes) Policy areas, estuarine wetlands, riparian vegetation (adjacent to streamlines), and vegetation within floodplains. Coastal vegetation on foredunes and secondary dunes is important in stabilising these sensitive areas and landforms.
Representation – local	Natural areas which are important or significant examples of their type within the Shire of Murray. This includes ecological communities which have been significantly cleared within the Shire of Murray.

<sup>3</sup> Ecological communities are described using vegetation complexes. See Section 7.1 for an explanation of vegetation complexes.



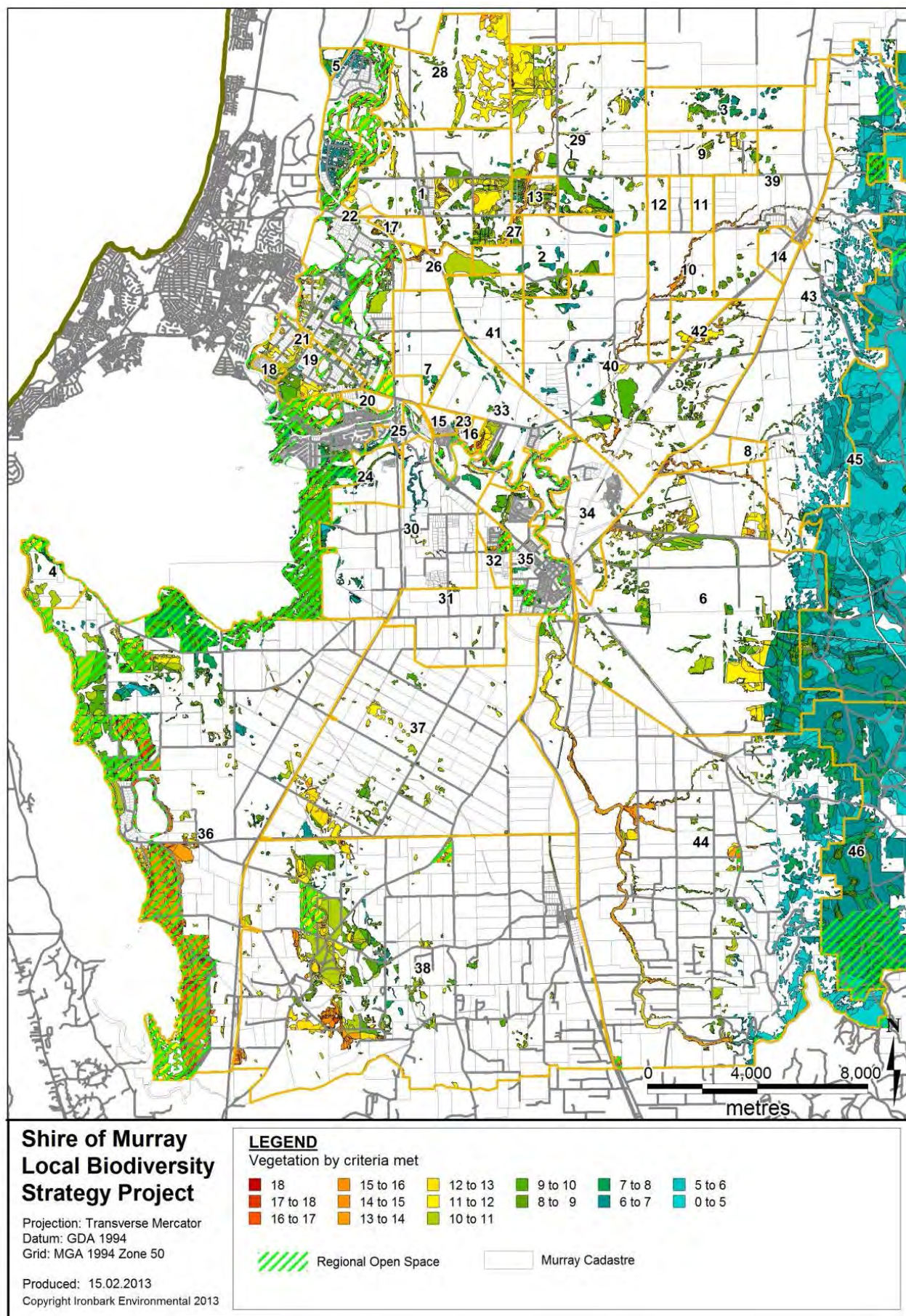


Figure 1: Regional-scale indicative ecological prioritisation (west)



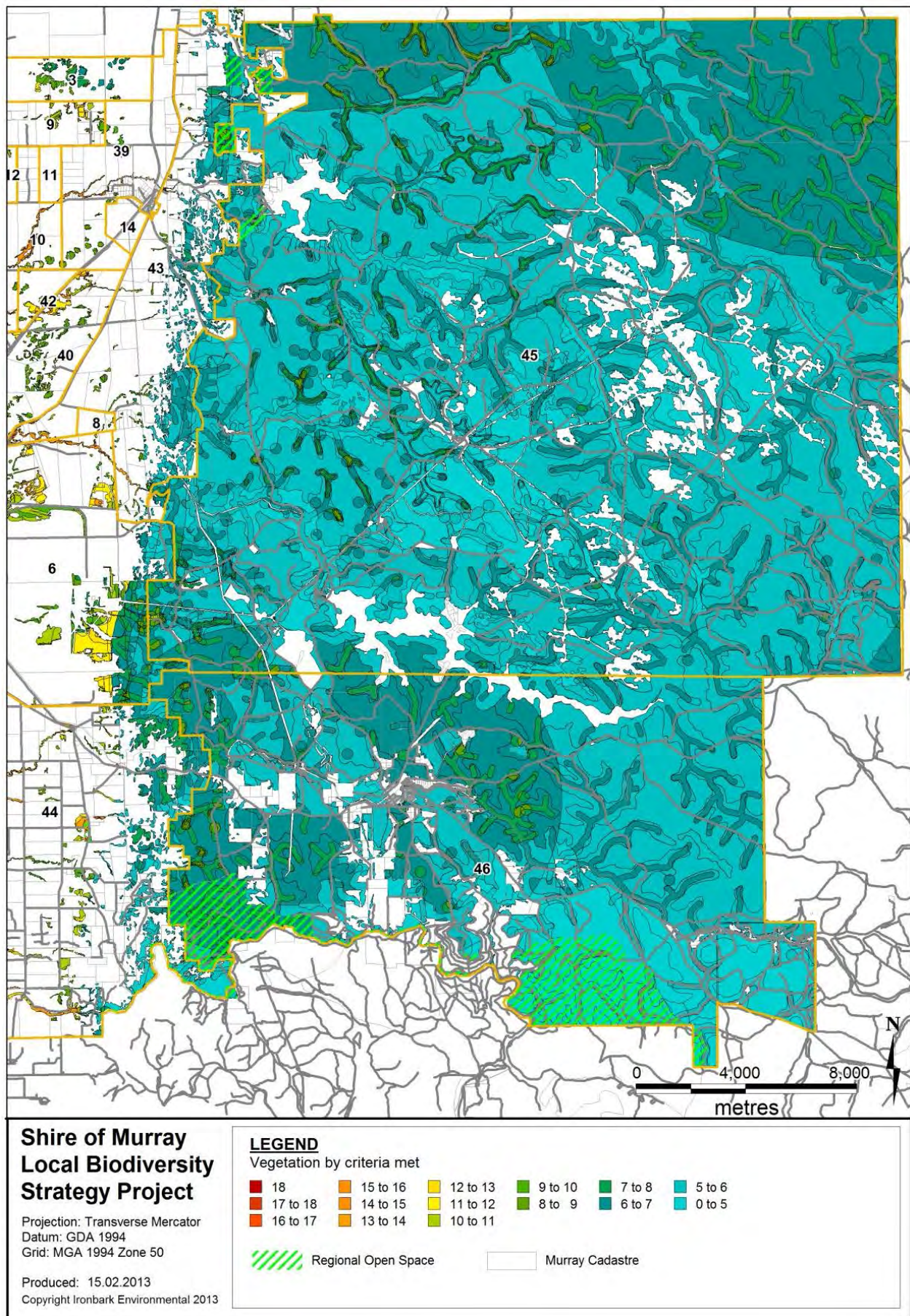


Figure 2: Regional-scale indicative ecological prioritisation (east)



## 8.2 Biodiversity planning precincts and precinct protection targets

Biodiversity Planning Precincts, or Precincts, have been created to enable the setting of natural area protection targets for specific parts of the Shire (Section 10). The precincts have no formal planning basis, but ensure that targets can be integrated into the Shire's land use planning system, and where appropriate, structure planning and subdivision planning processes. They also enable implementation of the Strategy over coming decades to be more easily audited, and improved.

Forty-six (46) Biodiversity Planning Precincts have been identified throughout the Shire and cover most of the remaining natural areas on zoned lands. Precinct boundaries have been based on:

- land zoning or scheme amendment areas,
- Outline Development Plan (ODP) or structure plan, and
- geographical location.

The precincts are shown in Figure 15 and listed in Table 8. A list of the Precincts in numerical order is provided in Appendix A.

Each precinct has been placed into one of six categories (Categories A to F) to assist with biodiversity protection target-setting. The precincts are based on a number of factors including priorities for biodiversity planning, land zoning, proposed future use of the majority of land in the precinct, and the status of planning and planning approvals (Table 7).

**Table 2: Biodiversity planning precinct categories**

Category of Precinct	Planning status
A	Key strategic areas for biodiversity planning with high potential for development pressure
B	Current Development Areas (Townsites, Urban, Industrial)
C	Potential Future Rural Residential
D	Existing Rural Residential and Rural residential in development
E	Rural, relative low potential for development pressure
F	Mining and Heavy Industry (including adjacent land in same ownership)

The six precinct categories reflect differing opportunities and constraints to the long-term protection and management of natural areas for conservation.

Category A precincts have been identified as having a high potential for development pressure due to their location near transport corridors and other infrastructure as well as their relative position to Pinjarra, Mandurah and the Perth Metropolitan Area. The classification of Category A does not in any form or shape endorse any changes in zoning, land use planning or the relevant strategic planning framework and does not imply that any changes will occur at any time in the future.

Category A precincts have been allocated specific targets in case they are identified for zoning or land use changes through the appropriate strategic planning framework in the future. As the Local Biodiversity Strategy is earmarked for regular review, it is anticipated that the categories allocated to precincts may change in the future.

In Category B precincts (Current Development Areas) the retention of LNA will generally be limited to public open space in accordance with structure plans, ODPs and subdivision approvals.

In potential future Rural Residential areas (Category C), opportunities exist to retain natural areas through public open space and sensitive subdivision design and lot layout.

Where Rural Residential areas have been developed (Category D), the long term prognosis for natural areas is poor due to extensive, gradual degradation and clearing.

For Rural Zoned land (Category E) with relative low potential for development pressure, the focus is on providing incentives for private land conservation.

For further information on the opportunities to protect natural areas in precincts, see Section 10.

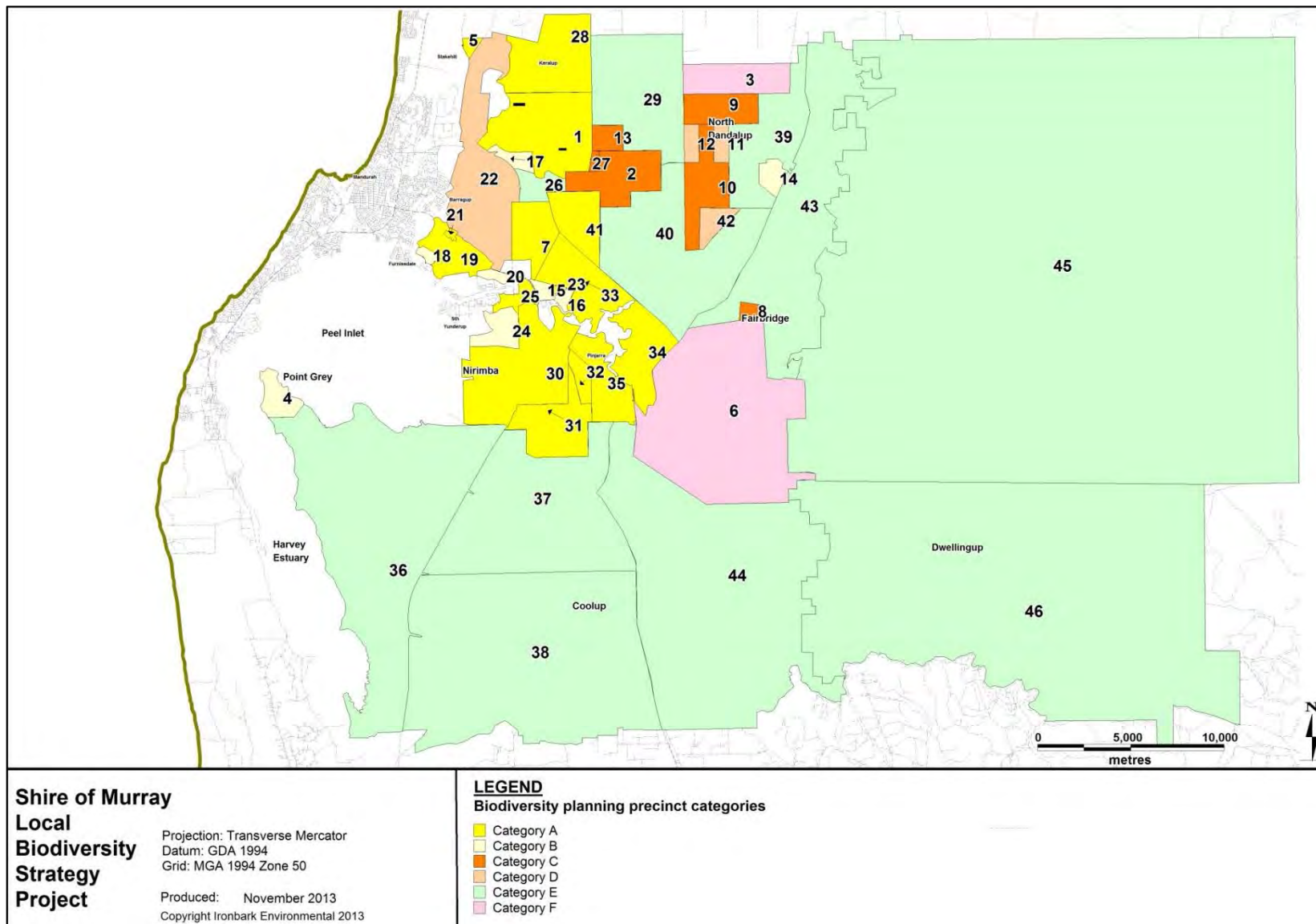


Figure 3: Biodiversity planning precincts

Table 3: Description of biodiversity planning precincts

KEY:		KEY:	
A	Key strategic areas for biodiversity planning with high potential for development pressure	D	Existing Rural Residential and Rural residential in development
B	Current Development Areas (Townsites, Urban, Industrial)	E	Rural, relative low potential for development pressure
C	Potential Future Rural Residential	F	Mining and Heavy Industry (including adjacent land in same ownership)

Precinct No.	Precinct category	Precinct Name	Predominant PRS zoning (and land use)	Most recent planning stage	Total precinct area (ha)	Total Natural Areas (ha)	Total LNA (ha)
0	-	Vegetated natural areas outside precincts				1427.05	785.38
1	A	Nambeelup Central	Rural (rural)	Nambeelup North Dandalup Local Rural Strategy (Shire of Murray & Department of Planning, 2012a)	2024.6	496.59	485.80
2	C	Golden Lakeview Rural Residential	Rural (rural)	Nambeelup North Dandalup Local Rural Strategy Shire of Murray and DoP (2012b)	1055.2	199.01	199.01
3	F	Keysbrook Sands	Rural (rural & mining)	Approved Mining Lease (Matilda Zircon Limited, 2011)	927.0	120.78	120.78
4	B	Point Grey	Urban (rural)	Approved/Endorsed ODP (Minus Marina area which is subject to assessment under EPBC Act) (Port Bouvard Limited, 2011)	370.1	128.44	128.44
5	A	Stakehill West	Urban (ex-sand quarry and vegetation area)	Nambeelup North Dandalup Local Rural Strategy (Shire of Murray and DoP, 2012a)	69.6	36.88	36.88
6	F	Alcoa	Industrial and rural (Pinjarra Alumina Refinery and buffer)	Pinjarra Long Term Residue Mgt Strategy (Alcoa, 2011); Hills Landscape Precinct Plan (Shire of Murray and DoP, 2012b)	6702.4	1620.04	1620.04
7	A	Ravenswood West	Rural (rural)		736.5	22.39	22.39

8	C	Fairbridge Cluster Farm	Rural (rural)	Hills Landscape Precinct Plan (Shire of Murray and DoP, 2012b)	109.2	4.36	4.36
9	C	Readheads North	Rural (rural and rural residential)	Nambeelup-North Dandalup Local Rural Strategy (Shire of Murray and DoP, 2012a)	652.7	64.70	64.70
10	C	Avoca-Shanns	Rural (rural)	Nambeelup-North Dandalup Local Rural Strategy; RR1 (Shire of Murray and DoP, 2012a)	929.9	73.78	73.78
11	D	Dandalup Springs Rural Residential	Rural (rural residential under construction)	RR Subdivision Approved/ Nambeelup-North Dandalup Local Rural Strategy (Shire of Murray and DoP, 2012a)	164.9	0.58	0.58
12	D	Dandalup West Rural Residential	Rural (rural)	RR Approved/ Nambeelup-North Dandalup Local Rural Strategy (Shire of Murray and DoP, 2012a)	164.4	2.84	2.84
13	C	Nambeelup Home Business Park	Rural (rural residential)	Nambeelup North Dandalup Local Rural Strategy (Shire of Murray and DoP, 2012a)	229.1	112.68	112.68
14	B	North Dandalup Town site	Rural (urban and rural)	Approved Urban Structure Plan-North Dandalup (Shire of Murray, 2011)	215.8	0.06	0.06
15	B	Ravenswood Waters	Urban (urban)	Approved ODP (TPG Consultants, 2010)	99.3	6.83	6.83
16	B	Old Mandurah Rd South	Urban	Approved ODP (Greg Rowe & Associates, 2008)	66.1	9.33	9.33
17	B	Nambeelup Industrial	Industrial (rural)	Approved ODP	174.7	14.71	14.71
18	B	Furnissdale Townsite	Rural		66.5	18.17	18.17
19	A	Furnissdale Rural Residential	Rural		619.4	243.70	243.70
20	B	North Yunderup	Urban		88.3	NA	NA

21	A	Barragup/Furnissdale Commercial Area	Urban		28.2	4.75	4.75
22	D	Serpentine Lakes Rural Residential	Rural	Nambeelup North Dandalup Local Rural Strategy (Shire of Murray 2012a)	2676.5	881.61	630.11
23	A	Ravenswood Waters East	Urban		27.0	2.35	2.35
24	B	Austin Lakes	Urban	Approved/Endorsed LSP/ODP (Chappell Lambert Everrett, 2008b)	393.6	38.44	38.44
25	A	South Yunderup Rural Residential	Rural		205.9	44.05	44.05
26	E	Nambeelup South Rural	Rural	Nambeelup North Dandalup Local Rural Strategy (Shire of Murray and DoP, 2012a)	322.6	94.07	94.07
27	E	Lot 1 Lakes Road	Rural	Town Planning Scheme 4	51.6	22.94	22.94
28	A	Keralup	Rural	Draft Keralup District Structure Plan (Department of Housing and Works, 2007)	1644.8	395.41	395.41
29	E	Yangedi Rural	Rural	Approved Urban Structure Plan/ Nambeelup North Dandalup Local Rural Strategy (Shire of Murray and DoP, 2012a)	2921.4	664.88	664.88
30	A	Nirimba/West Pinjarra	Rural	EELS Report (DoP, 2012b)	2542.8	149.79	149.61
31	A	Greenlands Road	Rural	EELS Report (DoP, 2012b)	1147.3	20.60	20.60
32	A	Pinjarra Industrial Area	Industrial	EELS Report (DoP, 2012b)	220.9	37.78	23.87

33	A	Ravenswood Central	Rural		1162.9	139.87	139.87
34	A	Greater North Pinjarra	Rural		1106.4	45.40	45.40
35	A	Pinjarra Townsite	Urban		873.6	161.51	147.51
36	E	Birchmont-Herron Point Rural	Rural		9705.9	2903.01	1514.06
37	E	Blythewood/West Pinjarra Rural	Rural		5856.4	298.22	298.22
38	E	Coolup Rural	Rural		11221.0	1316.27	1206.94
39	E	North Dandalup Rural	Rural	Hills Landscape Precinct Plan Shire of Murray and DoP, 2012b)	1905.2	82.02	82.02
40	E	Ravenswood Rural North	Rural	Nambeelup-North Dandalup Local Rural Strategy Shire of Murray and DoP, 2012a)	4303.3	561.14	561.14
41	A	Ravenswood North	Rural		772.1	76.81	76.81
42	D	Blue Ranges Rural Residential	Rural	Subdivisional Guide Plan (Peel Planning Consultants, 2010)	264.6	38.05	38.05
43	E	Hills Landscape North	Rural	Hills Landscape Precinct Plan (Shire of Murray and DoP, 2012b)	6037.3	1659.29	1598.29
44	E	Hills Landscape South/Meelon	Rural	Hills Landscape Precinct Plan (Shire of Murray and DoP, 2012b)	12017.8	1956.00	1935.62
45	E	Huntly/Myara State Forest	State Forest/Rural	-	60995.2	54546.46	525.50
46	E	Dwellingup State Forest	State Forest/Rural	Includes Dwellingup Town Site Structure Plan (Land in Sights, 2011)	24432.3	21343.06	1357.06
<b>TOTALS</b>						<b>92086.70</b>	<b>15568.03</b>

## 9. Targets to achieve objective 1: Specific biodiversity feature targets

Objective 1 of the Strategy is to achieve targets for the **protection** of specific biodiversity features as listed in Table 9. This applies to all LNA, but particularly those in the urban and industrial zones, rural lands being converted to rural residential uses, and land managed by the Shire.

Table 9 includes the proposed targets to retain or protect specific biodiversity features in the Shire (Specific Biodiversity Feature Targets). These are generally biodiversity features that are recognised under legislation or government policy. Most of these targets address the rare or special parts of the environment. Achieving these targets alone will not conserve biodiversity.

Precinct Protection Targets (Section 10) are identified to ensure representative examples of all vegetation types in the Shire, and complement the specific biodiversity feature targets.

The targets presented in Table 9 effectively become policy to guide the Shire's decisions and its advice in regard to planning assessment and environmental protection. The targets should be reviewed once the outcomes of the Strategic Assessment of the Perth and Peel Regions become known.

In applying the targets to consideration of any planning proposal, it will be important that site-specific information is gathered to confirm and assess the ecological values present on site. Detailed ecological site investigations should be consistent with EPA Guidance Statements 10, 51 and 56 (Environmental Protection Authority, 2010).



Table 4: Specific biodiversity feature targets

Special Biodiversity features	Protection Target		Notes and local examples	Relevant legislation and policy
RARE AND SIGNIFICANT SPECIES of FLORA	BF1	All habitat <sup>4</sup> of Threatened Flora is to be protected within an ecologically viable natural area where occurring in urban, industrial, rural residential and other intensive zones. All habitat, means known occurrences as well as suspected habitat that is verified through field survey. All other occurrences are to be retained.	Threatened species known to occur in the Shire of Murray Appendix C.	<ul style="list-style-type: none"> <li>Environmental Protection and Biodiversity Conservation Act 1999</li> <li>Environmental Protection Act 1986 (Environmental Protection (Clearing of Native Vegetation) Regulations 2004</li> <li>Wildlife Conservation Act 1950</li> <li>EPA Guidance Statement No 33 (Environmental Protection Authority, 2008)</li> <li>Draft Policy Statement No 9: Conserving Threatened Species and Ecological Communities (Department of Conservation and Land Management, 2003)</li> </ul>
	BF2	All natural areas that contain significant habitat <sup>5</sup> for priority listed species and other significant species are to be protected within an ecologically viable natural area where occurring in urban, industrial, rural residential and other intensive zones. All other habitat is to be retained.	Recorded priority species in the Shire of Murray Appendix C.	<ul style="list-style-type: none"> <li>EPA Guidance Statement No 33 (Environmental Protection Authority, 2008)</li> <li>EPA Guidance Statement No 10 (Environmental Protection Authority, 2003a)</li> <li>Wildlife Conservation Act 1950</li> <li>Draft Policy Statement No 9: Conserving Threatened Species and Ecological Communities (Department of Conservation and Land Management, 2003)</li> </ul>
SIGNIFICANT SPECIES OF FAUNA: black	BF3	All breeding and roosting habitat is to be protected where occurring in urban, industrial,	Habitat is to be identified through field survey and application of the EPBC Act	<ul style="list-style-type: none"> <li>Environmental Protection and Biodiversity Conservation Act 1999</li> </ul>

<sup>4</sup> All habitat includes all known habitat, as well as habitat that is verified through field survey.

<sup>5</sup> Significant habitat is defined as that habitat which, if lost, would likely lead to a change in the conservation status of the species by the Department of Environment and Conservation or the relevant Federal Government department.

Special Biodiversity features	Protection Target		Notes and local examples	Relevant legislation and policy
cockatoos breeding and roosting habitat		rural residential and other intensive zones. All other habitat is to be retained.	referral guidelines for three threatened black cockatoo species (SEWPC, 2012).	<ul style="list-style-type: none"> <li>Wildlife Conservation Act 1950</li> <li>EPA Guidance Statement No 33 (Environmental Protection Authority, 2008)</li> <li>EPA Guidance Statement No 10 (Environmental Protection Authority, 2003a)</li> <li>Draft Policy Statement No 9: Conserving Threatened Species and Ecological Communities (Department of Conservation and Land Management, 2003)</li> </ul>
SIGNIFICANT SPECIES OF FAUNA: black cockatoo foraging habitat	BF4	No nett loss of quality foraging habitat is to occur within the Shire. This is to occur through protection of existing habitat to form ecologically viable natural areas (where habitat is proposed for clearing) and revegetation to mitigate any loss of smaller habitat areas.	Quality foraging habitat is to be identified through field survey and application of the EPBC Act referral guidelines for three threatened black cockatoo species (SEWPC, 2012). The term 'quality foraging habitat' is used in the referral guidelines.	<ul style="list-style-type: none"> <li>Environmental Protection and Biodiversity Conservation Act 1999</li> <li>EPBC Act referral guidelines for three threatened black cockatoo species (SEWPC, 2012)</li> <li>Wildlife Conservation Act 1950</li> <li>EPA Guidance Statement No 33 (Environmental Protection Authority, 2008)</li> <li>EPA Guidance Statement No 10 (Environmental Protection Authority, 2003a)</li> <li>Draft Policy Statement No 9: Conserving Threatened Species and Ecological Communities (Department of Conservation and Land Management, 2003)</li> </ul>
SIGNIFICANT SPECIES OF FAUNA: OTHER SPECIES LISTED	BF5	Habitat of all other species listed under the EPBC Act are to be protected within ecologically viable natural areas <sup>6</sup> where occurring in urban, industrial, rural residential and other intensive zones. All other habitat is to be retained.	Species listed under the EPBC Act potentially occurring in the Shire are included in Appendix D.	<ul style="list-style-type: none"> <li>As for BF4 above.</li> </ul>

<sup>6</sup> Habitat quality and the ecological viability of subject natural areas are to be assessed as part of site-specific ecological assessment.

Special Biodiversity features	Protection Target		Notes and local examples	Relevant legislation and policy
IN THE EPBC ACT				
SIGNIFICANT SPECIES OF FAUNA: SPECIALLY PROTECTED AND PRIORITY LISTED FAUNA, GAZETTED UNDER THE WILDLIFE CONSERVATION ACT	BF6	Significant habitat of all other species Specially Protected or Priority Listed under the Wildlife Conservation Act are to be protected within ecologically viable natural areas where occurring in urban, industrial, rural residential and other intensive zones. All other habitat is to be retained.	Fauna species listed under the Wildlife Conservation Act and recorded in the Shire are included in Appendix D.	
THREATENED ECOLOGICAL COMMUNITIES	BF7	<p>All natural areas that provide habitat for Threatened Ecological Communities (TEC) or Priority Ecological Communities (PEC) are to be protected with a suitable buffer, where occurring in urban, industrial, rural residential and other intensive zones. All other habitat is to be retained.</p> <p>Suitable buffers should be determined on a site-specific basis. Advice should be sought from DPAW (formerly DEC) on what will constitute an adequate buffer.</p>	Threatened Ecological Communities that are known to occur in the Shire are listed in Appendix E.	<ul style="list-style-type: none"> <li>• Environmental Protection and Biodiversity Conservation Act 1999</li> <li>• Environmental Protection Act 1986 (Environmental Protection (Clearing of Native Vegetation) Regulations 2004</li> <li>• EPA Guidance Statement No 33 (Environmental Protection Authority, 2008)</li> <li>• EPA Guidance Statement No 10 (Environmental Protection Authority, 2003a)</li> <li>• Draft Policy Statement No 9: Conserving Threatened Species and Ecological Communities (Department of Conservation and Land Management, 2003).</li> </ul>

Special Biodiversity features	Protection Target		Notes and local examples	Relevant legislation and policy
				<ul style="list-style-type: none"> <li>Department of Environment and Conservation (2011b)</li> </ul>
WETLANDS AND WETLAND VEGETATION	BF8	<p>Protect all wetlands verified as Conservation Category Wetlands or Resource Enhancement Wetlands, plus a buffer to maintain ecological values in perpetuity<sup>7</sup> where occurring in urban, industrial, rural residential and other intensive zones. All other habitat is to be retained.</p> <p>Protect all estuarine wetlands verified as CCW, REW or with vegetation in Good or better condition<sup>8</sup> where occurring in urban, industrial, rural residential and other intensive zones. All other habitat is to be retained.</p>	<p>CCW and REW wetlands mapped throughout the Shire (DEC, 2012).</p> <p>Wetlands are natural areas with soils and vegetation that are characterised by a level of inundation or waterlogging.</p> <p>Wetlands with a high or moderate level of naturalness have been assessed as Conservation Category Wetlands (CCW) or Resource Enhancement Wetlands (REW) respectively.</p> <p>Selected wetlands are also protected under the Environment Protection (Swan Coastal Plain Lakes) Policy 1992).</p>	<ul style="list-style-type: none"> <li>Water and Rivers Commission Position Statement: Wetlands (2001)</li> <li>Wetlands Conservation Policy for Western Australia (Government of Western Australia, 1997)</li> <li>EPA Position Statement No 4: Environmental Protection of Wetlands (Environmental Protection Authority, 2004)</li> <li>Environmental Protection Act 1986 (Environmental Protection (Clearing of Native Vegetation) Regulations 2004</li> <li>EPA Guidance Statement No 33 (Environmental Protection Authority, 2008)</li> <li>Statement of Planning Policy No 2: Environment and Natural Resources (Western Australian Planning Commission, 2003)</li> </ul>

<sup>7</sup> The Shire will not accept buffers to wetlands of less than 50 m for CCWs and 30 m for REWs. Buffers to maintain ecological values in perpetuity are to be determined using the Draft Guidelines for the Determination of Wetland Buffers (WAPC, 2005).

<sup>8</sup> Vegetation condition is assessed using the vegetation assessment methodology of Keighery (1994)

Special Biodiversity features	Protection Target		Notes and local examples	Relevant legislation and policy
			<p>The Shire will endeavour to protect CCWs and REWs plus a buffer to maintain ecological values in perpetuity in accordance with target BF9.</p> <p>Wetlands are very dynamic natural systems, and all intact wetland vegetation<sup>9</sup>, should be retained within developments.</p>	
WATERWAYS	BF9	Protect all riparian vegetation associated with natural watercourses and those natural areas directly attached where occurring in urban, industrial, rural residential and other intensive zones. All other riparian habitat is to be retained.	Riparian vegetation has been identified in this strategy as all vegetation within 100 m of a mapped major watercourse and 50m of a mapped minor watercourse, except where verified through field survey.	<ul style="list-style-type: none"> <li>• Statement of Planning Policy No 2: Environment and Natural Resources (Western Australian Planning Commission, 2003)</li> <li>• EPA Guidance Statement No 33 (Environmental Protection Authority, 2008)</li> <li>• Development Control Policy No 2.3: Public Open Space (Western Australian Planning Commission, 2002)</li> <li>• Environmental Protection Act 1986 (Environmental Protection (Clearing of Native Vegetation) Regulations 2004)</li> </ul>

<sup>9</sup> Intact wetland vegetation means vegetation with some structure remaining (e.g. understorey).



## **9.1 Further information on Target BF8: Wetland protection**

Wetlands are a characteristic part of the coastal plain districts of the Shire of Murray. Vegetated wetlands once covered almost the entire Shire west of South West Highway.

Wetlands include the broad, seasonally waterlogged damplands and palusplains distinctive of Nambeelup and Coolup, the estuarine wetlands of Austin Cove, and lakes such as Barragup Swamp (Figure 4). Today, in addition to the conservation values of wetlands, our community values the productive aspect of cleared palusplains, which support much of the beef grazing and hay-making in the Shire.

Target BF8 and targets to meet Precinct Protection Targets are based on the wetland mapping and assessment information held by DPAW and published on the internet. This dataset is the geomorphic wetlands dataset.

Target BF8 is to protect all wetlands verified as Conservation Category Wetlands or Resource Enhancement Wetlands, plus a buffer to maintain ecological values in perpetuity. To achieve this target, all of the CCW and REW should be protected, and not just that portion that may be in the best condition, or with vegetation. This has important implications when designing the protection of wetlands into residential and other types of development.

When considering Target BF8 and all development proposals, the Shire will also be aware of the importance of understanding the potential impact of development on groundwater levels, and the effect on wetlands.

## **9.2 Further information on Target BF9: Riparian zone protection**

Protection of the vegetation associated with watercourses (riparian vegetation) is critical in the Shire given the need to improve water quality of the Peel-Harvey Estuary and the extensive network of watercourses on the coastal plain.

Riparian vegetation is important for preventing erosion and maintaining the watercourse channel structure, and provides habitat for local fauna such as the native water rat and freshwater mussels (Figure 16).



Figure 4: Freshwater mussels found in a watercourse near South West Highway. They are an indication of good water quality and a healthy watercourse.

In this strategy, the Shire has set a target of retaining all riparian vegetation, and protecting it where it may be subject to consideration of urban, light industrial or rural residential development.

Much of the riparian vegetation in the Shire, especially on the coastal plain and foothills has been removed or is degraded. On the coastal plain and foothills, 2656 ha of vegetation remains within 100 m of either side of watercourses.

The restoration of degraded riparian vegetation, and revegetation where it has been removed are important considerations of planning and development assessments. This is supported through the Shire's existing planning policies (Shire of Murray, undated, a,b,c).

In this strategy, riparian vegetation has been identified using standard 100 m buffers from major watercourses and 50m buffers from minor watercourses. This should be verified in the field as part of each planning and development assessment.

## 10. Targets to achieve Objectives 2 and 3

### 10.1 Background to precinct target-setting

Objectives 2 and 3 of the Strategy are to:

**Objective 2: Protect** natural areas that will maintain the current level of species and ecosystem diversity currently present in the Shire. This is described in Section 10 as it applies to specific areas in the Shire.

**Objective 3:** Maximise **retention** of all other LNA (e.g. rural and rural residential lands).

To achieve these objectives, particularly Objective 2, targets are proposed for the area of vegetated local natural areas that should be protected to conserve the representative vegetation complexes typical of the Shire's original vegetation. (See Section 7.1 for description of vegetation complexes).

The proposed Precinct Protection Targets have been set based on the vegetated LNA in each of the precincts presented in Section 8.2, and are referred to as 'Precinct Protection Targets' (PPT).

The proposed Precinct Protection Targets are based on the opportunities and constraints for development and biodiversity conservation as provided under the Shire of Murray Town Planning Scheme No 4 (1989) in each given precinct. This includes consideration of various information and datasets, including:

- zoning of the site and the associated reasonable development expectations;
- subdivision and development approvals applicable to the site (Stage of Outline Development Plan (ODP) development or implementation of a structure plan);
- legislative requirements;
- known environmental features on the site, and available environmental studies;
- biodiversity specific feature targets likely to be met on site; and
- principles of sound biodiversity conservation.

Where possible, all occurrences of Priority One vegetation complexes (Table 5) are proposed for protection given that they have become rare through past clearing.

The achievement of the PPTs is not independent of the achievement of the Specific Biodiversity Feature targets presented in Table 9. Natural areas that are protected to conserve, for example, the habitat of Carnaby's Black Cockatoo, will also contribute towards the achievement of the Precinct Protection Targets.

PPTs apply to the area, in hectares, of vegetated natural areas. Non-vegetated portions of wetlands, such as open water or cleared portions of wetlands, are not accounted for in the Precinct Protection Targets. These non-vegetated portions of wetlands will need to be protected to achieve Target BF8 where they form part of CCW and REW wetlands.

For each category of precinct A to F, a slightly different approach is taken to the setting of Precinct Protection Targets.

### **Precinct Categories A to D (various zones)**

Land in Precinct Categories A to D is a high priority for biodiversity planning, and may be undergoing land use change to urban, light industrial or rural residential development. In these precincts, the proposed targets are aimed at protecting natural areas (rather than retention) where this is possible.

Land in Precinct Category A is a key strategic area for biodiversity planning with high potential for development pressure due to their location near transport corridors and other infrastructure as well as their relative position to Pinjarra, Mandurah and the Perth Metropolitan Area. The classification of Category A does not in any form or shape endorse any changes in zoning, land use planning or the relevant strategic planning framework and does not imply that any changes will occur at any time in the future.

A significant consideration in Category A to D precincts is the presence and status of an Outline Development Plan (ODP) or similar approval that may exist over a site. An Outline Development Plan is a form of detailed structure plan describing the form and location of different land uses, including residential densities, roads and public open space.

Where an ODP or similar approved plan does not exist over the site (Categories A and C), there may be opportunity to retain local natural areas in accordance with the provisions of the local planning scheme and relevant State policies (for example, within public open space). Conversely, where an ODP has been approved, opportunities to retain local natural areas will generally be limited to those already identified in the ODP.

Protection targets mean that the protected natural areas are included in a conservation reserve, placed under a conservation covenant, or are zoned for conservation (Section 2.3). Retention of natural areas on private land, without a protection mechanism, for urban, light industrial and rural residential purposes, is not a viable option for long-term protection of biodiversity.

For Category A and B precincts where development occurs, it is assumed that LNA not protected will be degraded or cleared over time.

Other technical assumptions and guidelines used to set precinct protection targets are included in Appendix F.

### **Precinct Category E (Rural)**

On rural zoned land<sup>10</sup>, the Strategy assumes that all natural areas will be retained.

An indicative Precinct Protection Target for a portion of the LNA in Category E Precincts is proposed subject to the Shire (or others) providing appropriate incentives for landowners to protect significant natural areas. (See Section 13.3). The indicative target is protection of 10% of LNA in Category E precincts west of South West Highway and 5% for those rural precincts east of the highway.

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<sup>10</sup> Rural zoned land where no change in zoning is proposed.

In the event that Rural Precincts are considered for subdivision potential in the future, then the indicative Precinct Protection Targets do not apply. In these cases, the Shire should set new targets for the protection of all natural areas in the precinct to:

- 1) Achieve all Specific Biodiversity Feature Targets; and
- 2) Protect verified occurrences of Priority One vegetation complexes, where they are in a Degraded condition or better.

## 10.2 Summary of Precinct Protection Targets

A target of protecting an additional 4527 ha of local natural areas is proposed in this Strategy. Together with the 4959 ha of vegetation already in the Public (DPAW managed) Conservation Estate, this would total 9486 ha of protected vegetation in the Shire.

All but 82.2 ha of the 4527 ha of protected vegetation are located on the Swan Coastal Plain and Ridge Hill Shelf. This includes:

- Protection of all occurrences of Priority One vegetation complexes in Category A and C precincts;
- Protection of at least 50% of Priority Two Vegetation complexes in Category A and C precincts;
- Protection of all vegetated portions of CCW and REW wetlands in Category A and C precincts;
- Protection of vegetated portions of ROS in all precincts;
- Protection of an indicative (10% or 5% selection) of Rural zoned LNA (Category E precincts); and
- Protection of 80% of the 494.7 ha of LNA in local reserves.

The strategy assumes 883.7 ha of existing vegetation are likely to be cleared under current planning and development approvals. This does not include the loss and degradation of existing vegetation that is likely to occur if current trends of vegetation decline continue. This includes vegetation decline in existing rural residential areas and use of public lands for their reserved purposes (e.g. roads and public facilities).

All other vegetation in the Shire, 81,717 ha, is assumed to be retained. This includes areas not considered to be LNA. A summary of the proposed levels of protection is provided in Table 1 and Table 10.

Table 5: Summary of proposed levels of protection and retention in the Shire of Murray.

Category of natural area	All vegetated natural areas (ha)	Existing and proposed protection (ha)	Retention (ha)	Likely future clearing or 2012 approved clearing (ha)
<b>Protection</b>				
Existing DPAW Conservation lands	4,959	4,959		0
Proposed protection of LNA on zoned lands (incl. ROS)	4,131	4,131		0
LNA on local reserves	494	396 (80%)	98 (20%)	0
<b>Retention</b>				



State Forest	71,533	0	71,533	Not accurately known <sup>11</sup> .
DEC other	27		27	
Zoned lands	10,058	0	10,058	883
<b>Total</b>	<b>92,087</b>	<b>9,486</b>	<b>82,601</b>	<b>883</b>

Table 11 provides a summary of LNA protection by category of Precinct.

Table 6: Summary of LNA protection by category of Precinct

Precinct Category	LNA protection Target	LNA protection target minus ROS component (ha)	ROS component (ha)
A	1279	1174.2	104.8
B	116.4	51.4	65
C	289.2	289.2	0
D	213.5	0.6	212.9
E	1467.3	542.737	924.563
F	153.5	153.5	0.0
Outside precincts	612.5	0.0	612.5
Existing local reserves	395.7	395.7	0.0
<b>Total</b>	<b>4527.1</b>	<b>2607.3</b>	<b>1919.8</b>

This shows that 2607.3 ha of the LNA protection target are non-ROS lands, including 395.7 ha of LNA on existing local reserves.

Table 12 shows that there are six (6) Category A, B or C precincts in which the protected LNA would cover 15% or more of the precinct area (excluding DEC and ROS areas). These precincts are listed with comments related to the protection target.

These precincts support a large proportion (by area) of significant LNA remaining in the Shire on the coastal plain. In most cases, planning is well underway for development of these areas.

A summary of the proposed protection levels of vegetated LNA in each Precinct are provided in Tables 13, 14 and 15.

Table 13 provides an overview of the number of hectares of vegetation in each precinct that meet key criteria used to establish the protection targets: ROS, proposed POS, CCWs, Swan Bioplan sites, riparian vegetation and REWs.

The right-most columns in Table 14 provide information on the:

- Proportion (%) of current vegetated NA in each precinct to be protected (existing and proposed protection);
- Proportion (%) of precinct to be covered by protected natural areas; and
- Proportion (%) of precinct (less the area of DPAW managed lands and ROS) to be covered by protected LNA. In the case of Precincts A and C, this generally provides an indication of the portion of the site that would be protected as a percentage of the developable area.

<sup>11</sup> Clearing of State Forest will be in accordance with the Forest Management Plan.

Table 15 provides the extent to which the proposed Precinct Protection Targets will protect each of the vegetation complexes occurring within the Shire and Table 16 shows the impact of the Shire's Strategy on local protection levels of each vegetation complex.

For example, Table 16 shows that less than 1% of the pre-European extent of the Bassendean Central and South Vegetation Complex is currently protected in the Shire. With the implementation of the Strategy's Precinct Protection Targets, 11% of the Bassendean Central and South Vegetation Complex will be protected. Similarly, local protection levels of the Cannington Vegetation Complex will increase from 8% to 11% with the implementation of the Shire's Strategy.

Table 16 shows that for most Priority One Vegetation Complexes, (Forrestfield, Guildford, Serpentine River and Swan), the Strategy will increase protection levels considerably but will not achieve protection levels of 10% or greater (10% is an important aim for long-term biodiversity conservation). Similarly, local protection levels of two of the Priority Two Vegetation Complexes – Southern River and Darling Scarp – will be less than 10% of pre-European extent.

Increased protection of these vegetation complexes (Forrestfield, Guildford, Serpentine River, Swan, Southern River and Darling Scarp) can be addressed as part of a future possible private land conservation incentives scheme (See Section 13.3). Large LNAs of these vegetation complexes are located on rural zoned land where no land use change is proposed.

Note that the amount of hectares shown in Table 15 is the amount of LNA proposed for protection, and is not the total amount of LNA or natural areas of each complex in each precinct. Cells coloured yellow in Table 15 denote the vegetation complexes found in the relevant Precinct.

For Category E precincts, the extent of each vegetation complex eventually protected may change slightly depending on the criteria used in a future possible private lands conservation incentive scheme. As a general rule, incentive schemes should target high conservation value LNAs and build strong local landholder support and capacity to manage bushland into the long-term.

Appendices G to K present a comprehensive description of how the proposed protection targets were established for each precinct.

Table 7: Category A, B and C precincts with 15% or more of the precinct area covered by LNA proposed for protection

Precinct Name	Total protection (existing & proposed)	Precinct area (ha)	% Protection of all remaining NA)	% precinct covered by protected LNA (ex. DEC and DEC)	Comments
1. Nambeelup Central	357.7	2024.5	72%	17%	A large part of proposed protection in within the Nambeelup Industrial Estate Draft District Structure Plan. Other areas include large CCW wetlands outside of DSP zoned areas.
2. Golden Lakeview Rural Residential	153.9	1055.1	77%	15%	This proposed rural residential area supports a number of important wetland and bushland areas. It is important that these areas are protected, and not just retained within private lots.
5. Stakehill West	15.0	69.6	41%	22%	Achievement of this target will be challenging. The site is zoned urban in the PRS, rural in the Shire District Planning Scheme No. 2. The site is known to support DRF and is likely to contain bushland in Good or better condition.
19. Furnissdale Rural Residential	155.8	619.4	64%	25%	Over 100 ha of protection is proposed to cover ROS, CCW and Swan Bioplan sites.
27. Lot 1 Lakes Road	19.8	51.5	86%	38%	A large portion of the proposed protection is the riparian zone of Nambeelup Brook, and would continue the riparian reserve existing to the north.
28. Keralup	248.5	1644.7	63%	15%	The precinct supports a number of large and significant CCW and REW wetlands, riparian vegetation. Much of the vegetation has been recognised as regionally significant in Swan Bioplan.
<b>TOTAL</b>	<b>950.7</b>	<b>5465.1</b>			

Notes for Table 13: The columns (A to F) for ROS, proposed POS, CCWs, Bioplan Sites, riparian and vegetated REWs are hierarchical and have been calculated sequentially. Hence, the statistics are non-overlapping, and can be summed to determine the total area of LNA. For example, if an LNA is both within ROS and is in proposed POS or is a CCW, it only appears in the ROS column. In this way, a clearer picture of potential protection mechanisms can be determined.

Table 8: Proposed protection targets by precinct

Precinct details					Local Natural Area details (ha)						Protection (ha)				
Precinct Name	Prec. Category	Total LNA (ha)	Total NA (ha)	Precinct area (ha)	A. Regional Open Space (ROS)	B. POS proposed in approved ODP (ha)	C. Conservation Category Wetlands (CCW)	D. Peel Regionally Significant Areas (Swan)	E. Surrogate for Riparian vegetation	F. Vegetated REW (ha)	Proposed protection target (urban, rural res. & light)	Indicative protection target (rural & heavy industry)	Total LNA Protection (incl. ROS)	Existing Public (DEC) Cons. Estate	Total protection (existing & proposed) (ha)
1. Nambeelup Central	A	485.8	496.6	2024.6	0.1	109.0	95.1	142.7	0.0	0.0	346.9		346.9	10.8	357.7
2. Golden Lakeview Rural Residential	C	199.0	199.0	1055.2	0.0	108.3	0.1	28.2	15.0	2.3	153.9		153.9	0.0	153.9
3. Keysbrook Sands	F	120.8	120.8	927.0	0.0	0.0	0.8	0.7	24.2	12.0		64.7	64.7		64.7
4. Point Grey	B	128.4	128.4	370.1	61.4	21.4					82.8		82.8		82.8
5. Stakehill West	A	36.9	36.9	69.6	0.0	0.0	0.0	0.0	0.0	0.0	15.0		15.0	0.0	15.0
6. Alcoa	F	1620.0	1620.0	6702.4	0.0	0.0	91.5					88.8	88.8		88.8
7. Ravenswood West	A	22.4	22.4	736.5	0.0	0.0	1.1	0.1	0.3	0.9	16.8		16.8	0.0	16.8
8. Fairbridge Cluster Farm	C	4.4	4.4	109.2	0.0	0.0	2.5	0.9	0.8	0.0	4.4		4.4		4.4
9. Readheads North	C	64.7	64.7	652.7	0.0	0.0	13.3	13.2	8.1	3.3		37.9	37.9		37.9
10. Avoca-Shanns	C	73.8	73.8	929.9	0.0	0.0	32.2	22.8	1.5	0.0	73.2		73.2		73.2
11. Dandalup Springs Rural Residential	D	0.6	0.6	164.9	0.0	0.0	0.0	0.6	0.0	0.0	0.6		0.6		0.6
12. Dandalup West Rural Residential	D	2.8	2.8	164.4	0.0	0.0	0.0	0.0	2.3	0.0	2.8		0.0		0.0
13. Nambeelup Home Business Park	C	112.7	112.7	229.1	0.0	0.0	0.0	85.4	2.5	0.3	0.0		0.0	0.0	0.0



Precinct details					Local Natural Area details (ha)						Protection (ha)				
Precinct Name	Prec. Category	Total LNA (ha)	Total NA (ha)	Precinct area (ha)	A. Regional Open Space (ROS)	B. POS proposed in approved ODP (ha)	C. Conservation Category Wetlands (CCW)	D. Peel Regionally Significant Areas (Swan)	E. Surrogate for Riparian vegetation	F. Vegetated REW (ha)	Proposed protection target (urban, rural res. & light)	Indicative protection target (rural & heavy industry)	Total LNA Protection (incl. ROS)	Existing Public (DEC) Cons. Estate	Total protection (existing & proposed) (ha)
14. North Dandalup Townsite	B	0.1	0.1	215.8	0.0	0.0	0.0	0.0	0.0	0.0			0.0	0.0	0.0
15. Ravenswood Waters	B	6.8	6.8	99.3	0.0	0.0	0.0	0.0	4.5	0.0	0.0	0.0	0.0		0.0
16. Old Mandurah Road South	B	9.3	9.3	66.1	3.3	0.0	1.9	0.6	0.0	0.0	5.8		5.8		5.8
17. Nambeelup Industrial	B	14.7	14.7	174.7		4.3		5.5			9.8		9.8		9.8
18. Furnissdale Townsite	B	18.2	18.2	66.5	0.0	0.0	5.4	2.6	0.0	0.0	8.0		8.0	0.0	8.0
19. Furnissdale Rural Residential	A	243.7	243.7	619.4	16.9	100.2	38.7			0.0	155.8		155.8	0.0	155.8
20. North Yunderup/Wilgie Creek	B			88.3											
21. Barragup/Furnissdale Commercial Area	A	4.8	4.8	28.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
22. Serpentine Lakes Rural Residential	D	630.1	881.6	2676.5	212.9.7	0.1	34.1	62.7	4.9	6.7	212.9		212.9	251.5	464.4
23. Ravenswood Waters East	A	2.4	2.4	27.0	0.0	0.0	0.0	0.0	2.4	0.0	2.4		0.0	0.0	0.0
24. Austin Lakes	B	38.4	38.4	393.6	0.3	0.0	22.2				22.5		10.0		10.0
25. South Yunderup Rural Residential	A	44.1	44.1	205.9	15.6	0.0	7.2	6.1	0.1	1.4			28.9	0.0	28.9
26. Nambeelup South Rural	E	94.1	94.1	322.6	0.0	24.5	0.0	63.8	2.4	0.0	24.5		24.5		24.5
27. Lot 1 Lakes Road	E	22.9	22.9	51.6	0.0	0.1	0.0	10.9		8.8	19.8		19.8	0.0	19.8
28. Keralup	A	395.4	395.4	1644.8	0.0	0.0	45.0	90.3	25.4	87.8	248.5		248.5	0.0	248.5
29. Yangedi Rural	E	664.9	664.9	2921.4	0.0	0.0	39.8	336.7	74.1	30.1		49.5	49.5		49.5
30. Nirimba/West Pinjarra	A	149.6	149.8	2542.9	7.0	0.0	28.2	26.8	19.7	6.7	143.3		143.3	0.2	143.5
31. Greenlands Road	A	20.6	20.6	1147.3	0.0	0.0	1.2	0.0	2.6	0.0	20.6		20.6		20.6
32. Pinjarra Industrial Estate	A	23.9	37	220.9	16.1	0.0	0.1	7.3	0.0	0.2	23.7		23.7	13.9	37.6

Precinct details					Local Natural Area details (ha)						Protection (ha)				
Precinct Name	Prec. Category	Total LNA (ha)	Total NA (ha)	Precinct area (ha)	A. Regional Open Space (ROS)	B. POS proposed in approved ODP (ha)	C. Conservation Category Wetlands (CCW)	D. Peel Regionally Significant Areas (Swan)	E. Surrogate for Riparian vegetation	F. Vegetated REW (ha)	Proposed protection target (urban, rural res. & light)	Indicative protection target (rural & heavy industry)	Total LNA Protection (incl. ROS)	Existing Public (DEC) Cons. Estate	Total protection (existing & proposed) (ha)
33. Ravenswood Central	A	139.9	139	1162.9	0.0	0.0	57.3	16.5	13.3	7.1	94.2		94.2	0.0	94.2
34. Greater North Pinjarra	A	45.4	45	1106.4	0.7	0.0	13.9	4.8	11.6	0.0	45.4		45.4		45.4
35. Pinjarra Townsite	A	147.5	161	873.6	48.9	0.0	5.4	52.2	3.8	6.5	117.7		117.7	14.1	131.8
36. Birchmont/Herron Point Rural	E	1514.1	2903	9705.9	837.5	0.0	112.4	305.4	23.5	6.7	837.5	77.6	915.0	1389.0	2304.0
37. Blythewood/West Pinjarra Rural	E	298.2	298	5856.4	0.0	0.0	12.8	132.9	2.7		0.0	29.8	29.8	0.0	29.8
38. Coolup Rural	E	1206.9	1316	11221.0							0.0	120.7	120.7	109.3	230.0
39. North Dandalup Rural	E	82.0	82	1905.2	0.0	0.0	14.3	17.9	6.5	0.0		8.0	8.0	0.0	8.0
40. Ravenswood Rural North	E	561.1	561	4303.3	0.0	0.0	135.6	256.3	33.6	9.7		52.1	52.1		52.1
41. Ravenswood North	A	76.8	76	772.1	0.0	0.0	3.4	0.0	9.7	9.6	22.7		22.7		22.7
42. Blue Ranges Rural Residential	D	38.1	38	264.6	0.0	0.0	0.0	31.0	0.0	0.0	0.0		0.0		0.0
43. Hills Landscape North	E	1598.3	1659	6037.3	0.1	0.0	27.5	61.6	719.2	0.0	0.1	83.0	83.1	57.8	140.9
44. Hills Landscape South/Meelon	E	1935.6	1956	12017.8	4.9	0.0	139.0	483.6	666.4	0.0	4.9	97.6	102.4	17.1	119.5
45. Huntly/Myara State Forest	E	525.5	54546	60995.2	59.3						59.3		59.3	117.4	176.7
46. Dwellingup State Forest	E	1357.1	21343	24432.3	22.9						22.9		22.9	2386.0	2408.9
0. Outside Precincts		785.4	1427	1808.7	612.5						612.5		612.5	591.5	1204.0
		<b>15568</b>	<b>92087</b>	<b>170111</b>	<b>1920</b>	<b>367</b>	<b>981</b>	<b>2315</b>	<b>1681</b>	<b>200</b>	<b>3397</b>	<b>709</b>	<b>4131</b>	<b>4958</b>	<b>9486</b>

Table 9: LNA Protection percentages by precinct

Precinct details					Natural Area Protection details									
Precinct Name	Prec. Category	Total LNA (ha)	Total NA (ha)	Precinct area (ha)	Proposed protection target (urb., rural res. & light ind.)	Indicative protection target (rural & heavy industry)	Total LNA Protection (incl ROS)	Existing DECCON	Total protection (existing & proposed) (ha)	Cleared or Likely Cleared	Proposed retention	% Protection of all remaining NA (DEC +proposed)	% precinct area covered by protected NA (DEC + LNA prpsd protection)	% precinct area (not including DEC & ROS) covered by
1. Nambeelup Central	A	485.8	496.6	2024.6	346.9		346.9	10.8	357.7		138.9	72%	18%	17%
2. Golden Lakeview Rural Residential	C	199.0	199.0	1055.2	153.9		153.9	0.0	153.9	0.0	45.1	77%	15%	15%
3. Keysbrook Sands	F	120.8	120.8	927.0		64.7	64.7		64.7	48.2	7.9	54%	7%	7%
4. Point Grey	B	128.4	128.4	370.1	82.8		82.8		82.8	45.6	0.0	64%	22%	7%
5. Stakehill West	A	36.9	36.9	69.6	15		15	0.0	15	21.9	1.2	41%	22%	22%
6. Alcoa	F	1620.0	1620.0	6702.4		88.8	88.8		88.8	377.0	1154.2	5%	1%	1%
7. Ravenswood West	A	22.4	22.4	736.5	16.8		16.8	0.0	16.8	5.6	0.0	75%	2%	2%
8. Fairbridge Cluster Farm	C	4.4	4.4	109.2	4.4		4.4		4.4	0.0	0.0	100%	4%	4%
9. Readheads North	C	64.7	64.7	652.7		37.9	37.9		37.9	0.0	26.8	59%	6%	6%
10. Avoca-Shanns	C	73.8	73.8	929.9	73.2		73.2		73.2	0.0	0.6	99%	8%	8%
11. Dandalup Springs Rural Residential	D	0.6	0.6	164.9	0.6		0.6		0.6	0.0	0.0	100%	0%	0%
12. Dandalup West Rural Residential	D	2.8	2.8	164.4	2.8		0.0		0.0	0.0	2.8	0%	0%	0%
13. Nambeelup Home Business Park	C	112.7	112.7	229.1	0.0		0.0	0.0	0.0	14.6	98.1	0%	0%	0%
14. North Dandalup Townsite	B	0.1	0.1	215.8			0.0	0.0	0.0	0.1	0.0	0%	0%	0%
15. Ravenswood Waters	B	6.8	6.8	99.3	0.0	0.0	0.0		0.0	6.8	0.0	0%	0%	0%
16. Old Mandurah Road South	B	9.3	9.3	66.1	5.8		5.8		5.8	3.5	1.7	62%	9%	9%
17. Nambeelup Industrial	B	14.7	14.7	174.7	9.8		9.8		9.8		4.9	67%	6%	6%

Precinct details					Natural Area Protection details									
Precinct Name	Prec. Category	Total LNA (ha)	Total NA (ha)	Precinct area (ha)	Proposed protection target (urb., rural res. & light ind.)	Indicative protection target (rural & heavy industry)	Total LNA Protection (incl ROS)	Existing DECCON	Total protection (existing & proposed) (ha)	Cleared or Likely Cleared	Proposed retention	% Protection of all remaining NA (DEC +proposed)	% precinct area covered by protected NA (DEC + LNA prpsd protection)	% precinct area (not including DEC & ROS) covered by
18. Furnissdale Townsite	B	18.2	18.2	66.5	8.0		8.0	0.0	8.0	10.2	0.0	44%	12%	12%
19. Furnissdale Rural Residential	A	243.7	243.7	619.4	155.8		155.8	0.0	155.8	87.9	0.0	64%	25%	29%
20. North Yunderup/Wilgie Creek	B			88.3								0%	0%	0%
21. Barragup/Furnissdale Commercial Area	A	4.8	4.8	28.2	0.0		0.0	0.0	0.0	4.8	0.0	0%	0%	0%
22. Serpentine Lakes Rural Residential	D	630.1	881.6	2676.5	212.9		212.9	251.5	457.2	0.0	417.2	53%	17%	0%
23. Ravenswood Waters East	A	2.4	2.4	27.0	2.4		0.0	0.0	0.0	1.4	1.0	0%	0%	0%
24. Austin Lakes	B	38.4	38.4	393.6	22.5		10.0		10.0	4.6	23.8	26%	3%	2%
25. South Yunderup Rural Residential	A	44.1	44.1	205.9			28.9	0.0	28.9	15.2	0.0	66%	14%	7%
26. Nambeelup South Rural	E	94.1	94.1	322.6	24.5		24.5		24.5		69.6	26%	8%	8%
27. Lot 1 Lakes Road	E	22.9	22.9	51.6	19.8		19.8	0.0	19.8	0.0	3.1	86%	38%	38%
28. Keralup	A	395.4	395.4	1644.8	248.5		248.5	0.0	248.5	146.9	0.0	63%	15%	15%
29. Yangedi Rural	E	664.9	664.9	2921.4		49.5	49.5		49.5	0.0	615.4	7%	2%	2%
30. Nirimba/West Pinjarra	A	149.6	149.8	2542.9	143.3		143.3	0.2	143.5	6.5	0.0	96%	6%	5%
31. Greenlands Road	A	20.6	20.6	1147.3	20.6		20.6		20.6	0.0	0.0	100%	2%	2%
32. Pinjarra Industrial Estate	A	23.9	37	220.9	23.7		23.7	13.9	37.6	0.0	0.2	99%	17%	4%
33. Ravenswood Central	A	139.9	139	1162.9	94.2		94.2	0.0	94.2	45.7	0.0	67%	8%	8%
34. Greater North Pinjarra	A	45.4	45	1106.4	45.4		45.4		45.4	0.0	0.0	100%	4%	4%
35. Pinjarra Townsite	A	147.5	161	873.6	117.7		117.7	14.1	131.8	29.9	0.0	82%	15%	8%



Precinct details					Natural Area Protection details									
Precinct Name	Prec. Category	Total LNA (ha)	Total NA (ha)	Precinct area (ha)	Proposed protection target (urb., rural res. & light ind.)	Indicative protection target (rural & heavy industry)	Total LNA Protection (incl ROS)	Existing DECCON	Total protection (existing & proposed) (ha)	Cleared or Likely Cleared	Proposed retention	% Protection of all remaining NA (DEC +proposed)	% precinct area covered by protected NA (DEC + LNA prpsd protection)	% precinct area (not including DEC & ROS) covered by
36. Birchmont/Herron Point Rural	E	1514.1	2903	9705.9	837.5	77.6	363.6	1389.0	1752.6	0.0	599.0	79%	24%	1%
37. Blythewood/West Pinjarra Rural	E	298.2	298	5856.4	0.0	29.8	29.8	0.0	29.8	0.0	268.4	10%	1%	1%
38. Coolup Rural	E	1206.9	1316	11221.0	0.0	120.7	120.7	109.3	230.0	0.0	1086.2	17%	2%	1%
39. North Dandalup Rural	E	82.0	82	1905.2		8.0	8.0	0.0	8.0	0.0	74.0	10%	0%	0%
40. Ravenswood Rural North	E	561.1	561	4303.3		52.1	52.1		52.1	0.0	509.0	9%	1%	1%
41. Ravenswood North	A	76.8	76	772.1	22.7		22.7		22.7	54.1	0.0	30%	3%	3%
42. Blue Ranges Rural Residential	D	38.1	38	264.6	0.0		0.0		0.0	9.5	28.6	0%	0%	0%
43. Hills Landscape North	E	1598.3	1659	6037.3	0.1	83.0	83.1	57.8	140.9	0.0	1518.2	8%	2%	1%
44. Hills Landscape South/Meelon	E	1935.6	1956	12017.8	4.9	97.6	102.4	17.1	119.5	0.0	1836.2	6%	1%	1%
45. Huntly/Myara State Forest	E	525.5	54546	60995.2	59.3		59.3	117.4	176.7	0.0	54369.8	0%	0%	0%
46. Dwellingup State Forest	E	1357.1	21343	24432.3	22.9		22.9	2386.0	2408.9	0.0	18934.2	11%	10%	0%
0. Outside Precincts		785.4	1427	1808.7	612.5		612.5	591.5	1204.0	0.0	223.1	84%	67%	0%

Table 10: Precinct Protection Targets by vegetation complex<sup>12</sup>

				Vegetation complexes (Amount of hectares of LNA proposed to be protected in this Strategy) (Yellow shading indicates that LNA of this vegetation complex occurs in the Precinct)																	
Precinct Name	Prec Category	Total LNA in precinct	Precinct Protection Target (ha)	Bass Central & South	Cannington	Cottesloe Central &	Darling Scarp	Forrestfield	Guildford	Herdsmen	Serpentine River	Southern River	Swan	Vasse	Yoongarillup	Dwellingup 1	Helena 1	Murray 1	Yarrigil 1	No data	
1. Nambeelup Central	A	485.8	346.9	346.9																	
2. Golden Lakeview Rural Residential	C	199.0	153.9	73.5								80.4									
3. Keysbrook Sands	F	120.8	64.7	59.4					5.3												
4. Point Grey	B	128.4	82.7			58.7														24	
5. Stakehill West	A	36.9	15												15						
6. Alcoa	F	1620.0	88.8						86.1				2.7								
7. Ravenswood West	A	22.4	16.8	16.8																	
8. Fairbridge Cluster Farm	C	4.4	4.4					3.3	1.1												
9. Readheads North	C	64.7	37.9						37.9												
10. Avoca-Shanns	C	73.8	73.2						70.2			3									
11. Dandalup Springs Rural Residential	D	0.6	0.6						0.6												
12. Dandalup West Rural Residential	D	2.8	0																		
13. Nambeelup Home Business Park	C	112.7	0																		
14. North Dandalup Townsite	B	0.1	0																		
15. Ravenswood Waters	B	6.8	0																		
16. Old Mandurah Road South	B	9.3	5.8	5.8																	

<sup>12</sup> The following vegetation complexes which occur in the Shire of Murray are not shown in Table 15 as they have no LNA occurrences: Cooke, Dwellingup 2, Pindalup, Swamp, and Yarrigil 2.

				Vegetation complexes (Amount of hectares of LNA proposed to be protected in this Strategy) (Yellow shading indicates that LNA of this vegetation complex occurs in the Precinct)																
Precinct Name	Prec Category	Total LNA in precinct	Precinct Protection Target (ha)	Bass Central & South	Cannington	Cottesloe Central &	Darling Scarp	Forrestfield	Guildford	Herdsmen	Serpentine River	Southern River	Swan	Vasse	Yoongarillup	Dwellingup 1	Helena 1	Murray 1	Yarrigil 1	No data
17. Nambeelup Industrial	B	14.7	9.8	9.8																
18. Furnissdale Townsite	B	18.2	8	1.9										6.1						
19. Furnissdale Rural Residential	A	243.7	155.8	78.9										76.9						
20. North Yunderup/Wilgie Creek	B	0.0	0																	
21. Barragup/Furnissdale Commercial Area	A	4.8	0																	
22. Serpentine Lakes Rural Residential	D	630.1	212.9	67.3						145										
23. Ravenswood Waters East	A	2.4	0																	
24. Austin Lakes	B	38.4	10											10						
25. South Yunderup Rural Residential	A	44.1	28.9	3										25.9						
26. Nambeelup South Rural	E	94.1	24.5	24.5																
27. Lot 1 Lakes Road	E	22.9	19.8	19.8																
28. Keralup	A	395.4	248.5	248.5																
29. Yangedi Rural	E	664.9	49.5	11.9					25.8			11.8								
30. Nirimba/West Pinjarra	A	149.6	143.3		0.3				11.3				34.3	97.4						
31. Greenlands Road	A	20.6	20.6						20.6											
32. Pinjarra Industrial Estate	A	23.9	23.7	23.7																
33. Ravenswood Central	A	139.9	94.2	91.3										2.9						

				Vegetation complexes (Amount of hectares of LNA proposed to be protected in this Strategy) (Yellow shading indicates that LNA of this vegetation complex occurs in the Precinct)																
Precinct Name	Prec Category	Total LNA in precinct	Precinct Protection Target (ha)	Bass Central & South	Cannington	Cottesloe Central &	Darling Scarp	Forrestfield	Guildford	Herdsmen	Serpentine River	Southern River	Swan	Vasse	Yoongarillup	Dwellingup 1	Helena 1	Murray 1	Yarrigil 1	No data
34. Greater North Pinjarra	A	45.4	45.4						39.5				5.9							
35. Pinjarra Townsite	A	147.5	117.7	60.7					5.2				51.8							
36. Birchmont/Herron Point Rural	E	1514.1	914.9		187	367						65.9		280.3						14.4
37. Blythewood/West Pinjarra Rural	E	298.2	29.8		20				9.8											
38. Coolup Rural	E	1206.9	120.6		20.7				33.6		41.9	21.7	2.7							
39. North Dandalup Rural	E	82.0	8					2	6											
40. Ravenswood Rural North	E	561.1	52.1						26.4				25.7							
41. Ravenswood North	A	76.8	22.7	22.7																
42. Blue Ranges Rural Residential	D	38.1	0																	
43. Hills Landscape North	E	1598.3	83.1				40.1	43												
44. Hills Landscape South/Meelon	E	1935.6	102.4				51.2	51.2												
45. Huntly/Myara State Forest	E	525.5	59.3				5.2									7.5		5.8	40.8	
46. Dwellingup State Forest	E	1357.1	22.9													22.9				
Outside Precincts (LNA ROS)		785.4	612.2	190.7					3.1	81.4			73.3	215.7				1		47
LNA in Local Reserves (ha)			396.1	138	16.7		11.2	1.7	47.1	11	0	7.3	22.2	59.7	0	30	3.5	32.4	15.3	
<b>TOTAL LNA (ha)</b>		<b>15,568</b>	4527	1495	244	425	107	101	429	238	42	190	218	775	15	60	3.5	39	56	85



Table 11: Future vegetation complex protection levels resulting from Strategy implementation

Rows highlighted in green show the current level of local protection of each vegetation complex and the future level of local protection through implementation of the Strategy's Precinct Protection Targets.

	Total (ha)	Bass Central & South	Cannington	Cottesloe Central & South	Darling Scarp	Forrestfield	Guildford	Herdsmen	Serpentine River	Southern River	Swan	Vasse	Yoongarillup	Dwellingup 1	Helena 1	Murray 1	Yarrigil 1	No data
TOTAL LNA proposed for protection in this Strategy (ha)	4527	1495.1	244.8	425.9	107.7	101.2	429.6	238	41.9	190.1	218.6	775	15	60.4	3.5	39.2	56.1	85.4
Total current protection in DPAW Estate (ha)	4959	66.8	886.9	82	61.3	7.9	5.8	253.7	0	159	0	897	0	905.6	548.9	869.6	193.6	20.9
Total protection (current + proposed) (ha)	9486	1561.9	1131.7	507.9	169	109.1	435.4	491.7	41.9	349.1	218.6	1671	15	966	552.4	908.8	249.7	106.3
Pre-European extent in Shire of Murray (ha)	170105	13703	10497	1809	6651	5086	28555	1550	493	6556	4082	5128	273	44419	2399	9264	15080	0
Local protection % (current)	3%	0%	8%	5%	1%	0%	0%	16%	0%	2%	0%	17%	0%	2%	23%	9%	1%	
Local protection % (current + proposed)	6%	11%	11%	28%	3%	2%	2%	32%	8%	5%	5%	33%	5%	2%	23%	10%	2%	
Current remaining in Shire (ha)	92078	3057	1701	770	2996	557	1681	595	42	1525	566	1823	106	40281	2099	6768	13424	121
Current remaining in Shire (local %)	54%	22%	16%	43%	45%	11%	6%	38%	9%	23%	14%	36%	39%	91%	87%	73%	89%	
Current remaining LNA in Shire (ha)	15,568	2990	814	688	2670	549	1675	341	42	1366	566	926	106	577	739	669	745	98

## 11. Targets to meet Objective 4: Ecological linkage

Objective 4 is to “Protect and enhance ecological connectivity throughout the Shire. These linkages assist in the maintenance of species and biodiversity throughout the Shire by enabling native plants and animals to continue to survive, move, feed, reproduce, adapt and evolve.”

Ecological linkages are preferably made up of continuous areas of bushland (e.g. wildlife corridors). However, discontinuous patches of bushland, or stepping stones, can be of significant ecological linkage value too, and may be more appropriate in intensive development settings.

When local bushland is cleared not only is there a direct loss of fauna and fauna habitat, but there is an impact on the fauna that utilises or may occur in surrounding habitat and bushland in proximity to the site. This is because bushland in proximity to a site:

- a. Provides additional or key habitat for fauna which may use nearby bushland areas for other purposes (breeding, feeding, roosting);
- b. Provides a refuge for fauna or flora where a nearby bushland areas has been burnt or undergone some other catastrophic event;
- c. Provides seed store or juvenile animals to repopulate a nearby bushland area where local extinction has occurred; and
- d. Provides shelter to enable fauna to move through the landscape when escaping from a predator or moving to other parts of their home range.

Ecological linkage on the coastal plain parts of the Shire has been significantly reduced due to extensive clearing, and on average only 20% of the original vegetation remains. Protecting remaining vegetation and revegetation are both important to protect ecological connectivity.

The maintenance of ecological connectivity is not legislated, but is encouraged through a number of Federal and State policies (EPA, 2008) and initiatives including the National Wildlife Corridors Plan (SEWPC, 2012a) and the South West Regional Ecological Linkages (Molloy *et al*, 2009, EPA, 2009).

In this Strategy, the Shire’s proposed aim is to maintain ecological connectivity at the regional and local scales at 2013 levels or better.

Regional connectivity has been assessed as part of the South West Regional Ecological Linkages (SWREL) Technical Report and the Regional Framework for the Perth and Peel Regions. The SWREL report identified regional ecological connectivity axis lines, as shown in Figures 17 and 18. Natural areas within 250 m either side of these lines is a priority for protection and restoration. Strategic revegetation within these axis lines is also a priority where resources permit. Figures 17 and 18 also show the Peel Regionally Significant Natural Areas included within Swan Bioplan sites.



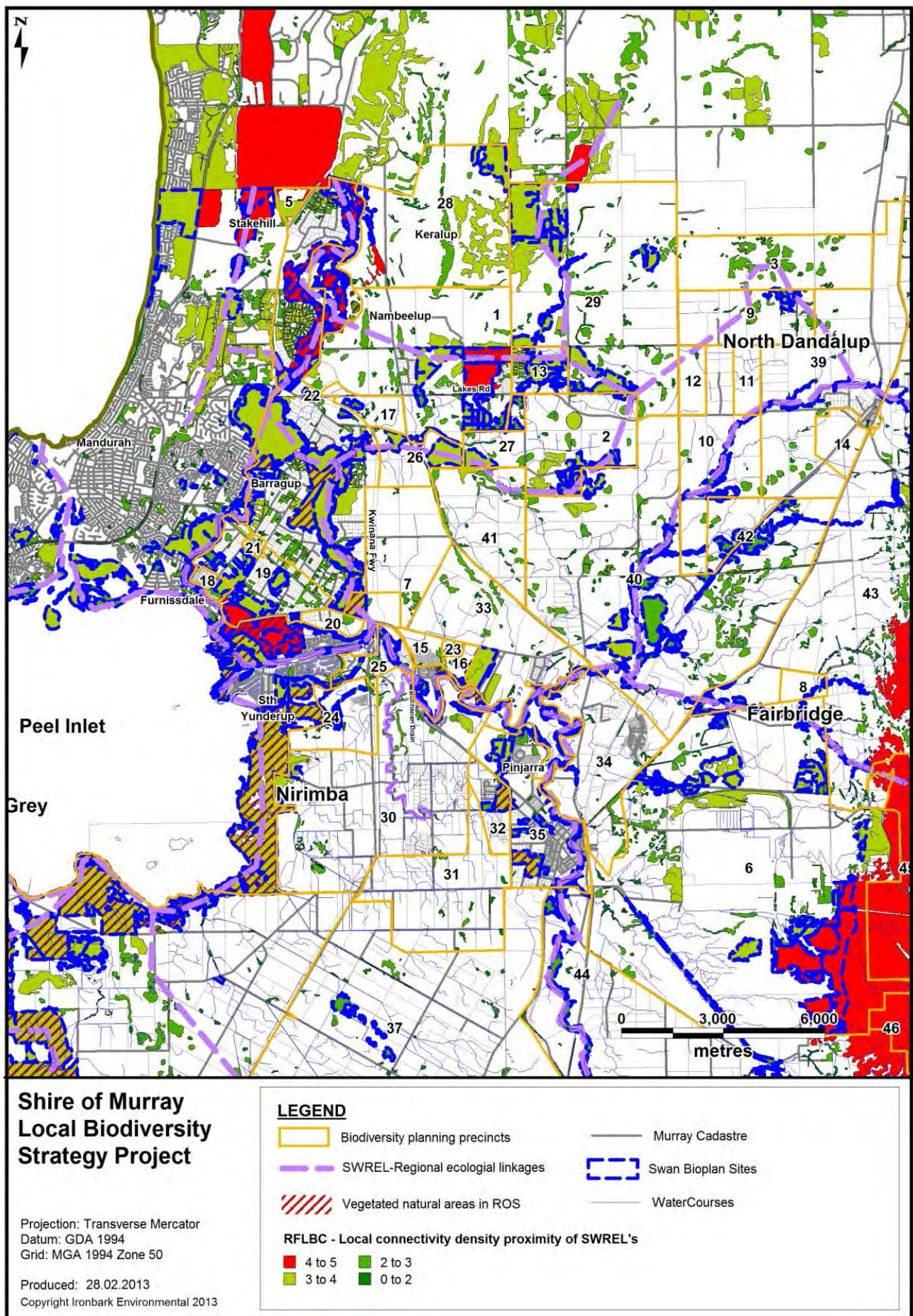


Figure 5: Ecological Linkages North



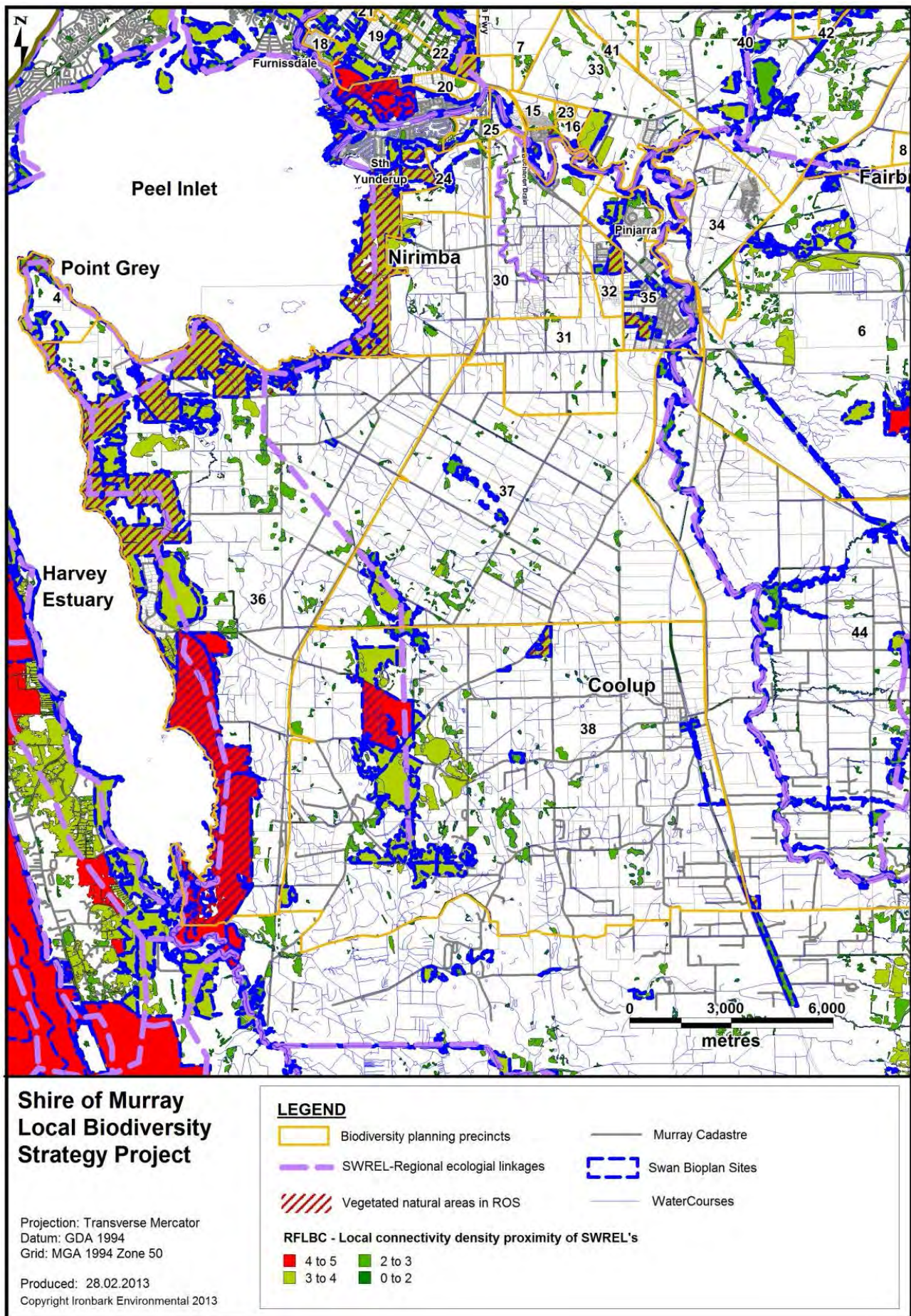


Figure 6: Ecological Linkages South



## 11.1 Proposed targets to protect ecological connectivity

Three targets are proposed to maintain or improve ecological connectivity at current (2013) levels within and around the Shire. The achievement of these targets will protect ecological connectivity as well as other ecological values (i.e. Targets EC1, EC2 and EC3 are to be achieved in addition to Precinct Protection Targets. Achievement of the other targets in the Strategy will contribute towards EC1, EC2 and EC3).

**TARGET EC1:** Where subject to urban, light industrial, rural residential or other intensive rezoning, protect all LNA within 250 m of a South West Regional Ecological Linkage axis line.

**TARGET EC2:** Where proposed scheme amendments, structure plans or subdivision includes land within 250 m of a South West Regional Ecological Linkage, and gaps of greater than 500 m exist between vegetation patches on or adjacent to the site, consider opportunities for revegetation to improve ecological connectivity.

**(Note:** This can be achieved as part of implementation of the Shire's Vegetation Management LPP and Water Sensitive Urban Design LPP. For revegetation to create functional and resilience habitat, it should be designed in accordance with the guidelines included in Del Marco *et al.* (2004).)

**TARGET EC3:** Where rezoning and development of structure plans is proposed, protect all other LNA.

**Note:** Where Target EC3 cannot be met, ensure that proposed development of relevant patches protects sufficient ecologically viable natural areas within the Site to maintain ecological linkage levels within and adjacent to the site at pre-development levels. To meet Target EC3 where an LNA cannot be protected in full, then proponents must show how ecological connectivity will be maintained by part protection of the LNA and revegetation though built up areas. In doing this, proponents should demonstrate that they meet the following criteria (a and b):

- a. Areas of bushland are to be retained and protected within ecologically viable areas where possible to ensure that no new gaps of more than 100 metres<sup>13</sup> are created between wetlands/rivers and protected upland bushland. This is to provide additional upland habitat in proximity to rivers and wetlands, for species such as frogs, turtles, reptile faunal groups, and bandicoots.
- b. On the remainder of the site, all or parts of existing LNA are to be retained and protected within ecologically viable areas where possible to ensure that no new gaps of 500 metres<sup>14</sup> or more are created between bushland areas on the site or in proximity to the site.

Figure 19 illustrates how the 100 metres and 500 metre criteria (criteria a and b respectively) could be applied on a hypothetical development site.

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<sup>13</sup> Distances of 100 metres and 500 metres are recognised as threshold distances beyond which there are significant reductions in usage by native fauna (Molloy *et al.*, 2009, Del Marco *et al.*, 2004).

<sup>14</sup> 500 metres is recognised as a threshold distance beyond which there is significantly less usage by smaller fauna (Molloy *et al.*, 2009).



All retained and protected LNA must meet or exceed standards of moderate ecological viability in regards to size, shape, condition, etc. As a general rule, in urban and industrial zones, protected bushland areas should contain at least 4 ha of vegetation in Good or better condition and be of compact shape. Ideally the largest possible area should be protected. Where less than 4 ha of vegetation in Good or better condition are not available, then bushland restoration (preferred) or revegetation can be used to achieve the 4 ha minimum.

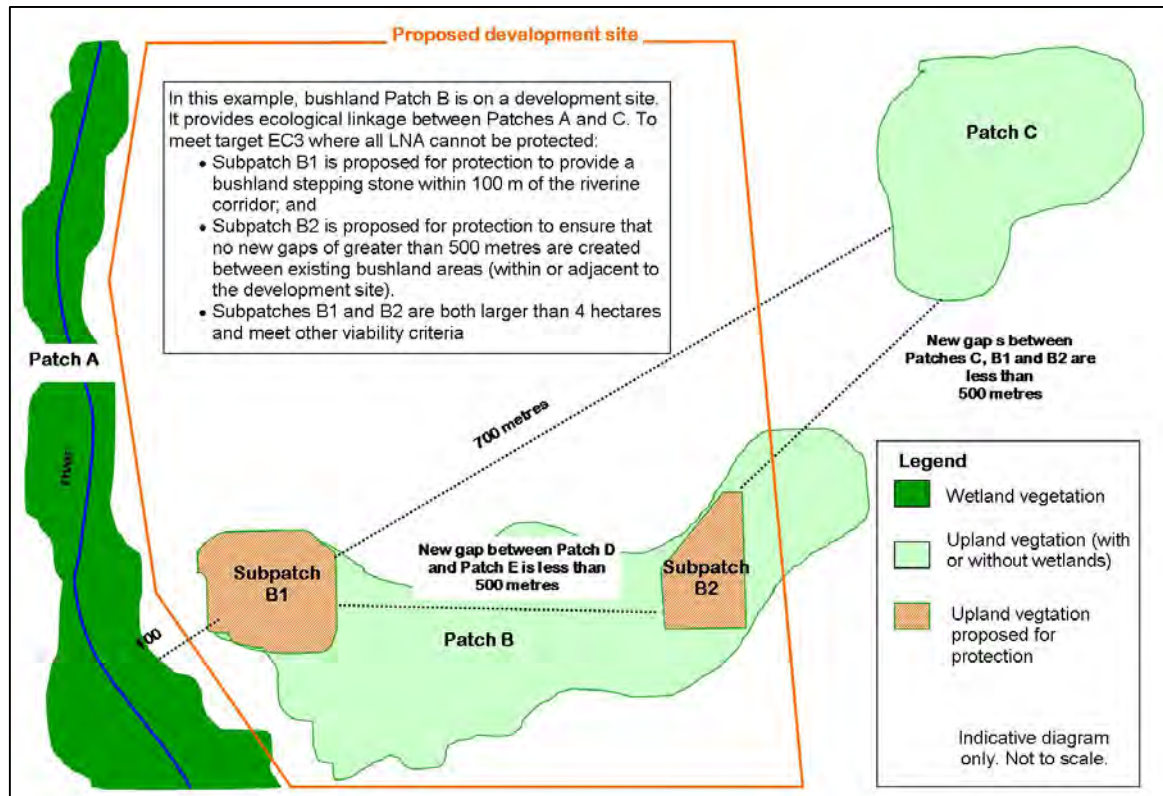


Figure 7: Example showing how Target EC3 may be achieved on a proposed development site.

Compliance with criteria (a) and (b) is to be demonstrated:

- Through simple graphical methods, such as is illustrated in Figure 19; or
- In more complex situations, through a GIS analytical method, such as the Proximity Analysis Tool developed by the South West Regional Ecological Linkages Project or the Regional Framework connectivity (PBP, 2012b), to show the linkage value of bushland on the site and in proximity, under pre-development and post-development conditions (Molloy *et al*, 2009).

In most cases, ecological linkage is likely to be one of a number of factors to assist in the selection and design of protected areas. These factors include the achievement of other Targets as specified in this Report and the design of protected areas for ecological viability (e.g. protected area size, shape, condition etc.).

The intent of Targets EC1 to EC3 is to:

- i. Protect all vegetation at least within the 500 m SWREL regional ecological linkages axis lines,
- ii. Increase connectivity on SWREL regional ecological linkages through revegetation that may already occur to meet existing Shire Local Planning Policies;
- iii. Maintain stepping stones of protected upland bushland within 100 metres of rivers/wetlands, and
- iv. ensure than no new gaps of greater than 500 metres are created between existing bushland areas in the Shire.
- v. Increase connectivity between newly protected areas not within SWREL through revegetation and vegetation retention to improve long term viability.

## 12. Targets to meet Objective 5: Bushland in local reserves

Objective 5 is to:

“Protect and manage LNA on local reserves to:

- a) maintain their current levels of species diversity, or where degraded, increase diversity through regeneration and revegetation;
- b) maintain or improve vegetation condition and maintain habitat diversity; and
- c) support and encourage compatible passive recreational uses.

### 12.1 Existing local reserves managed by the Shire

There are 494 ha of bushland in approximately 105 local Public Recreation/Conservation/Foreshore reserves in the Shire of Murray. These reserves are scattered throughout the Shire and cover a total area of 1129 ha. They include bushland, wetlands, and riverine and estuarine areas. (e.g. Herron Point Reserve, Murray River Reserves and the Coolup Gun Club Reserve). The reserves are shown in Figures 20 and 21 and listed in Appendix K.

The Shire is responsible for the general care and maintenance of these reserves, including the control of Declared Plants (weeds) and the installation of firebreaks. Over the past 5 years the Shire has also commenced a program of assessing the environmental condition of some of the most environmentally significant of these reserves. These assessments were carried out by experienced botanists using the Natural Area Initial Assessment Templates (Molloy *et al*, 2007).

As the Shire moves into a period of high population growth, there are four priorities with regard to local natural area reserves:

1. New local reserves created as part of subdivision processes, and which are created to protect bushland or other natural areas, should:
  - a. have a designated purpose on their title/management order which includes Conservation (e.g. Recreation and Conservation, Waterways and Conservation etc);
  - b. Developers/Proponents of subdivisions should be required to prepare and implement an environmental management plan for these new reserves to restore and protect their environmental values. This requirement should be agreed as early as possible in the planning assessment process (e.g. If possible, included as a requirement at the Scheme Amendment Stage). This management plan should be implemented during the development stages of new subdivisions.
2. Ecological assessments of existing local reserves which contain at least 2 ha of bushland or other natural areas should be conducted as funds permit. The assessment can be carried out using the Natural Area Initial Assessment Template provided by the WA Local Government Association (Molloy *et al*, 2007). A lower priority is to assess reserves with between 1 and 2 ha of bushland.
3. The Shire will, as funds permit, prepare and implement a strategic reserves management plan for its most significant bushland and riverine reserves. This may ensure that greater protection of existing reserves is achieved more efficiently.

4. The Shire will conduct a review of existing reserves with significant biodiversity values to ensure that their environmental values are adequately protected. This includes a review of the purpose and designation of the reserve. Where appropriate, the reserve's designated purpose in the Shire's local planning scheme should be amended to include conservation (e.g. Recreation and Conservation, Waterways and Conservation etc.).
5. For all proposed Local Conservation Reserves, apply to the Department of Regional Development and Lands for a change in the purpose of the management order/ vesting.

## **12.2 Target for protection of bushland in existing local reserves.**

The key long-term target for protection of bushland in existing local reserves managed by the Shire is to include at least 396 ha of bushland in Local Conservation Reserves. Most of the bushland in local reserves is designated for the purpose of Recreation or for other purposes. This does not afford bushland protection in the long-term. Part of the process of re-designating reserve purposes will be assessing the long-term requirements of the Shire, the needs of community user groups and the legislative requirements in relation to clearing.

## **12.3 Future POS**

Future development of urban, light industrial and rural residential areas (within Category A, B and C precincts) may add a further 368 ha of LNA to either local POS, or to a lesser extent, regional reserves.<sup>15</sup>

In addition, there is potential for a further 1224 ha of LNA would be protected to meet the targets proposed in this strategy<sup>16</sup>. Potentially, this future and proposed LNA protection means that an additional 1592 ha of bushland, wetland and foreshore may be included in public lands.

Management of a large portion of this LNA is likely to rest with the Shire. The Shire needs to plan strategically for this asset management responsibility, and should commence discussions with the State and Federal Governments in regards to resourcing requirements. Most of this 1592 ha of LNA is likely to be of state and national environmental significance.

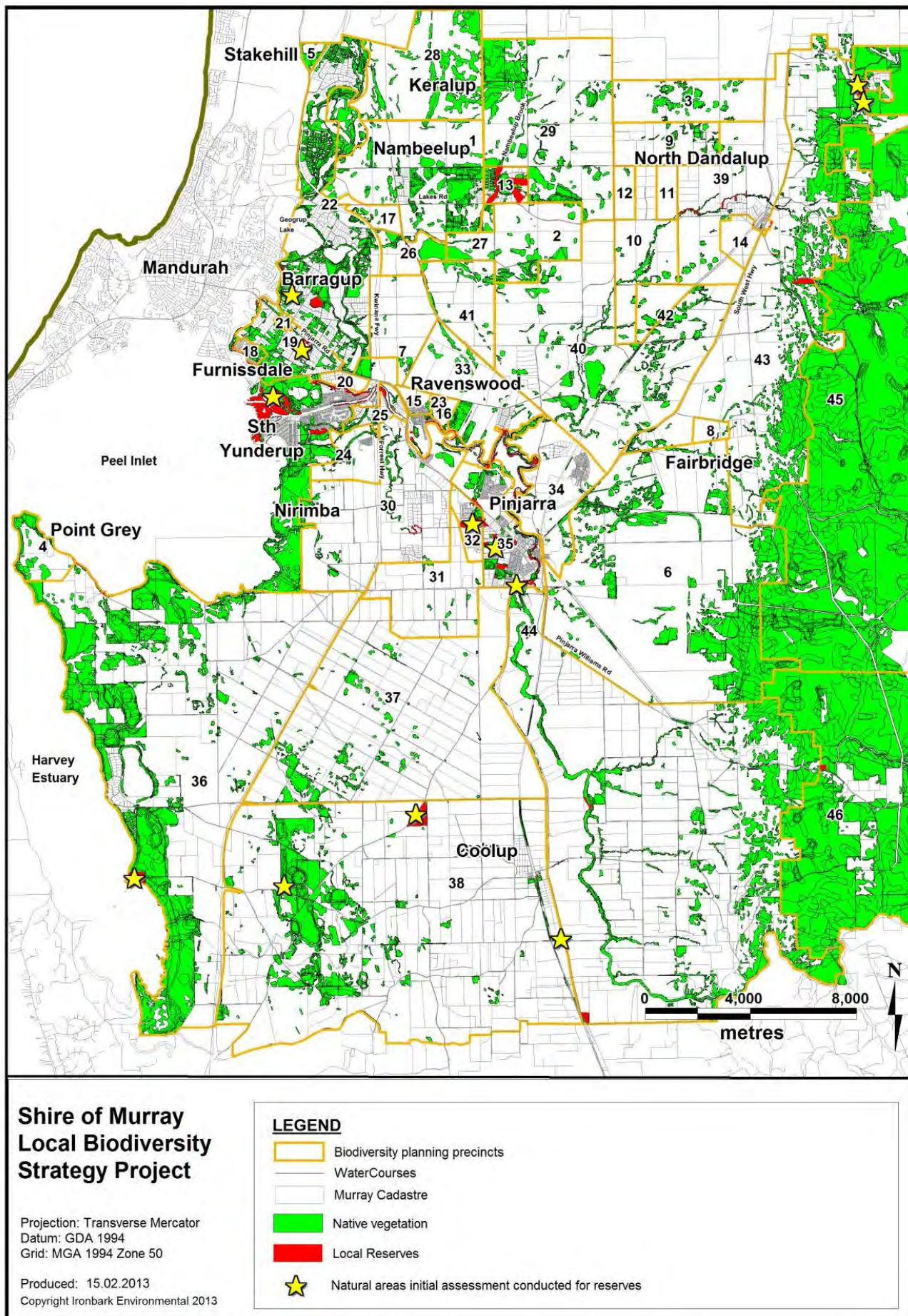
The Shire will need to plan proactively for the protection of this LNA and give consideration to selecting natural areas in good or better condition. The better the condition of bushland to be protected, the less the ongoing investment required from Council. In addition, development of a management plan for protected LNA and its implementation during subdivision development (e.g. fencing, clearing out of rubbish, signage, weed control), will ensure that the future need for investment from the Shire is minimised.

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<sup>15</sup> The amount of 368 ha of LNA has been calculated based on approved and draft ODPs as at early 2013.

<sup>16</sup> The amount of 1224 ha of LNA has been calculated based on full development of all precincts in Categories A to D.







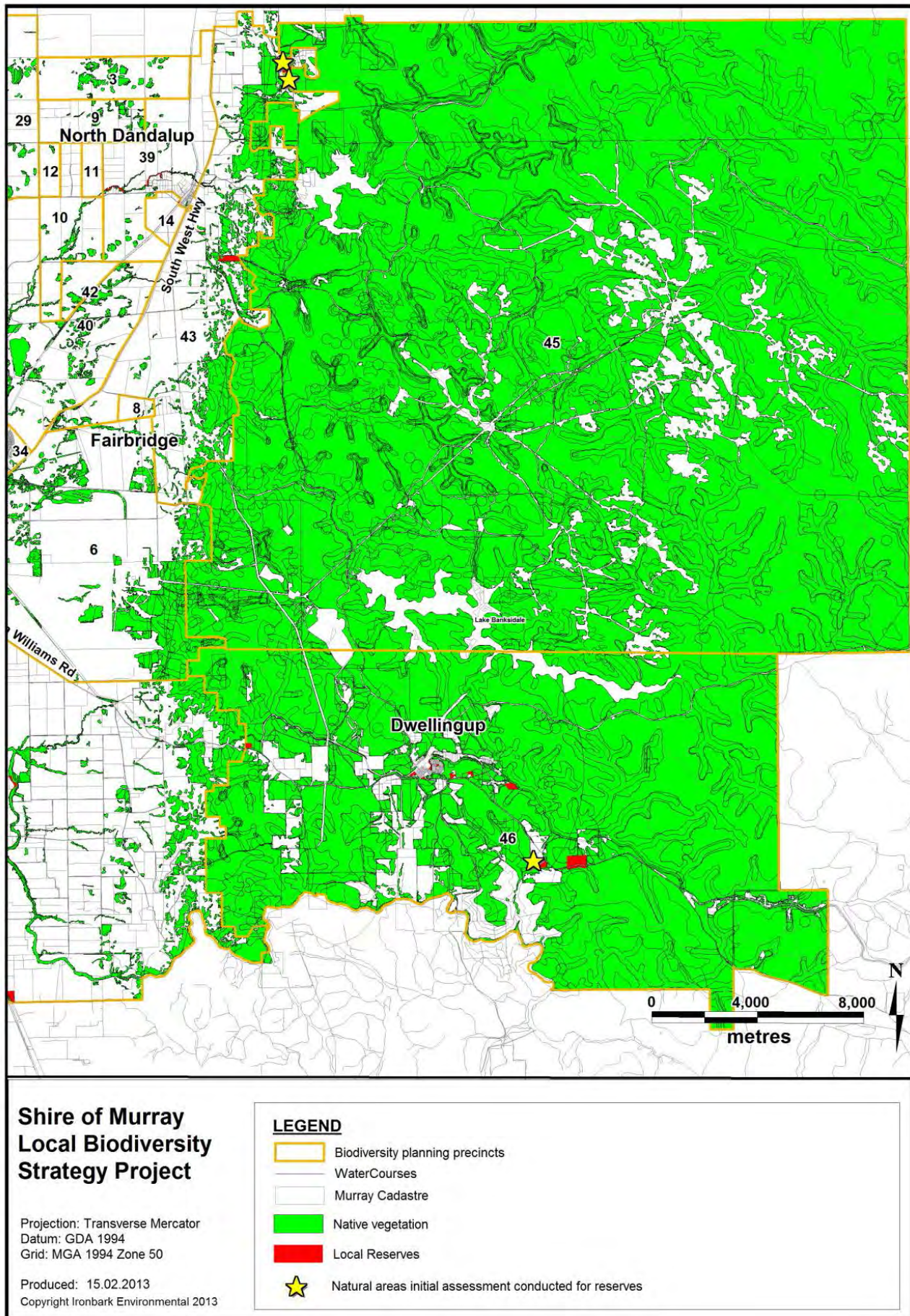


Figure 9: Local reserves (east)

## **13. Achieving bushland protection**

To achieve the targets in this Strategy, the Shire will need to consider a suite of strategies to achieve protection of local natural areas. A number of strategies are described below as they may relate to the natural areas remaining in the Shire. The Shire may adopt some of the strategies as it see fit, with due regard to the comments received during the public submissions period.

### **13. 1 Ecological information in the planning system.**

Professional ecological assessment with full disclosure of ecological values at the earliest possible stage of planning is critical to biodiversity conservation. This has not always been possible in the past for various reasons.

It will be important for the Shire clarify the level of ecological information that it expects from proponents when considering various types of planning and development proposals. The level of information should generally be commensurate with the risk posed by the proposal to biodiversity and the environment. This level of risk can be gauged by the potential impact that a proposal would have on achieving the targets proposed in this strategy.

The Shire's objectives in requesting ecological information work will be to:

- maximise the identification and protection of significant natural areas, and
- ensure protected areas meet or exceed standards of ecological viability for long-term health and maintenance.

The standards of ecological assessment should refer to accepted methodologies including:

- a. EPA Guidance Statements 51 and 56 on standards of flora and fauna assessment (Environmental Protection Authority, 2003b & 2003c);
- b. Mapping and assessment of vegetation communities and condition using the methodology of Keighery (1994);
- c. Assessment of a proposals impact on ecological connectivity, to be undertaken using the SWBP Proximity Analysis Tool (Molloy *et al*, 2009); and
- d. Ecological viability assessment of proposed protected areas, using the methodology described in Del Marco *et al*. (2004).

The Shire will consider the need for a professional ecological assessment, generally in accordance with the above standards where a planning application may cause a direct or indirect impact on:

- Natural areas that are likely to meet at least one Specific Biodiversity Feature Target; or
- Natural areas that, if lost, would reduce the likelihood of achieving a Precinct Protection Target.



The Shire may provide guidance on when and what level of ecological information will be required through a local planning policy (See Section 13.4.1).

## **13.2 Protection mechanisms**

### **13.2.1 Existing Regional Open Space reservations**

1920 ha of the 4527 ha LNA protection target is within Regional Open Space reserves set in the Peel Region Scheme. Most of this vegetated LNA is associated with the Peel-Harvey Estuary and Serpentine and Murray Rivers. Under the provisions of the Peel Region Scheme, the purpose of ROS is “to protect the natural environment, provide recreational opportunities, safeguard important landscapes and provide for public access” (Peel Regional Scheme, Clause 10).

ROS will be protected by the State Government in the long-term, and where appropriate acquired. Approval to clear native vegetation on ROS is unlikely as the area’s environmental values are the very reason why reservation has occurred. The Shire, through this LBS, reinforces the importance of LNA on ROS, and has assumed that all native vegetation on ROS will be protected. Indeed, the conservation targets in this LBS assume that all LNA on ROS will be protected.

To give the greatest level of protection to native vegetation on ROS lands, the PRS recognises management plans prepared for ROS areas and endorsed by the Western Australian Planning Commission. These management plans can be used to control works in ROS areas, and by default protect LNA.

### **13.2.2 Future ROS Reservation and/or Government acquisition**

In certain circumstances, and possibly as a result of the Strategic Assessment of Perth and Peel, other LNA may be eligible for protection by the State Government, either as ROS or direct acquisition.

The Strategic Assessment process is being managed by the WA Department of Premier and Cabinet and seeks to protect environmental matters of national and state significance. It is unclear as to what on-ground outcomes the process will achieve, but it has the potential to strengthen the protection of many natural areas which are targeted for protection in this Strategy.

A particular challenge for the Strategic Assessment will be the protection of many of the smaller (less than 5 ha) natural areas in the Shire which support Carnaby’s Black Cockatoo feeding habitat and Priority One vegetation complexes (State significance). The Strategic Assessment also aims to protect the environmental values of the internationally significant Peel-Yalgorup Ramsar site, in particular waterbird habitats and the Estuary’s water quality.

In addition to the potential for the Strategic Assessment to identify and protect natural areas in the Shire, the process could also set targets for the revegetation of lands in the Peel-Harvey Coastal Plain Catchment. This could address multiple objectives including the improvement

of water quality for the Peel-Harvey and the establishment of future feeding grounds for Carnaby's Black Cockatoo.

As part of the strategic assessment, the Government should consider the protection of natural areas in a number of precincts in which current ROS reservations and standard planning mechanisms (e.g. POS) will not protect significant natural areas. These are precincts 5 (Stakehill West), 18 (Furnissdale Townsite), 19 (Furnissdale Rural Residential), 27 (Lot 1 Lakes Road) and 28 (Keralup).

### **13.2.3 Ceding of Conservation Category Wetlands and riparian foreshores**

345 ha of the 4,527 ha LNA protection target is the protection of vegetation portions of CCW wetlands in areas undergoing rezoning to urban, light industrial or rural residential uses. An additional 117 ha of the LNA protection target is to be achieved through the protection of riparian foreshores in similar land use change areas.<sup>17</sup> The protection of these areas through the land use planning process is guided by the Western Australian Planning Commission's Liveable Neighbourhoods policy (WAPC, 2009).

The protection of these areas has implications for long-term management, and in most cases is likely to create additional land management responsibilities for the Shire. The shire will need to adopt a proactive approach to planning for these future reserves, preferably before subdivision occurs.

### **13.2.4 Public Open Space**

After ROS reservation and State Government acquisition, Public Open Space is the most common mechanism used to protect natural areas where widespread land use change is occurring. Public Open Spaces are the areas ceded to the Crown free of cost as part of the subdivision of land process and used for a variety of public uses, including active and passive recreation, drainage and natural area protection.

368 ha of the 4,527 ha LNA protection target is to be achieved through the protection of bushland in areas proposed as POS in draft and approved Outline Development Plans and Structure Plans. A further 1224 ha of LNA is proposed for protection in potential future development areas under this Strategy.

The provision of Public Open Space is a limited means of protecting natural areas, unless the area is designated as Conservation POS and formally gazetted as a Local Conservation Reserve (Section 12).

The creation of new Public Open Space is guided by the WAPC's policies, especially Liveable Neighbourhoods (WAPC, 2009). Element 4 of Liveable Neighbourhoods details WAPC policy in respect to the amount and function of public parkland that should be identified in Structure Plans or Subdivision Applications. This policy has a major influence on the ability to protect

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<sup>17</sup> The areas of CCW and riparian foreshore vegetation that are to be protected to achieve the 4,022 ha LNA protection target are outside of Regional Open Space (ROS) areas.

local biodiversity, and provides limits on natural area protection which are often not appropriate for development sites with significant conservation assets.

Local Governments are able to create local planning policies to augment the WAPC's policies to ensure that POS allocation and distribution is better suited to the needs of their community and local conditions. The Shire should consider the creation of such a Local Planning Policy or similar, with the aim of addressing the full range of issues that the Shire faces when assessing proposals or planning and managing POS areas. These issues include:

- Allocating sufficient space for active and passive recreation, stormwater management, community facilities and natural area conservation;
- Appropriate legal designation of the purpose of POS areas;
- Access control and community use;
- Handover and management of POS following establishment;
- Community safety issues; and
- Resource requirements for ongoing management.

Examples of guidance that the Shire could include a Local Planning Policy for Public Open Space:

1. Increasing the allowance for the creation of restricted POS from 2% to up to 5%<sup>18</sup> of gross subdivisible area where there are significant biodiversity features on the site, or where ecological connectivity is to be restored, subject to other community needs being met. Such an approach is included in the City of Wanneroo's Local Planning Policy 4.3 Public Open Space (City of Wanneroo, 2010).
2. Providing guidance where more than 10% POS may be accepted by the Shire, such as where significant biodiversity features are to be protected and recreational needs can be met in adjoining areas.
3. Establishing the requirement that all POS created to protect natural areas has undergone an ecological viability assessment. All identified management issues are then to be addressed by the proponent.
4. Guidance on where POS areas are to be designed for Conservation to ensure conservation values are protected in the long-term.
5. Consider establishing a requirement for the creation of POS as part of rural residential subdivision, where there are significant biodiversity features on the site, subject to other recreational needs being met.

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<sup>18</sup> Or similar levels in line with Liveable Neighbourhoods.



The Shire will also consider inclusion of public open space guidelines in the LPP as they relate to rural residential lands. This is currently a significant gap in local and state policy. The City of Wanneroo has successfully established such a policy to address issues related to the creation of POS in new rural residential estates (City of Wanneroo, 2010).

### **13.2.5 Cluster-living and conservation living zone**

The protection of bushland and wetlands in rural residential estates is a challenge and most bushland in lots less than 4 ha is degraded over the long-term. This is related to the inherent limitations of conventional rural residential subdivision designs and the resilience of small patches of bushland when impacted by a variety of developments and threats: firebreaks, building envelopes, dieback, trampling, domestic pets, feral animals and weeds.

For Category C precincts, there are two main mechanisms to protect bushland in the long-term the:

- 1) creation of Conservation POS or Local Conservation Reserves (as described in Section 12), or
- 2) protection of large areas of bushland within larger private lots, where the bushland is protected under a Conservation Covenant. Ideally, protected bushland areas should be over 10 ha, but patches over 4 ha with adequate management and good viability characteristics, can be maintained into the long-term.

Where large lots are to be created for the protection of bushland as part of rural residential development it is recommended that an appropriate zone and provisions be created. A conservation living zone may be such a zone and used to ensure that provisions are put in place to:

- 1) Encourage clustering of lots or similar to ensure an overall lot yield or lot bonus.
- 2) Provide design guidelines to ensure the development adopts best practice in terms of access, servicing and fire management; and
- 3) Ensure the protected natural area is managed in the long-term.

The clustering of rural residential lots or a conservation living zone may have limited applicability in the Shire, but is suited to Category C precincts, such as Precinct 2, where there are large areas of bushland and wetland on the site. One of the benefits of including the protected natural area on a private lot is that the Shire is not responsible for ongoing management.

The pursuit of a conservation living zone is not seen as a high priority for the Shire, but may be relevant where future rural residential subdivision is being considered as part of future planning strategies.

### **13.2.6 Conservation zone**

Conservation zoning is a means of protecting significant, usually large (over 10 ha) areas of bushland and wetland on rural lands whilst the land remains in private ownership. A conservation zone is usually part of a voluntary rezoning process, whereby a landowner enters

into the rezoning process because there is a financial incentive to do so, such as the ability to subdivide land. It is not to be confused with subdivision for conservation in accordance with Development Control Policy 3.4 *Subdivision of Rural Land*.<sup>19</sup>

A Conservation Zone has limited applicability in the Shire, but may have some potential in the Category D precincts on the coastal plain south of the Murray River (Precincts 36, 37, and 38). These precincts are under consideration as part of the Southern Palusplain Study by the Shire and Department of Planning. Precinct 38 in particular has some large natural areas of significant conservation value.

A conservation zone may be less suitable to other rural areas in the Shire which are not under consideration for land use change. However, as the Shire embraces more urban and rural residential areas, a conservation zone may provide another option to protect, and buffer agriculture whilst ensuring significant bushland areas can be conserved.

A separate study is required by the Shire to assess the feasibility of a conservation initiative in Murray. This would include an:

- 1) Assessment of eligibility criteria, including:
  - a. the types of natural areas that are a priority for protection;
  - b. minimum lots sizes, of the parent lot and the resultant lots.
2. The relationship of the Conservation Zone with a private land conservation incentive scheme;
3. An Analysis of the number of lots that may be eligible, and how this may impact on other planning objectives (e.g. protection of agricultural land, landscape values, future development potential).
4. Development of the planning tools (scheme text etc.).

Local Governments that have implemented a conservation zone or similar include the Shire of Serpentine-Jarrahdale and the Shire of Manjimup.

### **13.3 Private land conservation incentives**

Offering incentives to landowners who voluntarily protect bushland is now an accepted practice in Western Australia (e.g. Shires of Manjimup, Serpentine-Jarrahdale, and Busselton). Incentives may take the form of financial, development-bonus, or management assistance schemes. The keys to the success of private land conservation incentive schemes include a proactive approach by local government and offering a fair incentive for any lost (perceived or actual) development potential.

The Strategy proposes an indicative protection target of 518 ha of the 9465 ha of LNA on Rural zoned land in the Shire. Achievement of this target relies on the Shire and/or State

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<sup>19</sup> This policy provides for the subdivision of a single conservation lot (greater than 40 hectares and mostly vegetated) from its parent lot.

Government offering acceptable incentives to landowners, or some other protection mechanism.

Under a private land conservation incentives scheme:

- 1) criteria for environmental protection are set;
- 2) an incentive(s) is offered to landowners, either in the form of a development bonus, or direct financial incentive for management etc.;
- 3) Landowners voluntarily come forward to consider and accept the incentive in return for protection of the bushland;
- 4) The subject bushland is protected through a conservation covenant, or zone; or some other protection mechanism (e.g. gifting).
- 5) The bushland is usually managed in accordance with an agreed management plan.

It is timely that the Shire considers a private land conservation scheme given the current Strategic Assessment process for the Perth and Peel Regions. Given the regional and national significance of many bushland areas on rural lands in the Shire, a case may be put for State and or Federal assistance to contribute towards such a scheme.

### **13.4 Recommended changes to the Shire's planning system**

The ability of the Shire to protect biodiversity is directly related to the objectives and clauses set in its local planning scheme (Town Planning Scheme No. 4) and a number of local planning strategies which guide the implementation of the Scheme.

Whilst there are various statements in these documents that encourage the protection of natural areas, there are no clear objectives and targets.

The objectives and targets in this Strategy can provide that direction, and should be included in the Shire's planning strategies.

The Shire has a number of options for how the targets and other recommendations of this Strategy are achieved. However, given the amount of land zoned as urban, light industrial and rural residential development in the current Local Planning Scheme (2012), it is recommended that consideration be given to:

- 1) Recognition of the Strategy's biodiversity conservation objectives, targets and the mapping of local natural areas in the Shire's local planning strategy and scheme;
- 2) Ensuring all future planning strategies recognise the Specific Biodiversity Feature Targets and Precinct Protection Targets, as they apply to each planning strategy area.
- 3) In the Local Planning Strategy(ies) provide for new mechanism to better integrate local biodiversity conservation objectives into the local planning scheme, such as Local Conservation Reserve and conservation-type zones.
- 4) Ensuring all future scheme amendments recognise the applicable Specific Biodiversity Feature Targets and Precinct Protection Targets, as they apply to the scheme amendment area;

- 5) Ensuring all future Outline Development Plans and Structure Plans demonstrate how they achieve the relevant Specific Biodiversity Feature Targets and Precinct Protection Targets as they apply to the ODP or structure plan area.
- 6) Integration of the objectives and targets from this Strategy into the Shire's existing local planning policies, and the need for a new policies as outlined in Section 13.2.4 and 13.4.1.

In addition, the Shire would be required to amend its local planning scheme were it to create the potential for a Conservation Zone or Conservation Living Zone, as outlined in Sections 13.2.6 and 13.2.5 respectively.

### **13.4.1 Proposed Tree, Bushland and Biodiversity Local Planning Policy**

The Shire will consider revising its local planning policies to clarify how significant local natural areas will be identified, assessed and protected through the planning and approvals system.

The Shire currently has a number of local planning policies which indirectly relate to bushland and natural area protection. These include:

- Tree Retention Local Planning Policy (Shire of Murray, undated a);
- Water Sensitive Urban Design Local Planning Policy (Shire of Murray, undated b); and
- Vegetation Management Local Planning Policy (primarily addresses revegetation)(Shire of Murray, undated c).

These policies do not currently provide guidance on bushland conservation objectives that are to be met through the planning system. Further, they do not guide how bushland protection is to be achieved or guide the treatment of bushland in Public Open Space.

The Shire will consider creation of a consolidated Tree, Bushland and Biodiversity Local Planning Policy to ensure that the Shire's planning considerations, advice and decisions:

- 1) Recognise and assist in the achievement of the Strategy's Specific Biodiversity Feature Targets and Precinct Protection Targets (i.e. Criteria for assessment of proposals);
- 2) Clarify when and what ecological assessment is expected of proponents where proposals are likely to impact on biodiversity values;
- 3) Clarify the Shire's position on clearing and retention of local bushland;
- 4) Clarify the mechanisms that can be used to protect bushland; and
- 5) Guide priorities for bushland restoration and revegetation to support protected natural areas.

The policy could replace, or augment, the existing Tree Retention Local Planning Policy. The Shire could also ensure that other existing local policies, such as Water Sensitive Urban Design and Vegetation Management, directly reference the Targets set in the Strategy.

The Shire may consider including matters related to POS in this policy (as proposed in Section 13.2.4) such as:

- 1) Clarification of aspects of Conservation POS in urban and light industrial areas;
- 2) Clarification of where Conservation POS may be accepted in rural residential estates;
- 3) Establishment of requirements for ecological assessment and management planning of bushland to be included in POS; and
- 4) Requirements to implement environmental management plans prior to the handover of new Conservation POS to the Shire.

Alternatively, the Shire may keep the POS policy separate from a Tree, Bushland and Biodiversity Local Planning Policy.



## **14. Strategy monitoring and review**

This Strategy provides a long-term planning horizon for the Shire and community. While it is important that most of the recommendations included in the Strategy are implemented within the next 5 years, they will change the way that the Shire approaches natural area protection for the next twenty to thirty years and more.

For such a long-term planning horizon, it is important for the Shire to put in place a program to monitor and review the effectiveness of the Shire's efforts, and regularly provide feedback to elected members and the community.

To monitor implementation of the Strategy, it is recommended that the Shire:

1. Support the re-mapping of the extent of native vegetation (vegetated LNA) in the Shire, within two years of endorsement of the Strategy, and thereafter every three years. The Shire may get support from WALGA, NRM groups or the State Government to collect this information. Should resources not permit full re-mapping, then the priority should be to re-map vegetated LNA in the Biodiversity Planning Precincts.
2. Review the Strategy targets and achievements within three years of Strategy endorsement. Report findings and proposed changes to Council and the community.
3. Establish a vegetation condition assessment program for a selection of LNA in local reserves, or similar monitoring program to assess the effectiveness of the Shire's natural area management program.

## 15. Action Plan

Table 17 is a summary of the recommendations made throughout the strategy (specifically in Sections 9 to 14). Instigation of all actions is the responsibility of the Shire. An indication of the priority of each action is also provided. High priority actions (H) should be commenced within two years of Strategy endorsement, or as part of the next review of the draft Local Planning Strategy and Local Planning Scheme. Medium priority actions (M) may commence immediately should opportunities arise, but should be significantly commenced within 4 years.

**Table 12: Recommended actions to implement this Local Biodiversity Strategy**

	Action	Priority	Strategy section reference
STRATEGY ESTABLISHMENT			
1	Council provides the draft targets and precinct information to the Department of Planning, Department of Parks and Wildlife (Formerly DEC) and Department of Premier and Cabinet for consideration as part of the Perth and Peel Strategic Assessment Process.	High and immediate	13.2.2.
2	Finalise the Strategy, including the targets and actions to be adopted by Council, following a period of public consultation.	High	NA
INTEGRATION INTO LOCAL SCHEME, STRATEGIES AND PLANNING PROCESSES			
3	Consider the following to integrate the Local Biodiversity Strategy into the Shire's local planning scheme and strategies: <ul style="list-style-type: none"> <li>a) Recognition of the Strategy's biodiversity conservation objectives, targets and the mapping of local natural areas in the Shire's local planning strategy (ies) and scheme;</li> <li>b) Ensuring all future planning strategies recognise the Specific Biodiversity Feature Targets and Precinct Protection Targets, as they apply to each planning strategy area;</li> <li>c) Ensuring all future scheme amendments recognise the applicable Specific Biodiversity Feature Targets and Precinct Protection Targets, as they apply to the scheme amendment area; and</li> <li>d) Ensuring all future Outline Development Plans and Structure Plans demonstrate how they address the relevant Specific Biodiversity Feature Targets and Precinct Protection Targets as they apply to the ODP or structure plan area.</li> </ul>	High	13.4
4	Ensure staff understand and use the Precinct Protection Targets and Specific Biodiversity Feature Targets as part of statutory development assessment and strategic planning projects.	High (and ongoing)	Sections 9 to 13
5	Provide proponents of development with the Shire's anticipated conservation outcomes to be achieved on each site in a timely	High (and ongoing)	Sections 9 to 12

	Action	Priority	Strategy section reference
	manner. These are to be based on the Precinct Protection Targets and Specific Biodiversity Feature Targets.		
6	Once finalised, that the Council ensures the Strategy's Precinct Protection Targets and Specific Biodiversity Feature Targets are integrated into the Shire's relevant policies, including: <ul style="list-style-type: none"> <li>a) Tree Retention Local Planning Policy</li> <li>b) Water Sensitive Design Local Planning Policy</li> <li>c) Vegetation Management Local Planning Policy</li> <li>d) Preservation of Murray and Serpentine River Delta Area Local Planning Policy.</li> </ul>	High (and ongoing)	13.4.2
7	Develop a Tree, Bushland and Biodiversity Local Planning Policy (which may replace the existing Tree Retention Local Planning Policy, and covers those aspects outlined in Section 13.4.2.	High	13.4.2
8	Together with Action 7, develop a Local Planning Policy for Public Open Space.	High	13.2.4
NEGOTIATIONS WITH STATE AND FEDERAL GOVERNMENTS			
9	Commence discussions with the State and Federal Governments in regards to resourcing requirements for the estimated 1592 ha of LNA that is likely to be protected as part of full development of urban, light industrial and rural residential precincts in the future (outside of ROS). Most of this bushland is likely to be of state and national environmental significance.	High	13.2.2 & 13.2.4
10	Clarify the Shire's position with regard to the long-term protection of the 1362 ha of LNA in existing ROS (outside of the DEC estate).	Medium	13.2.1
PRIVATE LAND CONSERVATION INCENTIVES			
11	Consider the development of a Private Land Conservation Incentive Scheme, including financial incentives (with or without a Conservation Zone component). This could form part of discussions with the State Government as part of the Perth-Peel Strategic Assessment process.	Medium	13.3 & 13.2.6
12	Consider the development of a subdivision for conservation incentive (Zoning and incentive scheme) as part of the Southern Palusplain Precinct Project, and other rural planning exercises. This may require creation of a Conservation Zone under the Scheme.	Medium	13.3 & 13.2.6
13	Consider the development of a conservation living zone to encourage more environmentally-sustainable rural residential development in the future as part of current and future planning strategy development.	Low	13.2.5
LOCAL BUSHLAND RESERVES			
14	Ensure new local reserves created as part of subdivision processes, and which are created to protect bushland or other natural areas: <ul style="list-style-type: none"> <li>a. Have a designated purpose on their title/management order which includes</li> </ul>	High (and ongoing)	12

	Action	Priority	Strategy section reference
	conservation (e.g. Recreation and Conservation, Waterways and Conservation etc.); b. Subdividers should be required to prepare and implement an environmental management plan for these new reserves to restore and protect their environmental values. This requirement should be agreed as early as possible in the planning assessment process (e.g. If possible, included as a requirement at the Scheme Amendment Stage).		
15	Ecological assessments of existing local reserves which contain at least 2 ha of bushland or other natural areas should be conducted as funds permit. The assessment can be carried out using the Natural Area Initial Assessment template provided by the WA Local Government Association (Del Marco <i>et al.</i> , 2004). A lower priority is to assess reserves with between 1 and 2 ha of bushland.	High	12
16	The Shire should, as funds permit, prepare and implement a strategic reserves management plan for its most significant bushland and riverine reserves. This may ensure that greater protection of existing reserves is achieved more efficiently.	Medium	12
17	The Shire should conduct a review of existing reserves with significant biodiversity values to ensure that their environmental values are adequately protected. This includes a review of the purpose and designation of the reserve. Where appropriate, the reserve's designated purpose should be amended to include 'conservation' (e.g. Recreation and Conservation, Waterways and Conservation etc.).	Medium	12
18	Introduce denotations on local planning scheme maps to distinguish between local reserves for conservation and recreation		
19	For all proposed Local Conservation Reserves, apply to the Department of Regional Development and Lands for a change in the purpose of the management order/ vesting.(M)	Low	12
20	Facilitate community engagement in natural area management through support/promotion of local NRM groups.	High	
MONITORING THE STRATEGY			
21	Support the re-mapping of the extent of native vegetation (vegetated LNA) in the Shire, within 2 years of endorsement of the Strategy, and thereafter every 3 years. The Shire may get support from the State Government to collect this information.	High	14
22	Establish an internal reporting system to monitor the impact of future development outcomes on the proposed retention and protection targets.		

	<b>Action</b>	<b>Priority</b>	<b>Strategy section reference</b>
23	Review the Strategy targets and achievements within three years of Strategy endorsement. Report finding and proposed changes to Council and the community.	Medium	14
24	Establish a vegetation condition assessment program for a selection of LNA in local reserves, or similar monitoring program to assess the effectiveness of the Shire's natural area management program.	High	14



## 16. Glossary

**Biodiversity** is the variety of all life forms – the different plants, animals and micro-organisms, the genes they contain, and the ecosystems of which they form a part. Biodiversity is not static, but constantly changing; it is increased by genetic change and evolutionary processes and reduced by processes such as habitat degradation, population decline and extinction (Commonwealth of Australia 1996). Biodiversity has two key aspects:

- its intrinsic value at the genetic level, individual species level, and species assemblages levels; and
- its functional value at the ecosystem level.

Two species assemblages may have different intrinsic values but still have the same functional value in terms of the part they play in maintaining ecosystem processes.

**Ecological community** is a naturally occurring biological assemblage that occurs in a particular type of habitat (English & Blyth 1997). The scale at which ecological communities are defined will often depend on the level of detail in the information source, therefore, no particular scale is specified (Environmental Protection Authority, 2003a). The criteria in this document are based on using vegetation complexes as a means of interpreting ecological communities (except for threatened ecological communities).

Under the Environment Protection and Biodiversity Conservation Act 1999, ecological communities are similarly defined as assemblage of native species that:

- inhabits a particular natural area
- meets the additional criteria specified in the regulations made for the purposes of this definition.

**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 these larger areas.

**Habitat** is the natural environment of an organism or community, including all biotic (living) or abiotic (non-living) elements; a suitable place for an organism or community to live. (This term can be applied at a range of scales. Vegetation can become a reasonable surrogate for outlining habitat when its main components, structure and associated landform are also described. Habitat can be occupied by an organism or community continuously, periodically or occasionally or can have once been occupied and still have the potential for organisms of that kind to be reintroduced (Del Marco *et al.*, 2004).

**Local Natural Areas (LNA)** are natural areas that exist outside of Bush Forever Sites (Swan Coastal Plain), the DEC Managed Lands and Regional Parks. In the past these areas have been referred to as Local Biodiversity Areas.

**Native vegetation** – they are areas that have been mapped as ‘native vegetation’. They include natural areas and areas of native vegetation that is degraded such that it cannot be defined as a natural area. The mapping of native vegetation used in this report was

undertaken by the State Government using 2005 aerial photography. *NB: references to 'native vegetation' throughout this document are referring to 'naturally occurring' locally native species as opposed to revegetated areas of native species.*

**Natural area** is used to describe an area that contains native species or communities in a relatively natural state and hence contains biodiversity. Natural areas can be areas of native vegetation, vegetated or open water bodies (lakes, swamps), or waterways (rivers, streams, creeks – often referred to as channel wetlands, estuaries), springs, rock outcrops, bare ground (generally sand or mud), caves, coastal dunes or cliffs (adapted from Environmental Protection Authority 2003a). Note that natural areas exclude parkland cleared areas, isolated trees in cleared settings, ovals and turfed areas. Not all areas of native vegetation are natural areas because of the level of degradation.

**Natural Area Initial Desktop Assessment** template is a template developed by the Perth Biodiversity Project to assist in assessing and recording baseline information for a natural area that has been obtained using desktop tools (that is, datasets and other reference tools) (Del Marco *et al.*, 2004).

**Priority One vegetation complexes** – are vegetation complexes with less than 10% retained across their natural original extent (regional extent), or in the case of the Vasse Vegetation Complex are complexes with a substantial proportion of their pre-European extent in Perth and Peel within the Shire. The Priority One Complexes occurring in the Shire of Murray are: Cannington, Forrestfield, Guildford, Serpentine River, Swan and Vasse vegetation complexes. Of the Vasse Vegetation Complex, 70.7% of the pre-European extent in the Perth and Peel regions is located in the Shire of Murray.

**Protection** (of a Local Natural Area) means that the natural area is covered by a secure mechanism providing the highest level of long-term protection. Secure protection mechanisms in the Shire of Murray are considered to be:

- Public reserves vested for the purposes of conservation (e.g. DEC managed conservation estate or Local Conservation and Bushland Reserve), or
- Land under a conservation covenant registered with a recognised conservation organisation (e.g. National Trust or DEC), or
- Regional Open Space with a management plan which explicitly states that the area's vegetation is protected from clearing in perpetuity.
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**Regionally significant bushland** are natural areas that collectively aim to form a comprehensive, adequate and representative system of conservation areas (Environmental Protection Authority 2003a). In order for bushland areas to fall into this category, they need to be part of the existing or proposed conservation system or to meet, in part or whole, a range of criteria which are outlined in Appendix 3 of Environmental Protection Authority (2003a).

**Retention** (of a Local Natural Area) means that the natural area is retained on the site, but there is no mechanism which is proven to provide secure a long-term protection to the natural area. Natural areas that are retained may or may not have laws which specifically prevent clearing within the natural area. Whilst most clearing in the Shire requires a permit from the DEC, there are numerous exemptions under the Environment Protection (Clearing of Native Vegetation) Regulations which mean that the natural area may not be protected in the long-term.

**Vegetation condition** is a rating given to vegetated natural areas (both uplands and wetlands) to categorise disturbance related to human activities. This rating refers to the degree of change in the structure, density and species present in native vegetation in relation to undisturbed 'pristine' native vegetation of the same type. (Adapted from Government of Western Australia 2000b).

**Vegetation complexes** are based on the pattern of vegetation at a regional scale as they reflect the underlying key determining factors of landforms, soils and climate. In the area covered by the System 6 region and Swan Coastal Plain portion of the System 1 region, there was a reliance on the underlying landform and soils as defined and mapped by Churchward and McArthur (1980) and a major review of the forest climates by Gentilli (1989) (from Del Marco et al, 2004).

**Viability (as in ecological viability)** is the likelihood of long-term survival of a particular ecosystem or species.

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