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DS01 – 06/22	Update to the Shire of Chittering Local Biodiversity Strategy 2010 Attachments 1. Local Biodiversity Strategy (as updated)	1 – 94



Shire of Chittering Local Biodiversity Strategy 2022

Acknowledgements

The Shire of Chittering prepared this Local Biodiversity Strategy with assistance from the expert staff at the Chittering Landcare Centre.

Disclaimer

All reasonable efforts made by the Shire of Chittering and the Chittering Landcare Group have been to ensure the accuracy of this report's contents. The native vegetation mapping and statistics that were originally provided by the Perth Biodiversity Project, have been updated using 2020 aerial photography. The mapping of vegetation complexes was undertaken by State Government at a regional scale.

All mapped information should be verified on-ground to ensure its accuracy at any particular site. Any decision relating to the retention, protection or management of a Local Natural Area should be supported by site-specific assessments using recognised, standardised formats.

Mapping and Statistics to Determine Biodiversity Conservation Goals

The native vegetation extent statistics used in this document were provided by the Perth Biodiversity Project (2008, unpublished) Native vegetation mapping was initially conducted in 2003 and updated in 2007 by the Chittering Landcare with further data cleaning done by the Perth Biodiversity Project with assistance from the Chittering Landcare Group. The native vegetation mapping by the Department of Primary Industry and Regional Development, and statistics from Department of Biodiversity, Conservation and Attractions have been updated by Chittering Landcare Centre in 2020 from 2018 data.

For ease of reading, statistics are presented at the nearest whole number. Only natural areas larger than 4 hectares were considered, generally excluding land that has been subdivided to minimum lot sizes in rural living areas. As the vegetation mapping is based on interpretation of aerial photography, it is assumed that statistics of remaining individual vegetation complexes are an overestimate. Therefore biodiversity protection targets have been reduced by 5%. Any decision relating to the retention and protection of natural areas will need to be supported by site-specific ecological assessments undertaken to an acceptable standard.

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Abbreviations

CCW	Conservation Category Wetlands
DBCA	Department of Biodiversity Conservation and Attractions
DRF	Declared Rare Flora
EPA	Environmental Protection Authority
GIS	Geographical Information Systems (incl. computer mapping and analysis)
IBRA	Interim Biogeographical Regions of Australia (bioregions)
IHCVAs	Indicative High Conservation Value Areas
LBS	Local Biodiversity Strategy
LPS	Local Planning Strategy
LNA	Local Natural Area
NAIA	Natural Area Initial Assessment (template)
SPF	Specially Protected Fauna
TEC	Threatened Ecological Community
LPS6	Local Planning Scheme No.6
WALGA	Western Australian Local Government Association
WAPC	Western Australian Planning Commission

How to Read This Document

Determination of the proposed local biodiversity conservation objectives outlined in this document area based on a rigorous analysis of various datasets. However, most of the detailed technical information is included in Appendices. The main document focuses on main issues and recommendations.



Executive Summary

Vision

The Shire of Chittering will prioritise the retention of its Local Natural Areas and by 2050 will have formally protected at least 6,328 hectares within these areas.

In 2010, The Shire of Chittering was notionally a rapidly growing peri-urban local government. The demand for lifestyle properties within an hour of the Perth metropolitan area drove development with many new landholders seeking the tranquillity of natural bush as a major attraction. In 2022, the Shire of Chittering experiences the same growth demands as it did in 2010, yet with ever increasing battles to prevent sprawl into biodiverse locations.

The Shire of Chittering's corporate motto is “A connected thriving community” and the development of a biodiversity strategy is in keeping with this expressed desire. The importance of a Local Biodiversity Strategy is reiterated through the Shire’s primary strategic documents being the Shire of Chittering Local Planning Strategy (2019) and the Strategic Community Plan (2017-27). Both documents take clear learnings from the original version of this strategy.

The greatest threat to biodiversity in the Shire of Chittering is subdivisional development or other types of development that require clearing of native vegetation. This threat can largely be controlled by careful planning. Consideration has been given for future development to occur on previously cleared land as a result of the original version of this strategy, and the Local Planning Strategy.

Of the other threats listed in this document is the pathogen *Phytophthora cinnamomi* causing dieback. It is seen as the next greatest threat. Dieback has been responsible for the destruction of tens of thousands of hectares of bushland in the south-west of Australia. This disease can be managed by strict control on the movement of vehicles and people from areas of known infestation and by careful selection of road making basic raw materials from disease free deposits. Another major threat to the Shire’s biodiversity is bushfire. Careful consideration to minimising damage in fire events is critical to the sustainability of the biodiversity. This strategy is therefore intended to guide bushfire risk reduction measures by improving the knowledge base of those undertaking risk reduction.

The Perth Biodiversity Project assisted the Shire throughout the original production of this document. This updated version remains heavily influenced by the storied expertise at the Chittering Landcare Group. While key aspects of the Strategy have been updated, it retains the original ecological criteria for prioritising local biodiversity assets. Additionally, the Strategy recommends adopting three goals on which to base the Shire’s local biodiversity conservation efforts and form its land use planning policy, as follows:

Goal 1: Retention of natural areas

Retain all existing natural areas, unless unavoidable development has been granted having regard to this strategy and relevant expert studies. Where retention is not possible, seek opportunities for offsets. A specific target for Goal 1 is to retain 30% of each representative vegetation complex where possible.

Goal 2: Protection of natural areas

Protect adequate representation of the best examples of each vegetation complex/class found in the Shire, targeting at least 11,550 hectares of native vegetation in good or better condition. The aim is to protect natural areas where less than 30% of the original extent remains, protect the best examples of each of the vegetation complexes found in the Shire and to prevent reduction of any of the vegetation complexes below 10% of the pre-European extent.

Goal 3: Management of natural areas

All protected and reserved natural areas are managed for conservation through:

- Active management for conservation of reserved natural areas.
- Support being provided to landowners with significant natural areas protected through conservation covenants.
- Support being provided to landowners with voluntary management agreements entered into under programs such as Land for Wildlife and conservation covenants.

Goal 4: Bushfire fuel reduction measures

Provide for high-level detail regarding the extent of vegetation complex/class and suggest measures for maximising retention from bushfire risk through:

- Clearer understanding and location of indicative high conservation flora and fauna
- Providing data on how certain plants respond to fire.
- Consider fuel reduction methods other than fire to reduce bushfire risk and maintain ecological integrity of the natural vegetation,

Considering the growing pressure for development in the Shire, Goal 2 is of highest priority. The Shire should seek opportunities to protect natural areas of highest ecological value. These exist within 'Indicative High Conservation Value Areas' (IHCVAs) identified in this document. To facilitate integration of the Local Biodiversity Strategy objectives into land use planning, the Shire has incorporated strategies and goals into the Local Planning Strategy to ensure avoidance of development in areas with IHCVAs.

Recommendations

To achieve the three biodiversity conservation goals, recommendations are made for amendments to the Shire's planning framework, for improved bushland management and specific planning precinct recommendations. Adoption and implementation of a ten year prioritised Local Biodiversity Action Plan will guide the Shire's activities towards meeting the adopted local biodiversity conservation goals.

As a priority, this strategy recommends applying the environmental strategies and goals into ***Local Planning Scheme 6***, and future local planning schemes to ensure higher intensity development utilising already cleared land, and not affecting high conservation value areas as identified in this document by:

- Introducing a Local Planning Policy for Biodiversity Conservation;
- Promoting various covenanting programs to private landholders with native vegetation on their properties;
- Changing the vesting purpose of high conservation value natural areas cared for by the Shire;
- Continuing support to the Chittering Landcare Group which provides technical advice on best practice natural area management;
- Providing financial assistance to landholders protecting native vegetation on their properties;
- Incorporating the strategies and goals within this document towards the Bushfire Risk management System program.

The Local Biodiversity Strategy recommends distributing responsibilities for implementation of the local biodiversity conservation goals across the organisation, including the planning, engineering, marketing and executive services. Implementation of these overarching recommendations will enable achievement of retention and protection targets identified for each planning precinct.

Biodiversity Conservation Planning Precinct Recommendations

1 Bindoon

The Bindoon Planning precinct objective is to maintain a local centre attuned to dispersed settlement pattern. Large sections of this precinct are identified in the *Local Planning Strategy* as Priority Development Areas (4,143 ha), including areas within HCVAs.

Precinct specific recommendations

- Development should utilise the over 9,000 hectares of mostly cleared land within the precinct as a priority while avoiding high conservation value areas as identified within this strategy
- Change vesting of local government managed reserves to conservation
- Ensure road maintenance contractors are aware of biodiversity values of roadside vegetation along Teatree Road and development on adjoining properties does not result in fragmentation of the roadside vegetation
- Ensure adequate buffers protect all creeks and wetlands
- Seek to use environmentally sustainable measures to reduce bushfire risk in order to maintain vegetation health
- Seek to protect 2,431 hectares of remaining native vegetation and retain additional 1,300 hectares.

2 Chittering Valley

Protection of biodiversity is compatible with the land use planning objectives of the Chittering Valley precinct where no further excessive development and no subdivision is to occur apart from boundary realignments.

Precinct specific recommendations

- Consider the location of properties under voluntary agreements such as Land for Wildlife programs when approving development on adjoining properties
- Seek changing of vesting of high conservation value local government managed reserves to Conservation
- Examine opportunities to add high conservation value areas to the DBCA conservation estate
- Ensure all creeks are protected with adequate buffers
- Seek to protect 1,511 hectares of remaining native vegetation and retain additional 1,800 hectares.

3 Lower Chittering

Lower Chittering Planning Precinct is identified as suitable for rural residential subdivision with consideration of biodiversity preservation needs.

Over 1,100 hectares of regionally significant vegetation complexes are represented within eleven Interim High Value Conservation Areas. These areas still retain significant vegetation and where this vegetation is retained within viable patches, their increased protection should be encouraged through appropriate management and planning conditions during subdivisional considerations.

Precinct specific recommendations

- Consider the location of properties under voluntary agreements such as Land for Wildlife programs when approving development on adjoining properties
- Change vesting of high conservation value Local Government managed reserves to Conservation
- Ensure road maintenance contractors are aware of biodiversity values of roadside vegetation along Reserve Road and development on adjoining properties does not result in fragmentation of the roadside vegetation
- Ensure all creeks and wetlands are protected with adequate buffers
- Seek to protect 1,038 hectares of remaining native vegetation and retain additional 1,450 hectares.

4 Muchea Industrial Park Structure Plan Area

The objective of the Muchea Industrial Park is to provide for establishment of services and light industry with opportunities for local employment, in accordance with the Muchea Industrial Park Structure Plan (2022)

Precinct specific recommendations

- Retention and protection of remnant vegetation to form a buffer between the industrial areas and the adjoining lands.
- Rehabilitation of priority areas to improve connectivity should be a condition of future development
- Ensure all tributaries and creeks feeding the Ellen Brook are protected with adequate buffers and drainage management strategies.
- Seek to protect 273 hectares of remaining, primarily regionally significant native vegetation and retain additional 54 hectares.

5 Muchea Townsite

Muchea Precinct objective is to maintain existing density living in keeping with Muchea Village character.

Precinct specific recommendations

- Consider the location of properties under voluntary agreements such as Land for Wildlife programs when approving development on adjoining properties
- Ensure road maintenance contractors are aware of biodiversity values of roadside vegetation along loppolo Road and development on adjoining properties does not result in fragmentation of the roadside vegetation.
- Ensure all creeks and significant wetland are protected with adequate buffers.
- Seek to protect 316 hectares of remaining native vegetation and retain additional 300 hectares.

6 Agricultural areas

Pursuant to the Local Planning Strategy (2019), the Shire maintains a general presumption against Rural Residential, Rural Small Holdings or Rural Retreats in the northern agricultural areas. Any activity that results in clearing of native vegetation requires a Clearing Permit under the ***Environmental Protection Act 1986***, except for exempt activities that are defined in Clearing Regulations.

Precinct specific recommendations

- Ensure technical support is being provided to private landholders that agree to manage vegetation on their properties for conservation
- Encourage agricultural activities that do not require further vegetation clearing
- Consider the location of properties under voluntary agreements such as Land for Wildlife programs when approving development on adjoining properties
- Ensure road maintenance contractors are aware of biodiversity values of roadside vegetation along roads with significant roadside vegetation and development on adjoining properties does not result in fragmentation of the roadside vegetation
- Rehabilitation of priority areas to improve connectivity should be a condition of future development
- Ensure all creeks and significant wetlands are protected with adequate buffers
- Seek to protect 4,731 hectares of remaining native vegetation and retain additional 2,900 hectares.

To achieve planning precinct targets for local biodiversity conservation, it is recommended the Council endorses an updated Local Biodiversity Action Plan as the Shire's Local Biodiversity Strategy implementation plan. The action plan includes prioritised actions in areas of land use planning, natural area management, awareness raising and monitoring, allocating responsibilities for implementation across the organisation.

1 Strategic Approach

The **Local Biodiversity Strategy** provides a strategic approach to planning for the conservation of local natural areas across all land tenure. When prepared according to the Western Australian Local Government Association's **Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region** (Del Marco *et al*, 2004), local governments are following a local biodiversity planning process recognised by the Environmental Protection Authority (2008) and the Western Australian Planning Commission (2009).

The **Local Biodiversity Strategy** assists integration of biodiversity conservation considerations into the land use planning system and local government operational business. The Shire of Chittering's commitment to the protection of the natural environment and biodiversity is embedded in the objectives of its strategic community plan and the aims of its local planning scheme:

"A protected and bio-diverse environment, which the community and tourists enjoy in a well managed, respectful manner."

Shire of Chittering Community Strategic Plan (2017-2027)

"To provide environmental protection and enhancement of biodiversity and the natural resources including land, air and water quality"

Shire of Chittering Local Planning Scheme No. 6

1.1 Background

Biodiversity, defined as the variety of life forms: the different plants, animals and micro-organisms, the genes they contain, and the ecosystems they form, is an important part of our natural environment. The Shire of Chittering is located in the internationally recognised South West Australia biodiversity hotspot, an area identified for its exceptional species diversity under threat from human disturbance (Myers et al, 2000).

Why is local biodiversity conservation important?

Local natural areas and the biodiversity that they support have many benefits including:

- Maintain water quality in groundwater resource areas;
- Moderating local climates;
- Support beneficial species that act as natural pest control Provide opportunities; for a prosperous tourism industry Maintain rural lifestyle and a ‘sense of place’;
- Positive effects on human health, both physical and mental Buffers from roads, railway and industry; and
- Improved aesthetics of an area.

Conservation of biodiversity has many benefits to local communities. By protecting biodiversity assets, the functions of the local landscape on which local communities rely will be maintained, and opportunities for future enterprise will be secured.

The ***Local Biodiversity Strategy*** deals specifically with protection of the Shire's natural areas and the biodiversity that they contain. There is a range of other environmental considerations that need to be taken into account when planning for future development, including prevention of soil erosion, prevention of increased sedimentation in local waterways or improvement of water quality within local water catchments. The ***Local Biodiversity Strategy*** complements objectives of other local studies such as the Natural Resource Management Plan for the Brockman River Catchment (Water and Rivers Commission, 2003) and the Ellenbrook Catchment Management Plan (PPK Environment and Infrastructure, 2001) that cover several administrative boundaries.

Environmental rationale

Currently sufficient natural areas remain within the Shire to support a wide variety of plants, animals and other organisms. The impact of land clearing is only one issue threatening the sustainability of natural areas as well as the rural lifestyle local residents currently enjoy. Impacts of Phytophthora Dieback, salinity, weeds and feral animals, erosion, water logging, reduced water quality and altered fire regimes are intensified in a highly fragmented landscape. Therefore it is critical that biodiversity conservation needs are considered strategically preventing further loss of plant and animal species.

Areas of native vegetation provide habitat, home and food, to many species of animals that are still finding refuge within the Shire, including honey possums, (a the unique nectivorous marsupial), brushtail possums, wallabies and also the threatened Carnaby’s and Red-tailed black cockatoos. All these species are significantly affected by land clearing and fragmentation of natural areas within significant sections of their natural extent, including the Perth Metropolitan Region.

Conservation of biodiversity has many benefits to local communities. By protecting biodiversity assets, the functions of the local landscape on which local communities rely will be maintained, and opportunities for future enterprise will be secured.

LOCAL BIODIVERSITY STRATEGY 2022

The Local Biodiversity Strategy deals specifically with protection of the Shire's natural areas and the biodiversity that they contain. There is a range of other environmental considerations that need to be taken into account when planning for future development, including

- Prevention of soil erosion,
- Prevention of further sedimentation in local waterways or
- Improvement of water quality within local water catchments.

The Local Biodiversity Strategy complements objectives of other local studies such as the Natural Resource Management Plan for the Brockman River Catchment (Water and Rivers Commission, 2003), the Ellen Brook Catchment Management Plan (PPK Environment and Infrastructure, 2001) and the Water Quality Improvement Plan for the Ellen Brook (DBCA, Rivers and Estuaries Branch, 2018) that cover several administrative boundaries.

Planning rationale

Key planning considerations that have led to the preparation of this Strategy were:

- The high rate of development in the Shire
- The absence of a regional planning scheme
- The extent of future indicative subdivision suggested in the Local Planning Strategy
- The difficulty of obtaining Public Open Space as part of rural-residential subdivision.

The ***Local Planning Strategy 2019*** objectives clearly express the intention to maintain “A protected and bio-diverse environment, which the community and tourists enjoy in a well-managed, respectful manner” by carefully managing the existing rural lifestyle and new opportunities for development by aiming to:

“Formally protect areas of high conservation value, as provided for by the Local Biodiversity Strategy (2010) (as updated).”

Shire of Chittering Local Planning Strategy 2019

Implementation of the ***Local Biodiversity Strategy*** will assist in meeting the above objectives as it identifies the distribution of biodiversity assets and allows for strategic planning of future development with adequate consideration of biodiversity conservation needs.

Social rationale

A ***Local Biodiversity Strategy*** demonstrates the Shire’s commitment to meet the community’s expectations that the environment will be protected for the benefit of future generations. The high number of properties in the Shire registered in the ‘Land for Wildlife’ program administered by the State departments responsible for environment and conservation demonstrate the high level of interest and commitment by local residents to manage natural areas on private properties.

Strategic consideration of biodiversity assets within the Shire allows addressing issues of equity between landowners so that landowners with natural areas retained are not significantly disadvantaged. The Strategy will also assist in placing disincentives for those that are unwilling or unable to contribute to the protection of natural areas and propose to clear bushland.

Statutory Rationale

Schedule 7 of the *Planning and Development Act 2005* ‘Matters which may be dealt with by a planning scheme’ establishes biodiversity as a valid planning consideration.

1.2 Legislative and Policy Support for Biodiversity Protection and Retention

The Shire of Chittering *Local Biodiversity Strategy* objectives and targets can be implemented by using the provisions of existing laws and policies that cover natural areas. The most relevant pieces of legislation are:

- Environmental Protection (Clearing of Native Vegetation) Regulations 2004, set out under the Environmental Protection Act 1986
- Biodiversity Conservation Act 2016 and the Biodiversity Conservation Regulations 2016

Since 2004, clearing of native vegetation under the ***Environmental Protection Act 1986*** is an offence unless it is for an exempt purpose or in accordance with a development approval following a formal development application process. All other clearing of native vegetation requires a permit to be obtained from the Federal Department for Environment and Conservation.

Several flora and fauna species and ecological communities recorded within the Shire are protected by the Commonwealth ***Environmental Protection and Biodiversity Conservation Act 1999***. Any development that can potentially impact on species and communities listed under this Act, requires referral to the Department of Environment, Water, Heritage and the Arts to determine a level of assessment. Additional flora and fauna species known to be rare or under threat which occur in the Shire are given a level of protection under the ***Biodiversity Conservation Act 2016***.

Some level of guidance is provided on the significance of biodiversity values and the appropriate levels and methods of assessment through the following EPA policies and guidance statements:

- (i) EPA Guidance Statement No 33: Guidance for the Assessment of Environmental factors – Environmental Guidance for Planning and Development (2008)
- (ii) EPA Guidance Statement No 10: Guidance for the Assessment of Environmental Factors – level of assessment for proposals affecting natural areas within System Six Region and Swan Coastal Plain portion of System One region (2006)
- (iii) EPA Guidance Statement No. 51 – Terrestrial Flora and Vegetation Surveys (2016)
- (iv) EPA Guidance Statement No. 56 - terrestrial Fauna Surveys (2016)

When considering development proposals, the provisions of the Shire's local planning scheme must be interpreted and the various environmental and planning laws and policies followed.



The first objective listed in the Shire's ***Local Planning Scheme No 6*** is:

"To provide environmental protection and enhancement of biodiversity and the natural resources including land, air and water quality"

Followed by additional aims to protect landscape values, facilitate wildlife corridors or comply with the principles of catchment management as well as to provide a solid framework on which to facilitate development.

The ***Local Biodiversity Strategy*** complements the Shire's statutory planning framework's objectives by identifying and prioritising the biodiversity assets that should lead to better informed and transparent decision making.

2 Shire of Chittering Biodiversity Assets

Biodiversity is defined as the variety of life forms: the different plants, animals and micro-organisms, the genes they contain, and the ecosystem they form. It is usually considered at three levels: genetic diversity, species diversity and ecosystem diversity.

As we do not have access to descriptions of biodiversity at all levels, we need to rely on substitute measures. The *Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region* (Del Marco et al., 2004) encourage local governments to measure biodiversity using the variation of natural areas, including vegetation complexes, wetlands and waterways, threatened species and ecological communities, and ecological linkages.

The following biodiversity values are being used to assess and prioritise the Shire's natural areas for conservation.

2.1 Native vegetation extent and representation

Approximately 30% of the original (pre-European) extent of native vegetation remains within the Shire of Chittering. Table 1 shows the 2007 extent of remaining native vegetation within the Shire and Table 2 the 2018 extent. Figure 1 shows the 2018 extent of remnant vegetation.

FIGURE 1: REMNANT VEGETATION

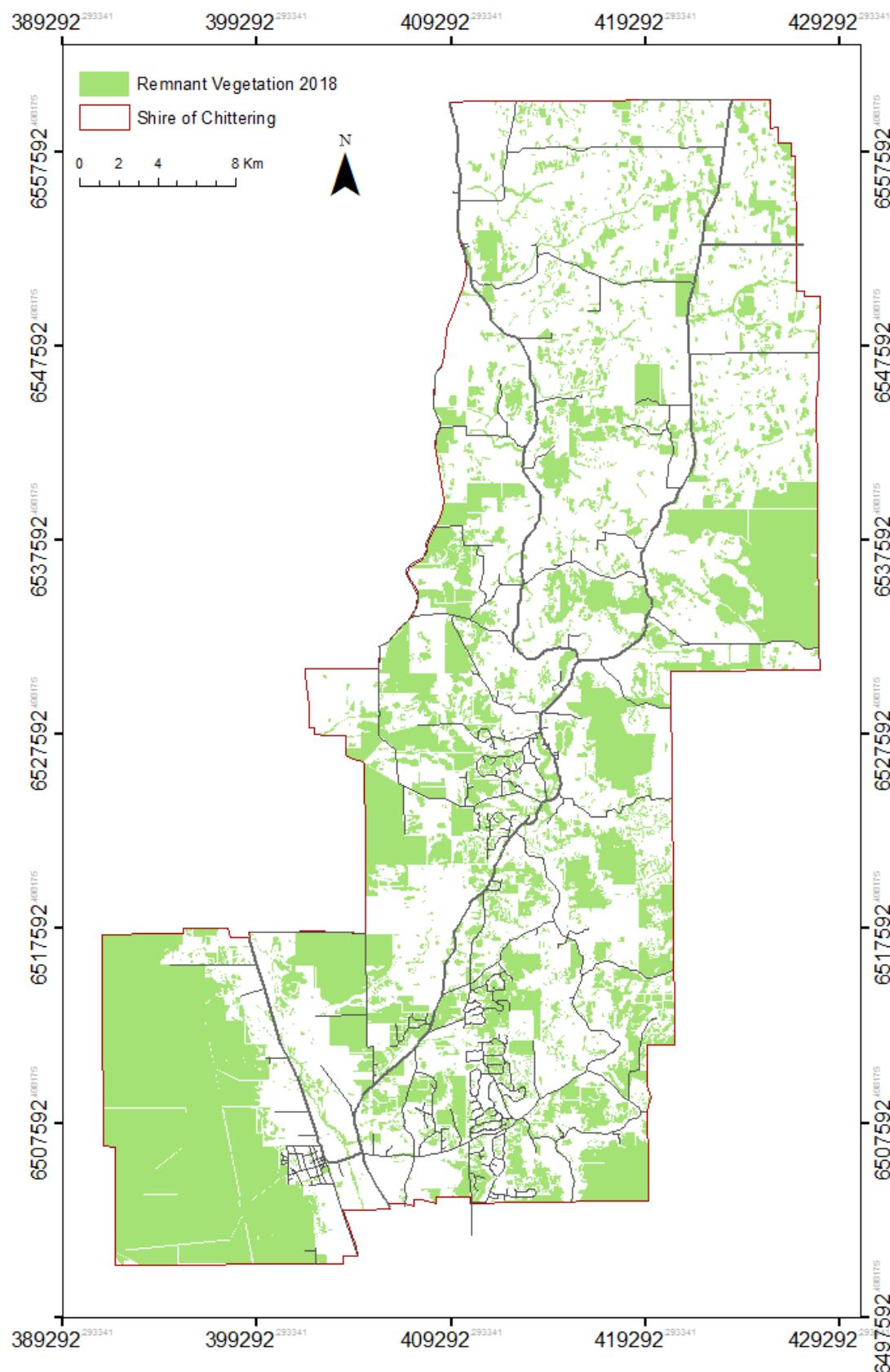


TABLE 1: EXTENT OF NATIVE VEGETATION IN THE SHIRE OF CHITTERING (2007)

(Based on the 2007 update of 2003 vegetation mapping obtained from the Department of Agriculture and Food Western Australia, prepared by the Perth Biodiversity Project, June 2009)

Land category	Area (hectares)	Area (%)
All natural areas	Local Natural Areas (Mostly in Good or better condition)	22,421
	Commonwealth natural areas	2,226
	DBCA Protected areas	1,695
	State forest and other DBCA managed natural areas	2,035
	Water supply (State Government)	10,950

Land category	Area (hectares)	Area (%)
Parkland cleared native vegetation (limited or no understorey or isolated trees)	9,309	8%
Cleared land in the Shire	73,099	60%
Total Shire Area	121,735	100%

TABLE 2: EXTENT OF NATIVE VEGETATION IN THE SHIRE OF CHITTERING (update 2018)

Land category	Area (hectares)	Area (%)
All natural areas	Local Natural Areas (Mostly in Good or better condition)	22,421
	Commonwealth natural areas	2,226
	DBCA Protected areas	3206
	State forest and other DBCA managed natural areas	2,035
	Water supply (State Government)	10,950

Land category	Area (hectares)	Area (%)
Parkland cleared native vegetation (limited or no understorey or isolated trees)	9,309	8%
Cleared land in the Shire	73,099	60%
Total Shire Area	121,756	100%

LOCAL BIODIVERSITY STRATEGY 2022

Native vegetation within the Shire reflects the distribution of landforms and associated soils and is described as vegetation complexes. At a regional scale, the Shire lies within three major biogeographic sub-regions, or geographic regions where unique mosaic of landforms, soils and other conditions define vegetation communities and associated ecosystems that form within Swan Coastal Plain, Dandaragan Plateau and Darling Plateau (Northern Jarrah Forrest) (Figure 2).

FIGURE 2: PRE-EUROPEAN NATIVE VEGETATION MAPPING

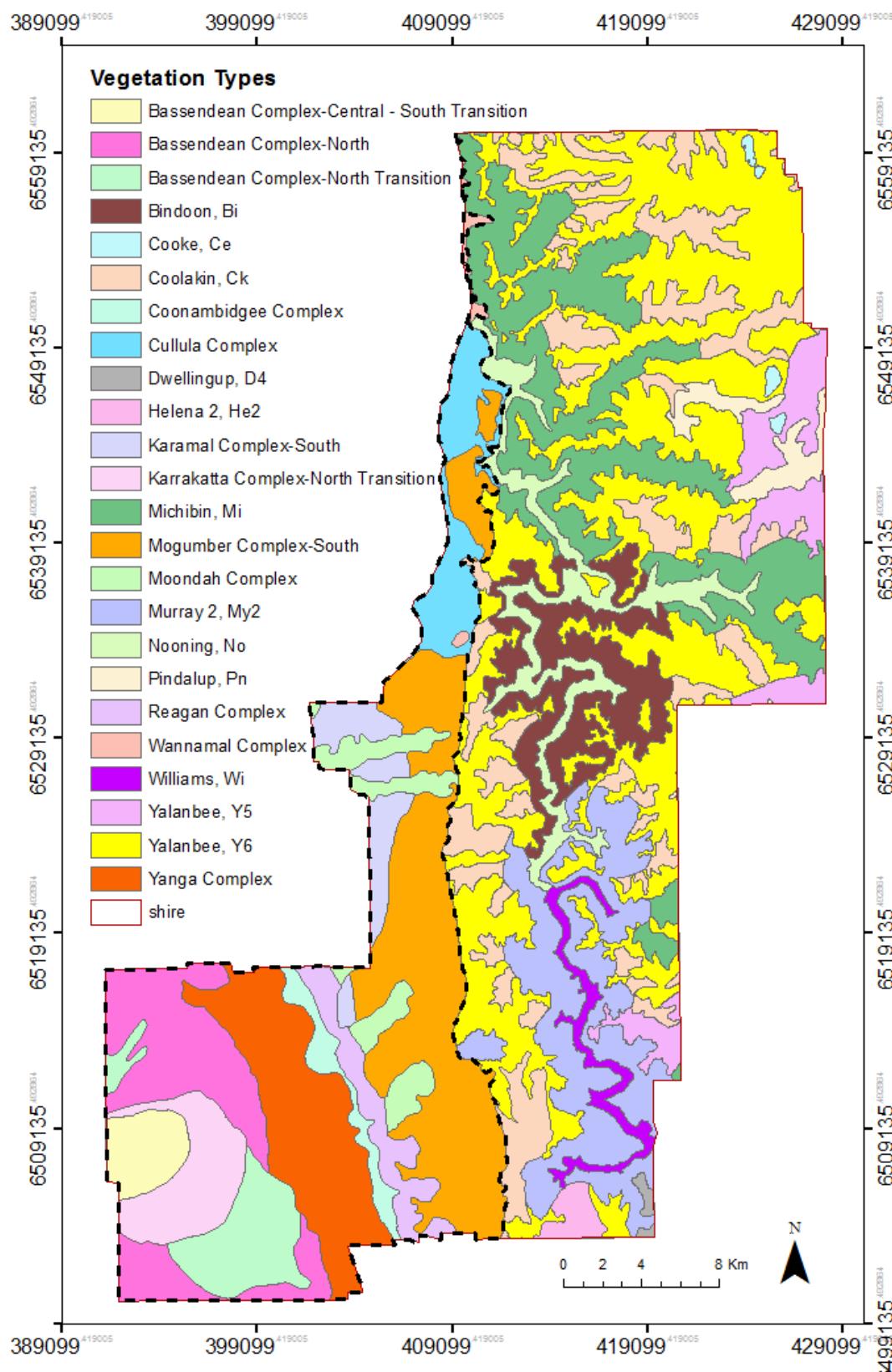


TABLE 3: AREAS OF VEGETATION COMPLEXES (UPDATED 2019)

Vegetation Complex	Source	Description	Original Area (ha)	Area 2007 (ha)	%	Area 2013 (ha)	%	Area 2016 (ha)	%	Area 2018 (ha)	%
Bassendean Complex-Central and South Transition	sys6	Woodland of <i>Eucalyptus marginata</i> (Jarrah) - <i>Corymbia calophylla</i> (Marri) with well defined second storey of <i>Allocasuarina fraseriana</i> (Sheoak) and <i>Banksia grandis</i> (Bull Banksia) on the deeper soils and a closed scrub on the moister sites. The understorey species reflect similarities with the adjacent vegetation complexes.	1547.8	1546.0	100	1508.0	97	1535.21	98	1521.1 (1535.21)	98
Bassendean Complex-North	sys6	Vegetation ranges from a low open forest and low open woodland of <i>Banksia</i> species <i>Eucalyptus todtiana</i> (Pricklybark) to low woodland of <i>Melaleuca</i> species and sedgelands which occupy the moister sites.	6245.7	5930.4	95%	5749.1	92	5781.02	92	5708.7	91
Bassendean Complex-North Transition	sys6	A transition complex of low open forest and low woodland of <i>Banksia</i> species - <i>Eucalyptus</i>	3122.6	3055.6	98%	2983.4	96	2843.53	97	2978.1	95

Vegetation Complex	Source	Description	Original Area (ha)	Area 2007 (ha)	%	Area 2013 (ha)	%	Area 2016 (ha)	%	Area 2018 (ha)	%
		<i>todtiana</i> (Pricklybark) on a series of high sand dunes. The understorey species reflect similarities with both the Bassendean-North and Karrakatta-North vegetation complexes.									
Bindoon, Bi	rfa	Woodland of <i>Eucalyptus loxophleba</i> on the slopes, flanked by woodlands of <i>Eucalyptus wandoo</i> - <i>Eucalyptus accedens</i> on the breakaways and upper slopes in the perarid zone.	5928.8	1384.4	23%	1272.4	21	1305.70	22	1192.8	20
Cooke, Ce	rfa	Mosaic of open forest of <i>Eucalyptus marginata</i> subsp. <i>marginata</i> - <i>Corymbia calophylla</i> (subhumid zone) and open forest of <i>Eucalyptus marginata</i> subsp. <i>thalassica</i> - <i>Corymbia calophylla</i> (semiarid and arid zones) and on deeper soils adjacent to outcrops, closed heath of Myrtaceae-Proteaceae species and lithic complex on granite rocks and associated soils in all climate zones, with some <i>Eucalyptus laeliae</i>	250.8	122.3	49%	117.6	47	109.80	44	104.6	42

Vegetation Complex	Source	Description	Original Area (ha)	Area 2007 (ha)	%	Area 2013 (ha)	%	Area 2016 (ha)	%	Area 2018 (ha)	%
		(semiarid), and <i>Allocasuarina huegeliana</i> and <i>Eucalyptus wandoo</i> (mainly semiarid to perarid zones).									
Coolakin, Ck	rfa	Woodland of <i>Eucalyptus wandoo</i> with mixtures of <i>Eucalyptus patens</i> , <i>Eucalyptus marginata</i> subsp. <i>thalassica</i> and <i>Corymbia calophylla</i> on the valley slopes in arid and perarid zones.	11446.2	3484.5	30%	3106.3	27	3070.31	27	2859.9	25
Coonambidgee Complex	sys6	Vegetation ranges from a low open forest and low woodland of <i>Eucalyptus todtiana</i> (Pricklybark) - <i>Banksia attenuata</i> (Slender Banksia) - <i>Banksia menziesii</i> (Firewood Banksia) - <i>Banksia ilicifolia</i> (Holly-leaved Banksia) with localised admixtures of <i>Banksia prionotes</i> (Acorn Banksia) to an open woodland of <i>Corymbia calophylla</i> (Marri) - <i>Banksia</i> species.	1155.1	257.4	22%	215.8	19	208.39	18	201.5	17

Vegetation Complex	Source	Description	Original Area (ha)	Area 2007 (ha)	%	Area 2013 (ha)	%	Area 2016 (ha)	%	Area 2018 (ha)	%
Cullula Complex	sys6	Mixture of low open forest of <i>Banksia</i> species - <i>Eucalyptus todtiana</i> (Pricklybark) and open woodland of <i>Corymbia calophylla</i> (Marri) with second storey of <i>Eucalyptus todtiana</i> (Pricklybark) - <i>B.attenuata</i> - <i>Banksia menziesii</i> (Firewood Banksia) - <i>Banksia ilicifolia</i> (Holly-leaved Banksia).	2999.5	758.1	25%	694.7	23	1088.96	36	1099.47	36.6
Dwellingup, D4	rfa	Open forest to woodland of <i>Eucalyptus marginata</i> subsp. <i>thalassica</i> - <i>Corymbia calophylla</i> on lateritic uplands in semiarid and arid zones.	173.0	169.0	98%	165.4	96	171.55	99	167.2	97
Helena 2, He2	rfa	Mosaic of open forest of <i>Eucalyptus marginata</i> subsp. <i>thalassica</i> - <i>Corymbia calophylla</i> and woodland of <i>Eucalyptus wandoo</i> with some <i>Eucalyptus accedens</i> and <i>Eucalyptus rudis</i> on the deeper soils ranging to closed heaths and lithic	637.0	274.5	43%	246.1	39	246.08	39	231.3	36

Vegetation Complex	Source	Description	Original Area (ha)	Area 2007 (ha)	%	Area 2013 (ha)	%	Area 2016 (ha)	%	Area 2018 (ha)	%
		complex on shallow soils associated with granite on steep slopes of valleys in semiarid and arid zones.									
Karamal Complex-South	sys6	Open forest of <i>Eucalyptus marginata</i> (Jarrah) - <i>Corymbia calophylla</i> (Marri) with second storey of <i>Banksia grandis</i> (Bull Banksia).	2180.6	1345.7	62%	1287.0	59	1147.67	53	1303.9	60
Karrakatta Complex-North Transition	sys6	A transition complex of low open forest and low woodland of <i>Banksia species</i> - <i>Eucalyptus todtiana</i> (Pricklybark) on the transition zone of a series of high sand dunes between Bassendean-North and Karrakatta-North.	2915.4	2899.1	99%	2833.4	97	2843.53	97	2834.0	97
Michibin, Mi	rfa	Open woodland of <i>Eucalyptus wandoo</i> over <i>Acacia acuminata</i> with some <i>Eucalyptus loxophleba</i> on valley slopes, with low woodland of <i>Allocasuarina huegeliana</i> on or near shallow granite outcrops in arid and perarid zones.	12902.7	4525.2	35%	4299.2	33	4393.33	34	4090.8	32

Vegetation Complex	Source	Description	Original Area (ha)	Area 2007 (ha)	%	Area 2013 (ha)	%	Area 2016 (ha)	%	Area 2018 (ha)	%
Mogumber Complex-South	sys6	Open woodland of <i>Eucalyptus calophylla</i> , with some admixture of <i>Eucalyptus marginata</i> (Jarrah) and a second storey of <i>Eucalyptus todtiana</i> (Pricklybark) - <i>Banksia attenuata</i> - <i>Banksia menziesii</i> (Firewood Banksia) - <i>Banksia ilicifolia</i> (Holly-leaved Banksia).	11779.0	4608.9	39%	4122.8	35	4510.13	38	3993.5	34
Moondah Complex	sys6	Low closed to low open forest of <i>Banksia attenuata</i> (Slender Banksia) - <i>Banksia menziesii</i> (Firewood Banksia) - <i>Eucalyptus todtiana</i> (Pricklybark) - <i>Banksia prionotes</i> (Acorn Banksia) on slopes, open woodland of <i>Corymbia calophylla</i> (Marri) - <i>Banksia species</i> in valley.	2322.8	1162.3	50%	957.9	41	992.06	43	942.3	41
Murray 2, My2	rfa	Open forest of <i>Eucalyptus marginata</i> subsp. <i>thalassica</i> - <i>Corymbia calophylla</i> - <i>Eucalyptus patens</i> and woodland of <i>Eucalyptus wandoo</i> with some <i>Eucalyptus accedens</i> on	8874.5	3694.3	42%	3116.9	35	3328.36	38	3038.1	34

Vegetation Complex	Source	Description	Original Area (ha)	Area 2007 (ha)	%	Area 2013 (ha)	%	Area 2016 (ha)	%	Area 2018 (ha)	%
		valley slopes to woodland of <i>Eucalyptus rufa</i> - <i>Melaleuca rhaphiophylla</i> on the valley floors in semiarid and arid zones.									
Nooning, No	rfa	Mosaic of low open forest of <i>Casuarina obesa</i> and open scrub of <i>Casuarina obesa</i> - <i>Acacia spp.</i> <i>Melaleuca spp.</i> and woodland of <i>Eucalyptus rufa</i> - <i>Melaleuca rhaphiophylla</i> on major valley systems in the perarid zone.	4166.7	814.8	20%	768.8	18	749.11	18	684.7	16
Pindalup, Pn	rfa	Open forest of <i>Eucalyptus marginata</i> subsp. <i>thalassica</i> - <i>Corymbia calophylla</i> on slopes and open woodland of <i>Eucalyptus wandoo</i> with some <i>Eucalyptus patens</i> on the lower slopes in semiarid and arid zones.	1487.5	168.0	11%	164.5	11	149.55	10	144.1	9.6
Reagan Complex	sys6	Vegetation ranges from low open woodland of <i>Banksia species</i> <i>Eucalyptus todtiana</i> (Pricklybark) to closed heath	2008.3	1249.3	62%	1120.9	56	1035.30	51	1100.4	55

Vegetation Complex	Source	Description	Original Area (ha)	Area 2007 (ha)	%	Area 2013 (ha)	%	Area 2016 (ha)	%	Area 2018 (ha)	%
		depending on the depth of soil.									
Wannamal Complex	sys6	Mixture of low shrubland of <i>Melaleuca species</i> and open woodland of <i>Eucalyptus wandoo</i> (Wandoo) - <i>Eucalyptus loxophleba</i> (York Gum).	275.0	160.8	58%	117.0	43	63.61	24	63.47	25.3
Williams, Wi	rfa	Mixture of woodland of <i>Eucalyptus rufida-Melaleuca rhaphiophylla</i> , low forest of <i>Casuarina obesa</i> and tall shrubland of <i>Melaleuca spp.</i> on major valley systems in arid and perarid zones.	1338.6	185.7	14%	142.5	11	163.28	12	135.6	10
Yalanbee, Y5	rfa	Mixture of open forest of <i>Eucalyptus marginata subsp. thalassica-Corymbia calophylla</i> and woodland of <i>Eucalyptus wandoo</i> on lateritic uplands in semiarid to perarid zones.	3857.7	1270.1	33%	1167.4	30	1153.75	30	1119.6	29
Yalanbee, Y6	rfa	Woodland of <i>Eucalyptus wandoo-Eucalyptus accedens</i> , less consistently open forest of <i>Eucalyptus marginata subsp. thalassica-Corymbia</i>	27649.5	9163.6	33%	8426.9	30	8493.94	31	7954.9	29

Vegetation Complex	Source	Description	Original Area (ha)	Area 2007 (ha)	%	Area 2013 (ha)	%	Area 2016 (ha)	%	Area 2018 (ha)	%
		<i>calophylla</i> on lateritic uplands and breakaway landscapes in arid and perarid zones.									
Yanga Complex	sys6	Predominantly a closed scrub of <i>Melaleuca species</i> and low open forest of <i>Casuarina obesa</i> (Swamp Sheoak) on the flats subject to inundation. On drier sites the vegetation reflects the adjacent vegetation complexes of Bassendean and Coonambidgee.	6491.9	1481.4	23%	966.9	15	916.81	14	849.0	13
TOTAL			121756.5	49711.3	41%	45551.1	37%	44900.98	37 %	43947.3	36 %

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All native vegetation in the Shire can be categorized into 30 vegetation complexes or classes as mapped by Heddle et al (1980) and Mattiske and Havel (1998). Some of the mapped vegetation complexes have been heavily cleared and few representative areas remain at regional or at local scale. A number of vegetation complexes within the Shire can be considered **regionally significant**. They can be divided into two main groups:

<p>Vegetation complexes where less than 30% of their original extent remains across their natural range and less than 10% is formally protected in conservation reserves</p>	<p>Yanga Complex Reagan (Re) Reagan (Re) Wannamal (Wn) Bindoon (Bi) Michibin (Mi) Nooning (No) Williams (Wi)</p>
<p>Vegetation complexes where less than 10% is formally protected in conservation reserves, but more than 30% of the original extent remains</p>	<p>Coonambidgee Complex Reagan Complex Cullula (Cu) Moondah (Mh) Mogumber Complex –South Mogumber (Mb) Wannamal Complex</p>

Vegetation complexes in bold are of highest priority for protection within the Shire as more than half of the original regional extent of these two vegetation complexes is within the Shire of Chittering. In fact, 99% of the pre-European extent of Nooning vegetation complex has been mapped within the Shire's administrative boundaries and 69% of the Mogumber Complex – South. This means that there are limited opportunities outside the Shire to ensure adequate retention and protection of these representative vegetation communities.

Several vegetation **complexes are considered locally significant as less** than 30% of the pre-European extent remains within the Shire. However, in the regional context, more than 30% still remains within the region and more than 10% is formally protected. Locally significant vegetation complexes within the Shire of Chittering are:

- (1) Coolakin
- (2) Murray
- (3) Pindalup
- (4) Yalanbee 5

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Detailed distribution of all 30 vegetation complexes is in Figure 2 and Table 3. While the historical land use in the Shire has led to land clearing and some degradation of remaining natural areas, a vegetation condition assessment conducted by the Ellen Brockman Integrated Catchment Group in 2006 shows significant areas of remnant vegetation are still in very good to good condition. These areas despite some disturbance support a variety of locally indigenous species and thus should be a priority for biodiversity conservation.

It is important to note that before final decisions are made regarding which parts of remaining vegetation are to be retained and protected, on ground assessment and confirmation of vegetation complexes and their condition needs to be conducted.

Progress towards goals and targets

**TABLE 4: PROPOSED PROTECTION TARGETS¹ FOR REPRESENTATIVE VEGETATION COMPLEXES
WITHIN THE SHIRE OF CHITTERING AND EXTENT AT JANUARY 2020**

Vegetation complexes (EPA, 2003) and vegetation classes for RFA area (DEC, 2007)	Pre-European extent (ha)	Local Natural Areas (> 4 ha) ha in HCVA	% of protected locally	Proposed protection targets (ha)	Protected as at Jan 2020? (yet to be assessed)
Vegetation complexes at risk regionally as less than 30% remains and less than 10% protected					
Yanga complex	6494	197	2%	187	
Reagan (Re)	51	23	0%	15	
Wannamal	642	12	0%	9	
Bindoon	5929	804	2%	764	
Michibin	12902	1226	0%	1165	
Nooning	4168	242	4%	230	
Williams	1336	72	0%	68	
Vegetation complexes protected at less than 10% regionally					
Bassendean Complex Central and South Transition	1549	0	0%	0	
Karrakatta Complex – North Transition	2915	0	0%	0	
Coonambidgee complex	1155	84	1%	80	
Reagan complex	2023	686	0%	600	
Cullula Complex	2492	705	0%	632	
Cullula (Cu)	62	12	0%	10	
Moondah	380	159	0%	87	
Mogumber Complex South	9518	2424	1%	2100	
Mogumber	2316	533	0%	338	
Wannamal Complex	46	45	0%	43	
Vegetation complexes retained at less than 30% locally					
Yalanbee 6 (Y6)	27581	4482	1%	2743	
Coolakin (Ck)	11414	1602	1%	1027	
Murray 2 (My2)	8877	1484	4%	532	
Pindalup	1476	75	0%	71	

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Yalanbee 5 (Y5)	3860	701	0%	386	
Other vegetation complexes					
Bassendean Complex North	6244	202	0%	20	
Bassendean Complex North-Transition	3122	19	0%	2	
Karamal Complex South	2159	1086	0%	215	
Moondah Complex	1962	617	1%	176	
Cooke	251	111	0%	25	
Dwellingup (D4)	173	23	84%	0	
Helena 2 (He2)	637	194	6%	25	
Totals	121,735	16,562	1%	11,550	

¹ Targets are specified levels or ranges of measurable parameters that decision-makers have agreed they will try to achieve; targets are policy tools, but they have a scientific base; they may be associated with one or more indicators (Williams et al 2001).

Vegetation complexes in bold font in Table 4 show complexes of highest priority for protection within the Shire as no or limited opportunities exist outside the Shire's administrative boundaries to retain and protect representative areas at a regional scale.

2.2 Significant biodiversity features

Due to historical loss of biodiversity to development but also due to limited original distribution of some species, number of plants, animals and ecological communities are threatened and are protected by legislation or policy. A list of protected species and threatened ecological communities recorded to date within the Shire of Chittering is recorded below. However, in the absence of any current records from a property being assessed for development, it should not be assumed that additional threatened or priority ecological communities, significant flora or fauna do not occur in the area.

Adequate ecological assessments might identify new locations of known significant species or even new species within the Shire.

LOCAL BIODIVERSITY STRATEGY 2022**2.2.1 Threatened Ecological Communities**

The number of threatened and priority ecological communities has increased since the original biodiversity strategy was adopted. Table 5 provides an updated list of these and Figure 3 maps these.

Banksia Woodland (73) of the Swan Coastal Plain is now a Threatened Ecological Community, listed as endangered under the *EPBC Act*, however, at this time the community has not been mapped accurately and does not appear in the table and map below.

Any areas with Banksia Woodland would need to be assessed against the criteria prior to any development taking place.

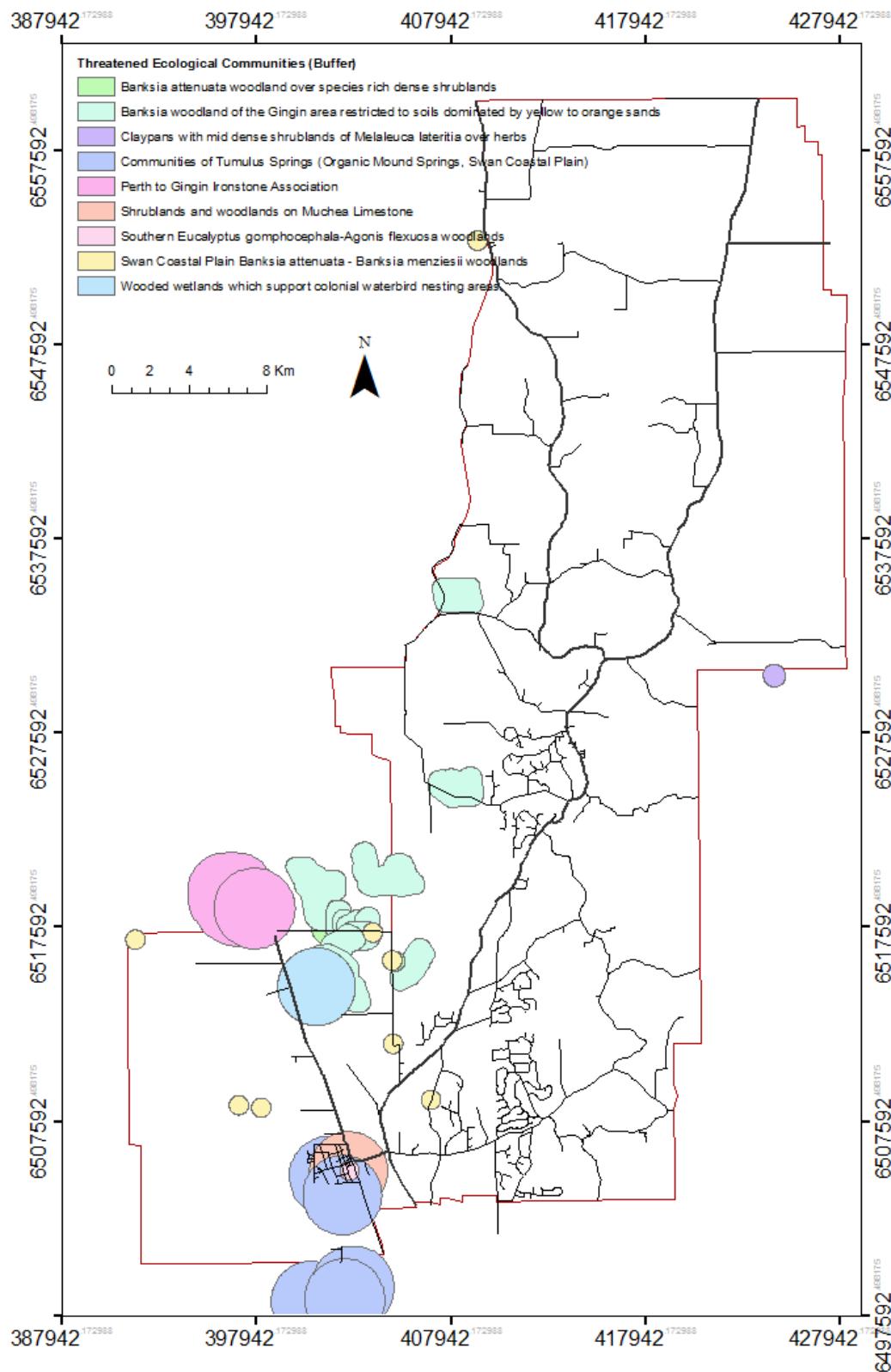
TABLE 5: SHIRE OF CHITTERING THREATENED AND PRIORITY ECOLOGICAL COMMUNITIES

(per EPBC Act)

Community ID	Community Name	Conservation Code
Banksia yellow-orange sands	Banksia woodland of the Gingin area restricted to soils dominated by yellow to orange sands	Priority 2
Claypans with shrubs over herbs	Claypans with mid dense shrublands of <i>Melaleuca lateritia</i> over herbs	Priority 1
Mound Springs SCP	Communities of Tumulus Springs (Organic Mound Springs, Swan Coastal Plain)	Critically Endangered
Muchea Limestone	Shrublands and woodlands on Muchea Limestone	Endangered
NTHIRON	Perth to Gingin Ironstone Association	Critically Endangered
SCP20a	Banksia attenuata woodland over species rich dense shrublands	Endangered
SCP23b	Swan Coastal Plain Banksia attenuata - Banksia menziesii woodlands	Priority 3
Wooded waterbird wetlands	Wooded wetlands which support colonial waterbird nesting areas	Priority 2

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FIGURE 3: THREATENED ECOLOGICAL COMMUNITIES



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2.2.2 Threatened Flora

Threatened flora are listed in Table 6 and mapped in Figure 4

TABLE 6: THREATENED FLORA (FEB 2022)

Name	Family	Conservation Code	Ranking
<i>Acacia alata</i> var. <i>platyptera</i>	Fabaceae	4	
<i>Acacia anarthros</i>	Fabaceae	3	
<i>Acacia anomala</i>	Fabaceae	T	VU
<i>Acacia browniana</i> var. <i>glaucescens</i>	Fabaceae	2	
<i>Acacia cummingiana</i>	Fabaceae	3	
<i>Acacia drummondii</i> subsp. <i>affinis</i>	Fabaceae	3	
<i>Acacia oncinophylla</i> subsp. <i>oncinophylla</i>	Fabaceae	3	
<i>Acacia pulchella</i> var. <i>reflexa</i> acuminate bracteole variant (R.J. Cumming 882)	Fabaceae	3	
<i>Adenanthes cygnorum</i> subsp. <i>chamaephyton</i>	Proteaceae	3	
<i>Allocasuarina ramosissima</i>	Casuarinaceae	3	
<i>Anigozanthos humilis</i> subsp. <i>chrysanthus</i>	Haemodoraceae	4	
<i>Asteridea gracilis</i>	Asteraceae	3	
<i>Asterolasia grandiflora</i>	Rutaceae	4	
<i>Calothamnus pachystachyus</i>	Myrtaceae	4	
<i>Caustis gigas</i>	Cyperaceae	2	
<i>Chamaescilla gibsonii</i>	Xanthorrhoeaceae	3	
<i>Chamelaucium lullfitzii</i> (N.G. Marchant 6)	Myrtaceae	T	VU
<i>Conospermum densiflorum</i> subsp. <i>unicephalatum</i>	Proteaceae	T	EN
<i>Cyanicula ixioides</i> subsp. <i>candida</i>	Orchidaceae	2	
<i>Cyathochaeta teretifolia</i>	Cyperaceae	3	
<i>Darwinia acerosa</i>	Myrtaceae	T	EN

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Name	Family	Conservation Code	Ranking
<i>Darwinia foetida</i>	Myrtaceae	T	EN
<i>Darwinia sp. Bindoon (S.Patrick 281)</i>	Myrtaceae	P1	
<i>Daviesia debilior subsp. sinuans</i>	Fabaceae	3	
<i>Diuris drummondii</i>	Orchidaceae	T	
<i>Drosera sewerliae</i>	Droseraceae	2	
<i>Eleocharis keigheryi</i>	Cyperaceae	T	VU
<i>Eryngium pinnatifidum subsp. Umbraphilum (G.J. Keighery 13967)</i>	Apiaceae	2	
<i>Eucalyptus exilis</i>	Myrtaceae	4	
<i>Gastrolobium crispatum</i>	Fabaceae	1	
<i>Gastrolobium nudum</i>	Fabaceae	2	
<i>Goodenia arthrotricha</i>	Goodeniaceae	T	EN
<i>Grevillea althoferorum subsp. fragilis</i>	Proteaceae	T	CR
<i>Grevillea bracteosa subsp. bracteosa</i>	Proteaceae	T	
<i>Grevillea candelleana</i>	Proteaceae	2	
<i>Grevillea corrugata</i>	Proteaceae	T	VU
<i>Grevillea curviloba</i>	Proteaceae	T	
<i>Grevillea drummondii</i>	Proteaceae	4	
<i>Grevillea florida</i>	Proteaceae	3	
<i>Grevillea synapheae subsp. latiloba</i>	Proteaceae	1	
<i>Guichenotia tuberculata</i>	Malvaceae	3	
<i>Halgania corymbosa</i>	Boraginaceae	3	
<i>Hibbertia glomerata subsp. ginginensis</i>	Dilleniaceae	2	
<i>Hibbertia miniata</i>	Dilleniaceae	4	
<i>Hibbertia subglaba</i>	Dilleniaceae	3	Mogumber? Or maybe not
<i>Hypocalymma sylvestre</i>	Myrtaceae	T	EN

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Name	Family	Conservation Code	Ranking
<i>Hypolaena robusta</i>	Restionaceae	4	
<i>Isotropis cuneifolia</i> subsp. <i>glabra</i>	Fabaceae	2	
<i>Lasiopetalum caroliae</i>	Malvaceae	3	
<i>Leucopogon squarrosus</i> subsp. <i>trigynus</i>	Ericaceae	2	
<i>Millotia tenuifolia</i> var. <i>laevis</i>	Asteraceae	2	
<i>Ornduffia submersa</i>	Menyanthaceae	4	
<i>Oxymyrrhine coronata</i>	Myrtaceae	4	
<i>Persoonia sulcata</i>	Proteaceae	4	
<i>Platysace ramosissima</i>	Apiaceae	3	
<i>Poranthera moorokatta</i>	Phyllanthaceae	2	
<i>Schoenus griffinianus</i>	Cyperaceae	4	
<i>Senecio gilbertii</i>	Asteraceae	1	
<i>Spirogardnera rubescens</i>	Santalaceae	T	VU
<i>Stylium cymiferum</i>	Stylidiaceae	3	
<i>Stylium glabrifolium</i>	Stylidiaceae	2	
<i>Stylium sacculatum</i>	Stylidiaceae	3	
<i>Stylium semaphorum</i>	Stylidiaceae	T	CR
<i>Stylium squamellosum</i>	Stylidiaceae	2	
<i>Styphelia filifolia</i>	Ericaceae	3	
<i>Synaphea grandis</i>	Proteaceae	4	
<i>Synaphea panhesya</i>	Proteaceae	1	
<i>Synaphea rangiferops</i>	Proteaceae	2	
<i>Tetraria</i> sp. <i>Chandala</i> (G.J. Keighery 17055)	Cyperaceae	2	
<i>Thysanotus</i> sp. <i>Badgingarra</i> (E.A.Griffin 2511)	Asparagaceae	2	
<i>Tetrapetra pilifera</i>	Elaeocarpaceae	3	

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Name	Family	Conservation Code	Ranking
<i>Thelymitra stellata</i>	Orchidaceae	T	EN
<i>Thelymitra variegata</i>	Orchidaceae	2	
<i>Verticordia lindleyi</i> subsp. <i>lindleyi</i>	Myrtaceae	4	
<i>Verticordia rutilastra</i>	Myrtaceae	3	
<i>Verticordia serrata</i> var. <i>linearis</i>	Myrtaceae	3	
<i>Verticordia serrata</i> var. <i>Udumung</i> (D. Hunter & B. Yarran 941006)	Myrtaceae	2	

Conservation Codes

T - Rare or likely to become extinct

X - Presumed extinct

IA - Protected under international agreement

S - Other specially protected fauna

1 - Priority 1

2 - Priority 2

3 - Priority 3

4 - Priority 4

5 - Priority 5

2.2.3 Threatened Fauna

Natural areas within the Shire and in neighbouring areas support a wide range of native fauna. Native fauna recorded within the Brockman River catchment which covers about two thirds of the Shire includes 24 native mammals, 182 bird species, 17 amphibians, 83 reptile species, 6 native fish and 3 freshwater crustaceans (*Water & Rivers Commission, 2003*).

Honey possum, *Tarsipes rostratus*, the unique nectivorous marsupial found only in the South West of Western Australia still remains within the Shire and can be seen feeding on nectar of banksias, bottlebrushes or grevilleas. The long term future of this species is dependent on a connected mosaic of natural areas that provide a full range of mature flowering plants. In a highly fragmented landscape with increased risk of fires this can be very difficult considering that a sustainable population of honey possums requires a natural area which had at least 20 to 30 years post fire to achieve the required maturity of plants (Bradshaw, *et al*, 2007).



Carnaby's black cockatoo, an iconic species of the South West of Western Australia is threatened due to the loss of breeding as well as its feeding habitat. Clearing and subsequent land degradation combined with increasing competition for nesting hollows by galahs, western corellas and feral honey bees all affect this bird's future. With significant reductions in the areas of pine plantations just southwest of the Shire's boundary, the future populations of this iconic bird will be significantly affected (Government of Western Australia, 2009). Therefore, retention of mature trees, and native vegetation to support this iconic species is critical to its survival.

Seeds of hakeas, banksias, grevilleas and eucalyptus form the bulk of Carnaby's black cockatoo's diet.

Threatened fauna are listed in Table 7 and mapped in Figure 4.

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TABLE 7: THREATENED FAUNA

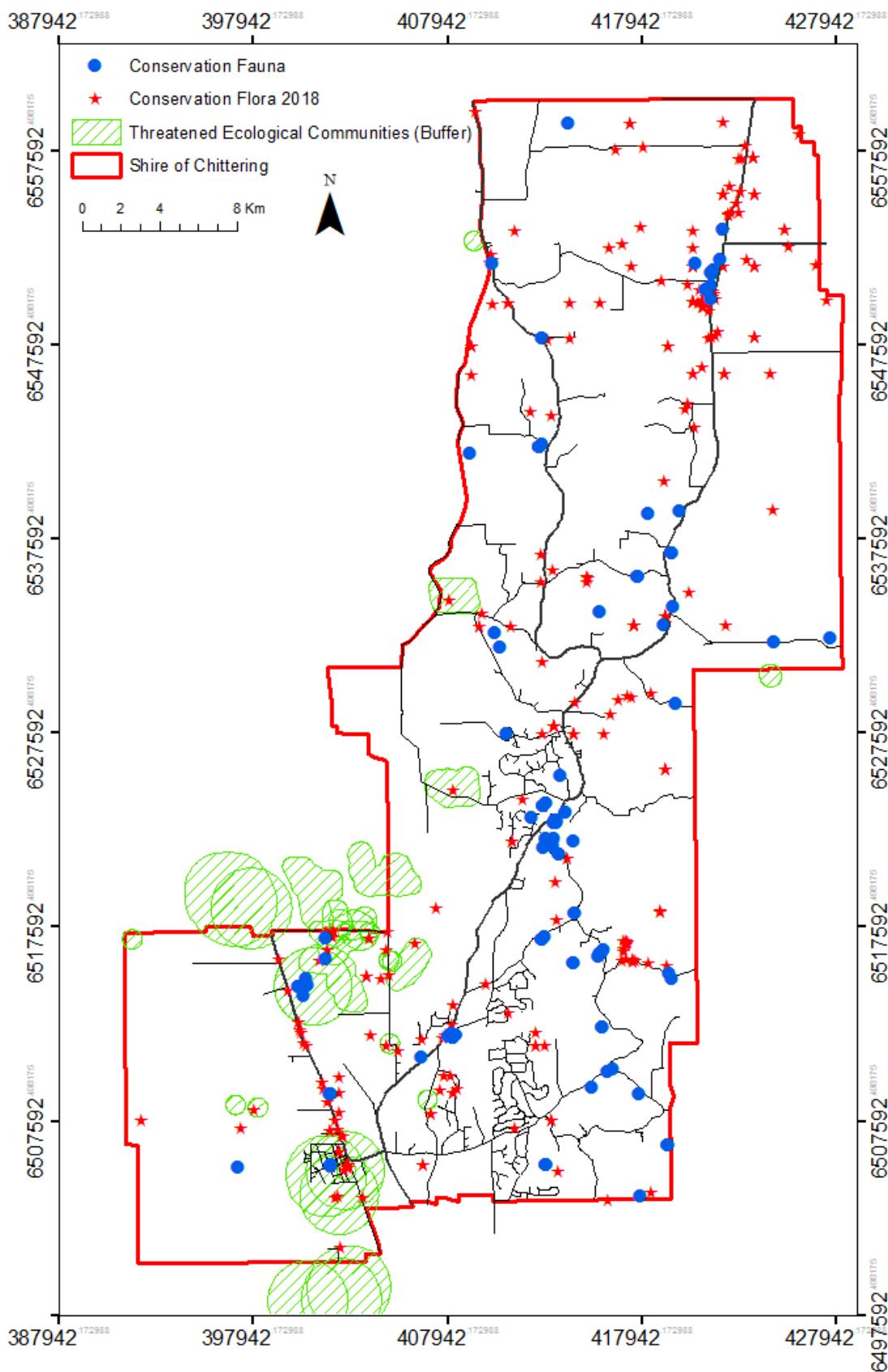
Species	Common Name	Conservation Code
Oxyura australis	Blue-billed Duck	P4
Botaurus poiciloptilus	Australasian Bittern	T
Thinornis rubricollis	Hooded Plover	P4
Falco peregrinus	Peregrine Falcon	S
Calyptorhynchus banksii subsp. naso	Forest Red-tailed Black Cockatoo	T
Calyptorhynchus baudinii	Baudin's Cockatoo	T
Calyptorhynchus latirostris	Carnaby's Cockatoo	T
Calyptorhynchus sp.	White-tailed Black Cockatoo	T
Actitis hypoleucus	Common Sandpiper	IA
Calidris acuminata	Sharp-tailed Sandpiper	IA
Calidris ferruginea	Curlew Sandpiper	T
Calidris melanotos	Pectoral Sandpiper	IA
Calidris ruficollis	Red-necked Stint	IA
Calidris subminuta	Long-toed Stint	IA
Limosa limosa	Black-tailed Godwit	IA
Tringa glareola	Wood Sandpiper	IA
Tringa nebularia	Common Greenshank	IA
Plegadis falcinellus	Glossy Ibis	IA
Aspidites ramsayi subsp. southwest subpop.	Woma southwest subpop.	P1
Pseudemydura umbrina	Western Swamp Tortoise	T
Neelaps calonotos	Black-striped Snake, black-striped burrowing snake	P3
Hesperocolletes douglesi	a short-tongue bee	X
Leioproctus contrarius	a short-tongued bee	P3
Throscodectes xederoides	Mogumber Bush Cricket	P3

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Species	Common Name	Conservation Code
<i>Dasyurus geoffroii</i>	Chuditch, Western Quoll	T
<i>Phascogale tapoatafa</i> subsp. <i>wambenger</i>	South-western Brush-tailed Phascogale	S
<i>Notamacropus eugenii</i> subsp. <i>derbianus</i>	Tammar Wallaby	P4
<i>Notamacropus irma</i>	Western Brush Wallaby	P4
<i>Leporillus conditor</i>	Greater Stick-nest Rat	S
<i>Isoodon fusciventer</i>	Quenda, southwestern brown bandicoot	P4
<i>Macrotis lagotis</i>	Bilby	T
<i>Galaxiella munda</i>	mud minnow, western dwarf galaxias	T
<i>Westralunio carteri</i>	Carter's Freshwater Mussel	T
<i>Euoplos inornatus</i>	inornate trapdoor spider northern Jarrah Forest	P3
<i>Idiosoma nigrum</i>	Shield-backed Trapdoor Spider	T

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FIGURE 4: THREATENED FLORA AND FAUNA



2.3 Regional and local ecological linkages

In a highly fragmented landscape the distribution of the remaining natural areas is critical to the maintenance of biodiversity in that landscape. When looking outside the administrative boundaries of the Shire of Chittering, extensive areas of native vegetation remain along the East - South East boundary and also to the North West. However, the remnant vegetation in between is critical to maintain the connection between these natural areas, enable movement and exchange of animals, seeds and pollen.

Patches of native vegetation scattered across a landscape have a capacity to remain functional natural systems if they are of adequate size and connected to other patches through a good quality network of linkages. This connectivity is important to assist with natural system recovery after events such as fires and will be critical to climate change adaption.

The importance of ecological linkages has been recognised as an environmental policy consideration in EPA and State planning policy for some years with the latest support published by EPA in the ***Environmental Protection Bulletin No 8, South West Regional Ecological Linkages*** (October 2009).

Networks of regional and local ecological linkages have been identified for the Shire of Chittering by the Perth Biodiversity Project with input from the Chittering Landcare Group. Descriptions, spatial distribution and extent of linkages is presented in Table 8 and Figure 5 Regional Linkages and Table 9 and Figure 6 Local Linkages.

The criteria used to identify the linkages,

The following principles have been used for the identification of Ecological Linkages within the Shire of Chittering:

1. Continuous corridors of native vegetation with a minimum width of 500 m where these are available have been chosen where appropriate (Davis 2008).
2. Thin corridors (<500m wide) along roads mainly consisting of trees over a highly disturbed understorey may be of little value except for already highly mobile species have generally been avoided.
3. Where continuous corridors of native vegetation are not available, linkages made up of Local Natural Areas that form stepping stones between larger intact areas have been selected.
4. The target maximum distance between Local Natural Areas is from 500 m to 1000 m (the closer the Local Natural Areas, the better)
5. Where most Local Natural Areas are a minimum size of 4 Ha with as many natural areas within each.
6. The widest ranges of habitats within the linkages with similar habitats no more than 500 m to 1000 m apart.
7. The number of links to any given natural area has been maximised (as this improves overall connectivity across the landscape and long-term viability of individual Local Natural Areas).
8. Linkages have been chosen to maximise the width, connectivity and structural complexity of vegetation to make them suitable for a broad range of fauna and flora.
9. The following areas have been given high priority for inclusion in the linkage are Local Natural Areas forming the most direct links with Regionally Significant and Local Natural Areas or Regional Ecological Links
10. Local Natural Areas that form a network of links across the north-south and east-west gradients of variation in ecological communities within a Local Government area (due to soils, geology, landform and climate)

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11. Local Natural Areas located within 500 m of DEC Managed Estate, System 6 areas, other areas of regional value, protected LSNA (>10 ha); These areas buffer the large, viable, already protected Local Natural Areas and the association improves the viability of each of the sites
12. Riparian vegetation along waterways (including an appropriate buffer of non-riparian vegetation)
13. Local Natural Areas at high points in the landscape that are in the line of sight of other Local Natural Areas. These are important for the movement of song birds and butterflies (John Dell, pers. comm. 2008,)

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TABLE 8: REGIONAL ECOLOGICAL LINKAGES

ID	Description	Total Area (ha)	Native Vegetation 2007		Native Vegetation 2013		Native Vegetation 2018	
			ha	%	ha	%	ha	%
2	Extends west from The Brockman River and Regional Links 42 and 16 to Local Link 27. Moderately Vegetated.	150.0	80.1	53%	78.1	52%	71.7	48%
3	Extends south along Ellen Brook linking with Regional Link 4 and Local Link 1. South of the Shire it joins Regional Link 1. Riparian. Poorly Vegetated.	380.8	109.4	29%	109.9	29%	78.7	21%
4	Extends north along Ellen Brook from Regional Link 4 and Local Link 1 joining Regional Links 39 and 40. Includes Chandala N.R. Riparian. Poorly Vegetated.	342.2	146.0	43%	88.3	26%	86.4	25%
5	Extends north from Regional Link 37 joining Regional Links 10 and 39 well outside the Shire. Poorly Vegetated.	77.3	23.2	30%	14.9	19%	22.1	29%
10	Extends west along Lennard Brook from Regional Links 11 and 36 joining Local Link 18 within the Shire and Regional Linkages 5 and 39 well west of the Shire. Riparian. Poorly Vegetated.	172.2	61.8	36%	53.7	31%	54.4	32%
11	Extends west from Lennard Brook and Regional Links 10 and 36 joining Regional Link 40 and 12 and Local Links 5 and 17. Partly Riparian. Well Vegetated.	291.4	202.9	70%	173.5	60%	179.5	62%
12	Extends west from The Brockman River and Regional Links 13 and 17 to Regional Link 11 and Local Links 5 and 17. Poorly Vegetated.	233.6	89.0	38%	69.8	30%	68.8	29%
13	Extends south along the Brockman River from Regional Links 12 and 17 to Regional Link 14 and Local Link 32. It also joins Local Links 21 and 33. Riparian. Poorly Vegetated.	401.6	159.8	40%	144.6	36%	142.8	36%
14	Extends south along the Brockman River from Regional Link 13 and Local Link 32 to Regional Link 15 and Local Links 22 and 31. Includes BlackBoy Ridge Reserve. Riparian. Very Poorly Vegetated.	405.9	45.8	11%	38.2	9%	36.6	9%
15	Extends south along the Brockman River from Regional Link 14 and Local Link 22 to Regional Link 16 and Local Links 25 and 30. Riparian. Very Poorly Vegetated.	490.2	74.3	15%	69.8	14%	68.7	14%

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16	Extends south along the Brockman River from Regional Link 15 and Local Links 25 and 30 to Regional Links 2 and 42. Riparian. Very Poorly Vegetated.	509.8	70.3	14%	70.9	14%	65.9	13%
17	Extends south along the Brockman River from Regional Link 18 and Local Links 5 and 16 to Regional Links 12 and 13. It also connects with Regional Link 43 and Local Link 34. Riparian. Poorly Vegetated.	769.5	180.1	23%	171.6	22%	155.6	20%
18	Extends south along the Brockman River from Regional Links 19 and 25 to Regional Link 17 and Local Links 5, 15 and 16. Riparian. Very Poorly Vegetated.	324.8	65.2	20%	65.2	20%	55.4	17%
19	Extends east from the Brockman River (Regional Links 16 and 25) along Wootra Brook to Regional Link 20 and Local Links 41 and 42. Riparian. Very Poorly Vegetated.	383.4	56.3	15%	56.7	15%	45.8	12%
20	Extends east along Wootra Brook from Regional Link 19 and Local Links 41 and 42 to Regional Links 21 and 22. Riparian. Moderately Vegetated, mostly in the upper reaches.	341.3	158.7	47%	137.9	40%	140.1	41%
21	Extends south from Regional Links 21 and 22 to Regional Links 41 and 43 outside the Shire. Well Vegetated	82.6	75.7	92%	70.9	86%	70.9	86%
22	Extends north from Regional Links 20 and 21 to Regional Links 23 and 31 east of the shire. Well Vegetated.	368.0	360.2	98%	355.1	96%	355.3	97%
23	Extends east fromn Regional Link 24 and Local Links 10 and 42 joing Regional Links 22 and 31 outside of the shire. Very Poorly Vegetated.	364.3	73.8	20%	73.9	20%	59.3	16%
24	Extends east from the Brockman River (Regional Links 25 and 26, Local Link 13), joining Local Links 9, 10 and 42 and Regional Link 23. Riparian. Poorly Vegetated.	514.7	152.4	30%	157.5	31%	147.5	29%
25	Extends south along the Brockman River from Regional Links 24 and 26 and Local Link 13 joining Local Link 14 and Regional Links 18 and 19. Riparian. Very Poorly Vegetated.	271.1	15.7	6%	15.7	6%	15.8	6%
26	Extends south along the Brockman River from Regional Link 27 and Local Link 12 joining Regional Links 24 and 25 and Local Link 13. Riparian. Poorly Vegetated.	200.7	46.6	23%	46.6	23%	42.3	21%
27	Extends south along the Brockman River from Regional Link 28 and Local Link 35 joining Regional Link 26 and Local Link 12. Riparian. Poorly Vegetated.	175.7	42.1	24%	45.0	26%	35.5	20%

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28	Extends south along the Brockman River from Regional Links 29 and 33 joining Regional Link 27 and Local Links 8 and 35. Riparian. Poorly Vegetated.	253.9	79.0	31%	76.2	30%	75.1	30%
29	Extends east from the Brockman River (Regional Links 28 and 33) along Uduzung Brook to Regional Link 30 and Local Link 38. Riparian. Poorly Vegetated.	253.4	71.0	28%	62.7	25%	56.6	22%
30	Extends east along Uduzung Brook from Regional Link 29 and Local Link 38 to Regional Link 31 and Local Links 10, 35, 36 and 37. Includes Uduzung N.R. Riparian.. Poorly Vegetated.	400.3	137.0	34%	138.3	35%	115.8	29%
31	Extends east along Gooninong Romary Creek from Regional Link 30 and Local Links 10, 35, 36 and 37 joining Local Link 11 and then Regional Links 22, 23, 32 outside the shire. Includes Uduzung N.R. Riparian. Poorly Vegetated.	333.7	144.3	43%	144.4	43%	125.8	38%

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TABLE 9: LOCAL ECOLOGICAL LINKAGES

ID	Description	Total Area (ha)	Native Vegetation 2007		Native Vegetation 2013		Native Vegetation 2018	
			ha	%	ha	%	ha	%
1	Almost Rocky Gully Creek. Realignment suggested. Includes Lot 209. Poorly vegetated.	344.4	142.7	41%	128.2	37%	125.2	36%
2	Poorly vegetated.	245.5	91.8	37%	80.0	33%	63.5	26%
3	Reserve Rd Remnants. Includes Lot 209, loppolo N.R. Well vegetated.	423.9	369.4	87%	361.1	85%	361.1	85%
4	Yal Yal Brook. extension downstream suggested. Poorly vegetated.	387.9	148.3	38%	128.7	33%	124.4	32%
5	Part of a major N-S linkage chain west of the Brockman R. Moderately vegetated. needs dissection.	531.8	252.9	48%	253.0	48%	246.4	46%
6	Poorly vegetated.	273.3	113.8	42%	110.7	40%	100.5	37%
7	Very Poorly vegetated.	146.1	29.4	20%	25.0	17%	22.2	15%
8	Very Poorly vegetated.	327.2	61.5	19%	60.4	18%	49.2	15%
9	Moderately vegetated.	306.4	165.4	54%	158.5	52%	154.9	51%
10	Great Northern Hwy, part of a major N-S linkage chain east of the Brockman R. Udumung N.R. Poorly vegetated.	416.6	142.2	34%	142.2	34%	120.9	29%
11	Gooninong Romary Creek. Poorly vegetated.	255.5	108.8	43%	98.7	39%	89.7	35%
12	Poorly vegetated.	160.4	76.8	48%	63.9	40%	52.1	33%
13	Moderately vegetated.	281.1	176.9	63%	170.8	61%	165.8	59%
14	Poorly vegetated.	364.1	82.7	23%	82.1	23%	92.7	25%
15	Moderately vegetated.	240.9	97.3	40%	114.6	48%	104.2	43%
16	Well vegetated.	409.6	254.1	62%	256.6	63%	254.6	62%
17	Part of a major N-S linkage chain west of the Brockman R. Well vegetated. realignment indicated	160.1	106.7	67%	117.8	74%	106.0	66%

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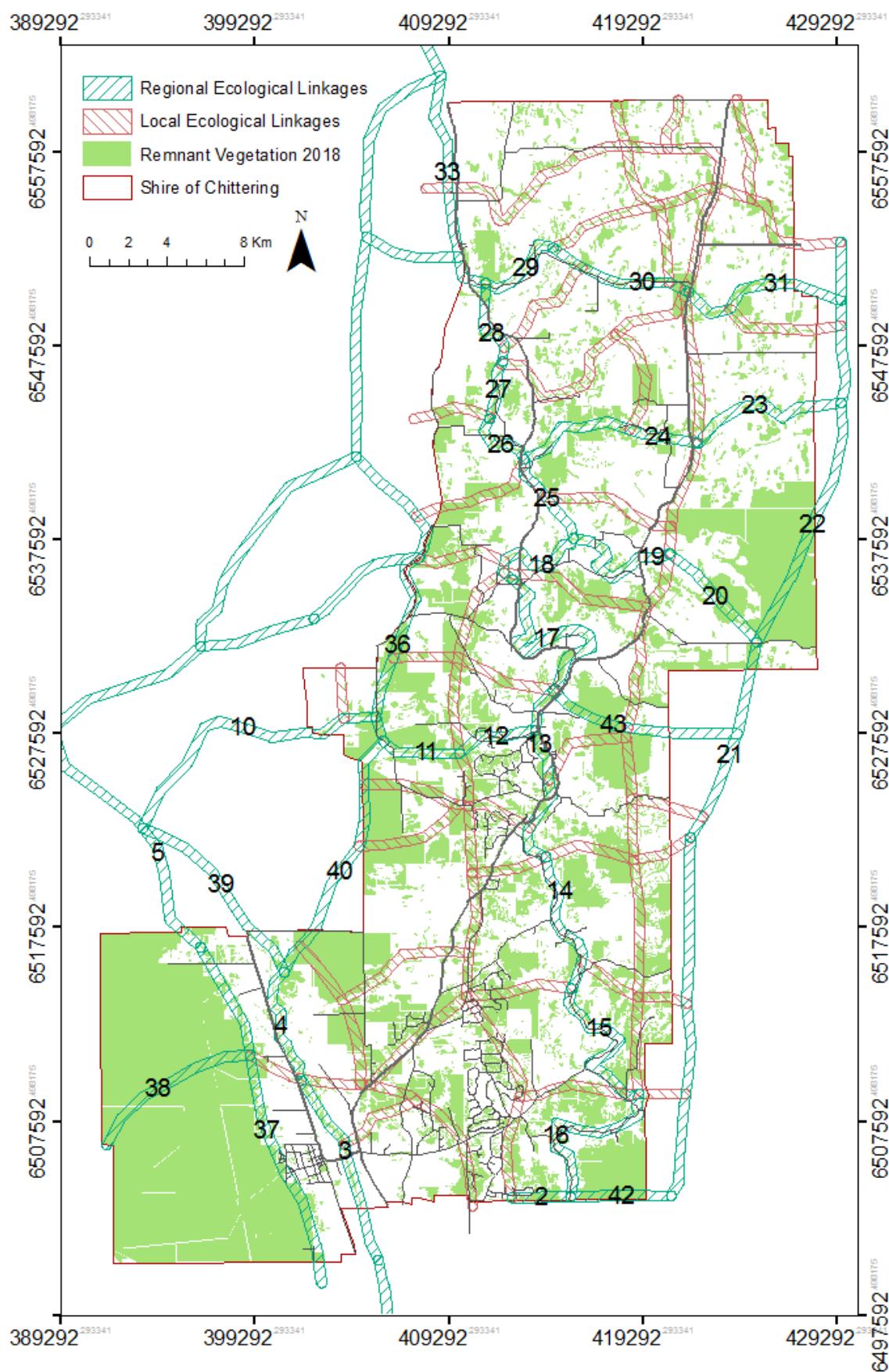
18	Very Poorly vegetated.	139.3	7.8	6%	6.6	5%	5.7	4%
19	Brennan N.R. Well vegetated. realignment indicated	293.5	210.1	72%	208.5	71%	204.9	70%
20	part of a major N-S linkage chain west of the Brockman R. Well vegetated.	191.4	127.2	66%	116.3	61%	116.8	61%
21	Mount Byroomanning N.R. Moderately vegetated. realignment?	277.1	149.6	54%	151.3	55%	139.5	50%
22	Poorly vegetated. realignment?	295.1	145.6	49%	118.1	40%	108.3	37%
23	Poorly vegetated.	109.9	26.0	24%	23.2	21%	22.3	20%
24	Part of a major N-S linkage chain east of the Brockman R. Moderately vegetated.	373.4	214.1	57%	200.8	54%	203.0	54%
25	Part of a major N-S linkage chain east of the Brockman R. Moderately vegetated.	271.6	171.7	63%	162.6	60%	163.2	60%
26	Part of a major N-S linkage chain west of the Brockman R. Poorly vegetated.	322.0	139.5	43%	120.3	37%	105.2	33%
27	Includes Muchea East Reserve, part of a major N-S linkage chain west of the Brockman R. Poorly vegetated.	284.0	109.8	39%	95.0	33%	92.7	33%
28	Rocky Gully Creek. Includes Lot 209. Moderately vegetated.	356.0	210.7	59%	184.9	52%	180.5	51%
29	Part of a major N-S linkage chain west of the Brockman R. Moderately vegetated.	339.8	179.2	53%	155.0	46%	154.6	46%
30	Poorly vegetated.	345.9	174.9	51%	136.8	40%	133.7	39%
31	Poorly vegetated.	271.9	133.2	49%	137.1	50%	145.0	53%
32	Partly Spice Brook, Moderately vegetated. dissect? realign?	541.2	256.0	47%	216.5	40%	214.3	40%
33	Spoonbill Lake. Moderately vegetated.	469.5	272.3	58%	242.3	52%	242.6	52%
34	Moderately vegetated. dissect?	449.5	202.9	45%	198.7	44%	197.8	44%
35	Gooninong Romary Creek, Poorly vegetated.	683.0	192.9	28%	196.9	29%	182.6	27%

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36	Part of a major N-S linkage chain east of the Brockman R. Poorly vegetated. dissect	518.8	174.2	34%	165.2	32%	126.6	24%
37	Part of a major N-S linkage chain east of the Brockman R. West Point Creek, very poorly vegetated, needs to be dissected	1177.1	279.9	24%	271.2	23%	222.0	19%
38	Udumung Brook. Poorly vegetated. dissect?	750.0	276.8	37%	277.5	37%	245.5	33%
39	Includes Harris Reserve, Lot 209. Moderately vegetated.	451.8	270.8	60%	235.7	52%	226.7	50%
40	Part of a major N-S linkage chain east of the Brockman R. Well vegetated.	362.2	233.5	64%	226.6	63%	224.4	62%
41	Part of a major N-S linkage chain east of the Brockman R. Poorly vegetated.	495.1	220.6	45%	205.5	42%	195.5	39%
42	Part of a major N-S linkage chain east of the Brockman R. Poorly vegetated.	318.2	110.1	35%	109.0	34%	100.2	31%

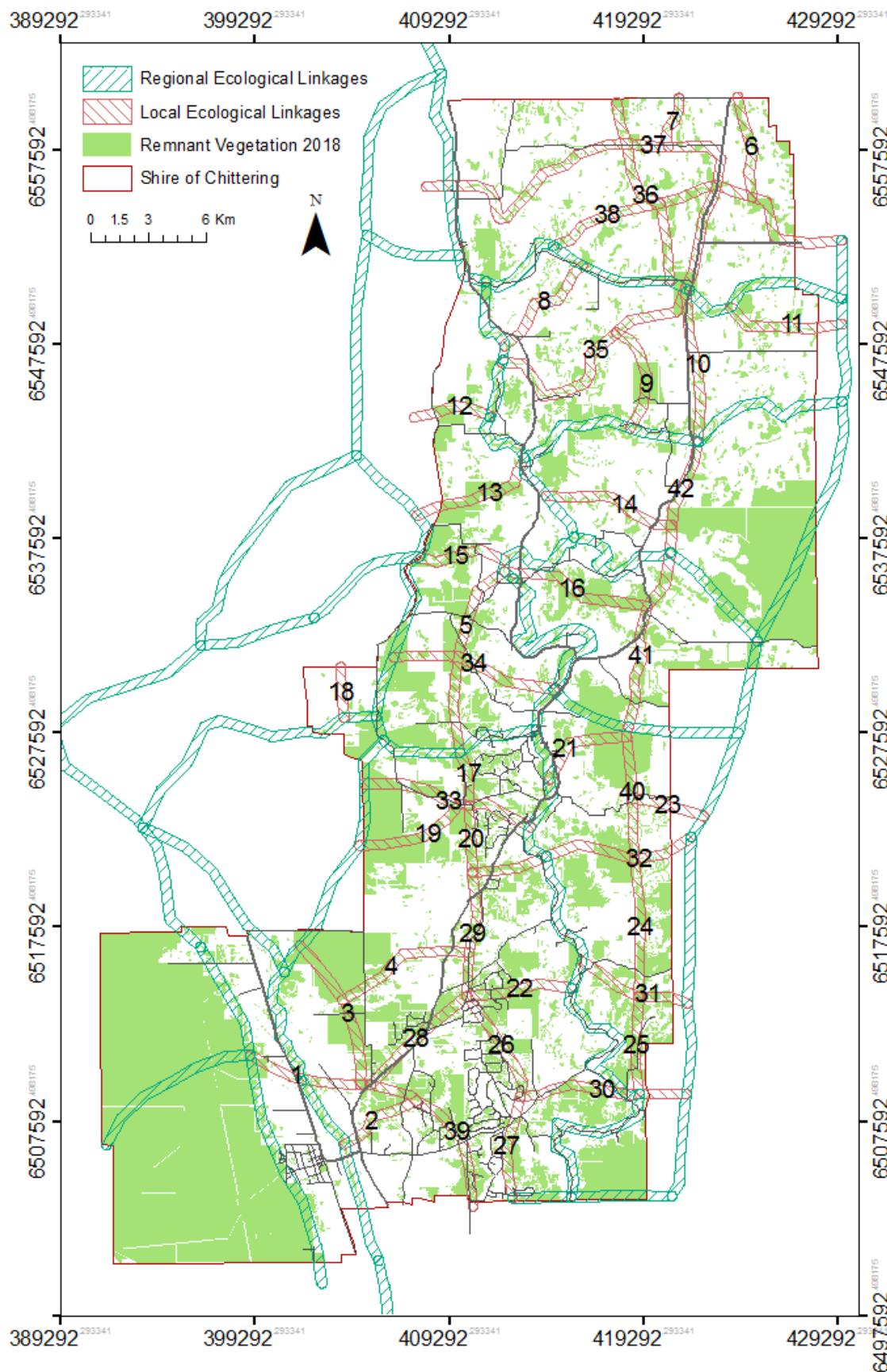
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FIGURE 5: REGIONAL ECOLOGICAL LINKAGES



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FIGURE 6: LOCAL ECOLOGICAL LINKAGES



2.4 Wetlands and Waterways

There is a wide variety of wetlands within the Shire. They include lakes, sumplands, damplands, streams and palusplains. They vary in

- Shape and size,
- Water characteristics,
- Stratigraphy and
- Vegetation assemblages.

Wetlands support a great variety of fauna, including migratory bird species that are protected by international treaties to which Australia is a signatory.

They not only provide a breeding and feeding habitat to large number of various birds and other animals, but also accommodate the movement of animals across the landscape. In fact a number of regional and local ecological linkages follow a river or a stream. Maintenance of healthy streams is critical for biodiversity conservation but also to long term sustainable land use.

There are three Wetlands of National Significance in Chittering, all are important breeding areas for birds. They are

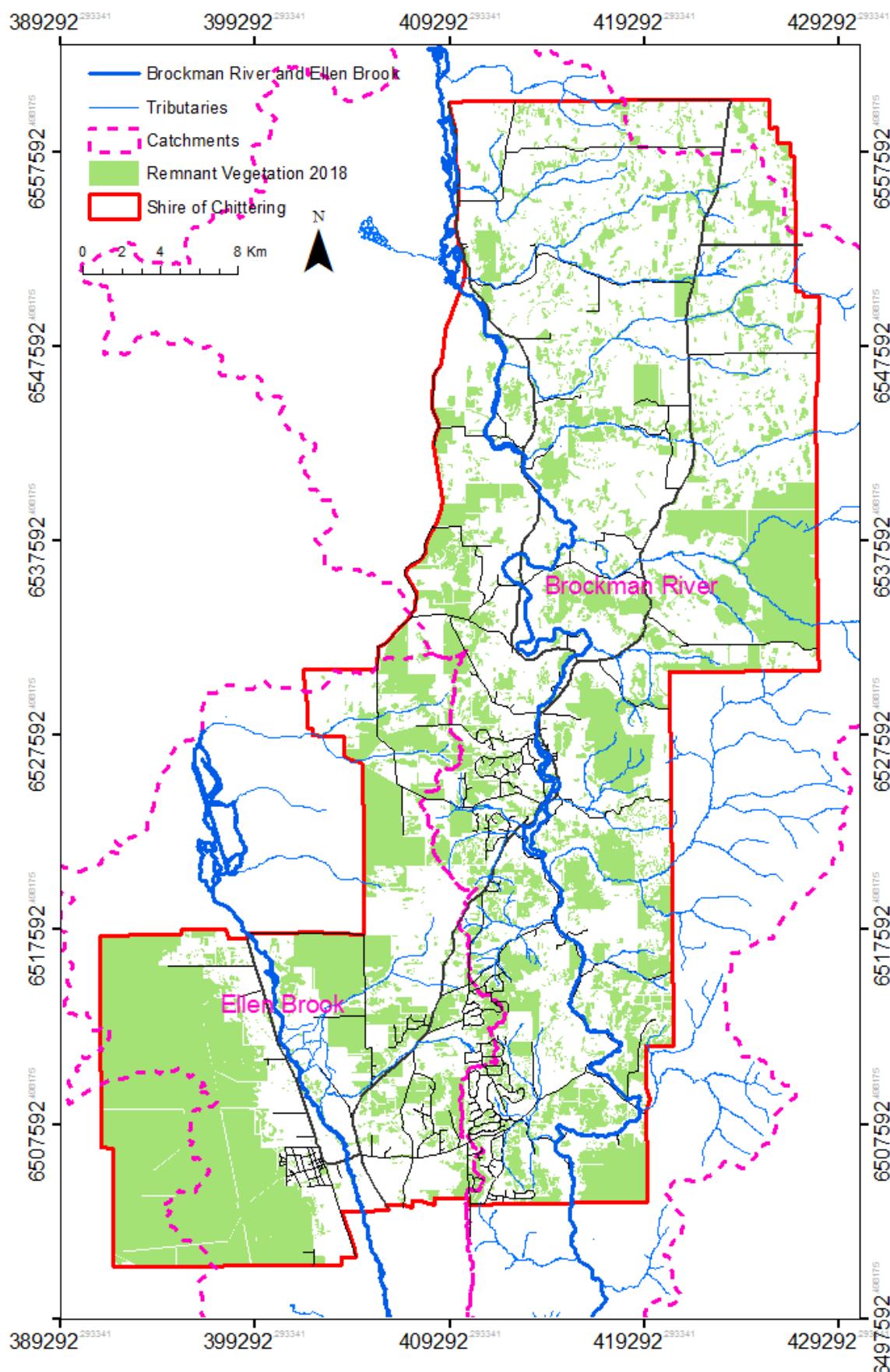
1. Lake Noodoonga
2. Lake Chittering
3. Lake Chandala

There are two major waterways flowing through Chittering and meet with the Swan Avon River system:

1. The Ellen Brook that flows across the Swan Coastal Plain
2. The Brockman River which flows through the Chittering Valley.

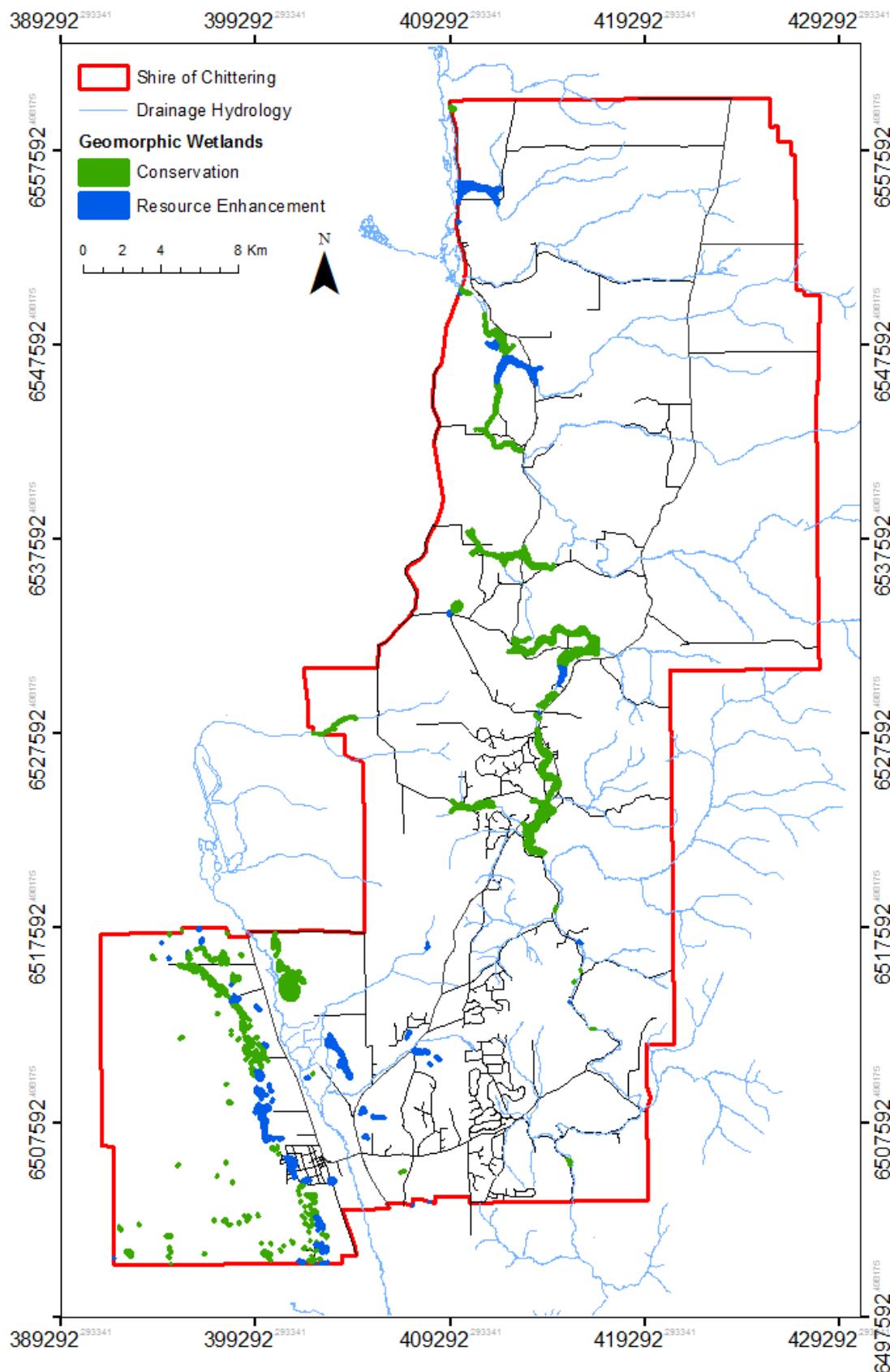
The major drainage systems are shown in Figure 7 and the geomorphic wetlands are shown in Figure 8.

FIGURE 7: DRAINAGE SYSTEMS



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FIGURE 8: GEOMORPHIC WETLANDS



2.5 Indicative High Conservation Value Areas

The 2010 Local Biodiversity Strategy included 88 areas of indicative high conservation value including over 16,500 hectares of native vegetation within patches larger than 4 hectares.

The sites selected were generally:

1. Large, and over 20 . Hectares;
2. Contained vegetation in Good or Very Good condition categories (Connell, 2006); and
3. Were on a Regional or Local Ecological Linkage.

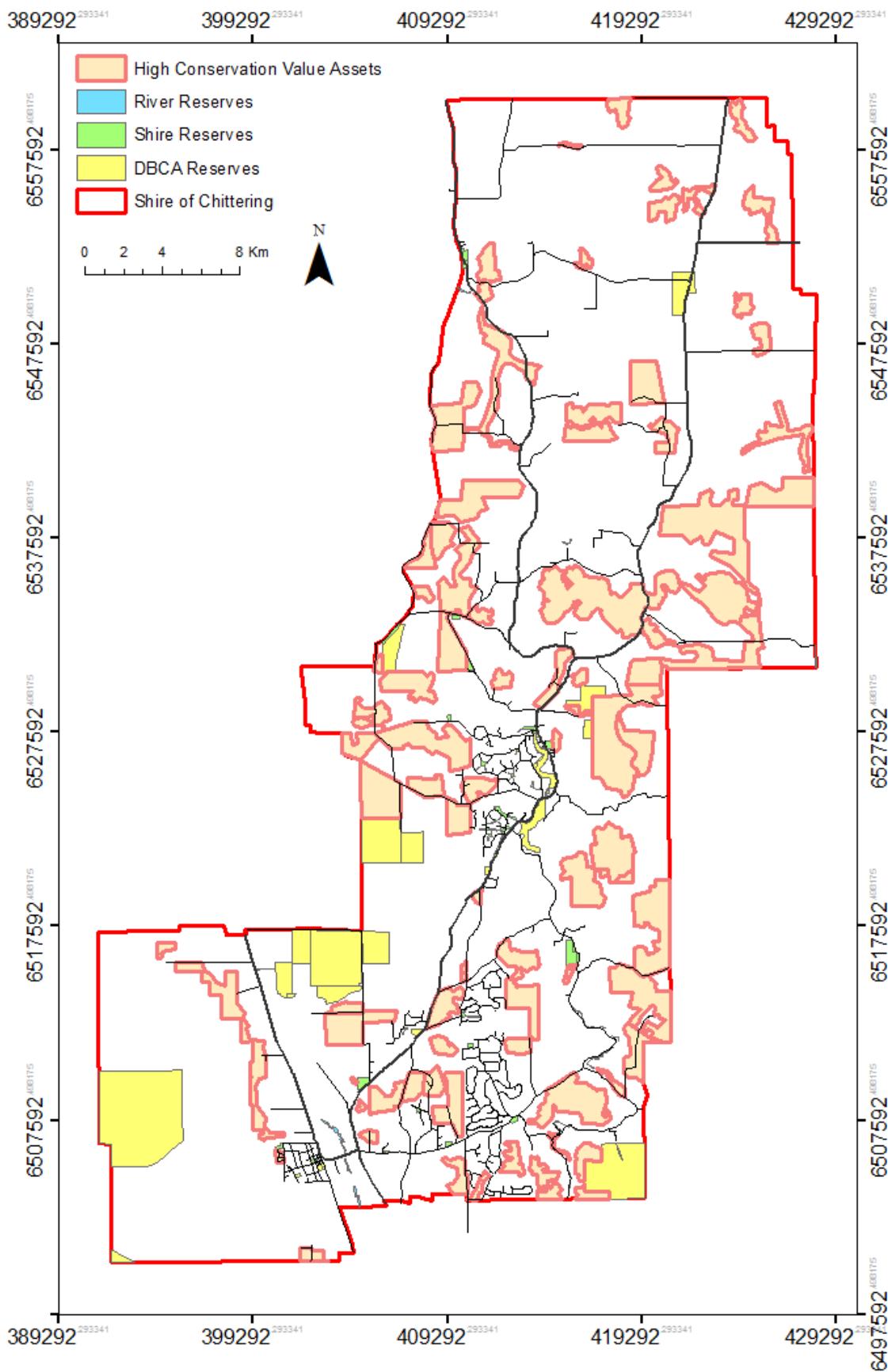
To ensure better representation of all vegetation communities within the Indicative High Conservation Value Areas (IHCVAs), areas which met the following criteria were also included:

1. Allowed for increased opportunities to protect or retain at least 10% and where feasible closer to 30% of the original extent of a vegetation complex;
2. Vegetation was in good or better condition, except where no or limited other opportunities exist at regional or local scale;
3. Ensured all natural areas with records of significant flora and fauna and ecological communities were identified as IHCVAs; and
4. Increased connectivity between patches of native vegetation by retaining natural areas within regional and local ecological linkage

The general integrity of the vegetation on these sites has been confirmed the Chittering Landcare Group, with recommendation for further ecological assessments of all sites prior final decisions are made on any future land use. IHCVA boundary lines generally follow an outline of a significant patch of vegetation. Distribution of High Conservation Values Areas and Shire, DBCA and river reserves is shown in Figure 9.

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FIGURE 9: RESERVES AND CONSERVATION ASSETS IN THE SHIRE



2.6 Threats to Biodiversity

The greatest threat to biodiversity in the Shire of Chittering is development which fails to consider biodiversity as a legitimate land asset. Loss of biodiversity is primarily due to land clearing. With nearly 70% of the total Shire area already cleared, future development should make use of already cleared areas.

The ***Western Australian State of the Environment Report (2006 & 2007)*** acknowledged that physical threats to biodiversity are exacerbated by knowledge gaps, the failure to adequately value biodiversity in decision-making and the lack of commitment and capacity to manage threats.

It is difficult to maintain biodiversity within a fragmented landscape such as rural residential subdivisions where design encourages small scale clearing. Any remaining vegetation is inadvertently being degraded over years due to unsustainable land-use and higher exposure to threatening processes. For example, an area that is mostly covered in native vegetation in good condition, when subdivided into 1-2 hectares blocks could potentially lose at least one third of native vegetation to building envelopes, access tracks, fencing and fire risk reduction activities. In addition, through these cleared areas the introduction of weeds, dieback and other degrading processes is significantly increased and to manage them adequately will require significant investment from land managers (Gardner, 2007).

The other threatening processes on either public or private land in the Shire include:

1. Dieback phytophthora
2. Weeds and feral animals
3. Salinity
4. Erosion
5. Sedimentation of streams
6. Eutrophication of wetlands
7. Grazing, and
8. Climate change.

The Shire of Chittering ***Local Planning Strategy 2019*** sets out to consolidate future development to identifiable areas as outlined on Figures 1 and 3 of the Strategy. This has the intention of maintaining biodiversity rich areas from being developed, while providing for improved bushfire connectedness and safety

.

3 Vision and Goals

The following section outlines the biodiversity conservation objectives for the Shire of Chittering. These objectives or goals were determined after careful consideration of the biodiversity assets, their regional and local significance and known constraints to implementation. Methodology used to determine the significance of Local Natural Areas and calculation of protection targets is described in Appendix 4 (*of the original document, 2010*).

While the long term vision set out in this document is for the next 40 years, several immediate actions are needed to secure the long term outcome.

4 Implementation

The implementation framework of the Shire's biodiversity conservation goals follows a hierarchy of actions supported by current:

1. Environmental and Planning Legislation
2. Environmental and Planning Policy
3. Guidelines on best practice

4.1 Goal 1: Retention of natural areas

Retention in this document is defined as all mechanisms used to preserve a natural area even though long term formal protection and management for conservation is not secured.

Due to previous existing development approvals, it is assumed that out of the mapped 22,421 hectares of native vegetation remaining in 2020, some clearing of native vegetation will occur, although this is expected to be minimal. In addition, a target of 20,000 hectares of native vegetation to be retained makes allowance for some clearing on small lots that may be permitted under the Shire's Local Planning Scheme and State legislation, such as clearing for building envelopes, approved infrastructure or fire protection measures.

The target indicates that the Shire should maintain its efforts in minimising clearing in natural areas and all remaining Local Natural Areas, regardless of their current zoning. It is critical that the requirements for minimal clearing apply to all natural areas in good condition, not only those identified as 'Indicative High Conservation Value Areas' in this **Local Biodiversity Strategy** (see Figures 1 and 9). The target has been set at this level to enable the Shire to maintain overall native vegetation retention of nearly 30% of the pre-European extent.

This methodology, as described previously, provided significant background information in the preparation and subsequent approval of the **Local Planning Strategy 2019**. Having said that, the Shire invariably receives applications for development in areas not identified for such within the Local Planning Strategy.

While local planning strategies provide local government with strategic directions in planning future development, development can occur only according to approved plans under a current local planning scheme.

Native vegetation of conservation significance occurs along several roads across the Shire. Often constrained in narrow strips along roadsides, many sections contain a wide diversity of plants,

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including some Declared Rare Flora. Some of these roads are known as 'Flora Roads' and attract visitors to the region during the wildflower season. However, due their restricted area, narrow shape and location, they are exposed to many threatening processes. Retention of high conservation value roadside vegetation will contribute to local biodiversity retention and in many areas act as an ecological link between larger patches of vegetation.

Various mechanisms will need to be applied to each development proposal depending on the underlying Local Planning Scheme zoning, planning precinct and distribution of remaining native vegetation and other significant biodiversity features such as wetlands or streams.

4.2 Summary advice on identification of significant local natural areas for biodiversity conservation through retention

Priority areas of native vegetation include:

- natural areas with vegetation complexes under represented regionally and locally, within and outside the IHCVAs (see Figure 9)
- adequate buffers to significant flora, fauna and ecological communities adequate buffers to creeklines and other wetlands
- vegetation that provides habitat to Carnaby's black cockatoos
- patches of native vegetation that form a regional or local ecological linkage
- buffers to formal conservation reserves as well as private properties with voluntary management agreements through Land for Wildlife and conservation reserves or similar
- high conservation value roadside remnant vegetation.

4.3 Goal 2: Protection of natural areas

Protect adequate representation of the best examples of each vegetation complex/class found in the Shire, targeting at least 11,550 hectares of native vegetation in good or better condition, including locations of significant flora and fauna. The aim is to protect areas natural areas where less than 30% of the original extent remains at regional and local scale, protect the best examples of each of the vegetation complexes found in the Shire and to prevent reduction of any of the vegetation complexes below 10% of the pre-European extent.

Protection of a natural area means that the area is explicitly managed for conservation and is either:

- Protected in a public conservation reserve
- Protected in a conservation covenant
- Protected to mitigate the impacts of climate change

4.3.1 Criteria to prioritise areas for protection

Areas of high conservation value will trigger the legislative support mechanisms available in Western Australia to protect biodiversity. When identifying where such areas occur within the Shire, the following ecological value attributes were considered:

Regional and local representation of the variety of vegetation complexes

There are 30 vegetation complexes within the Shire of Chittering, of which two are contained entirely within State and Commonwealth managed lands and therefore are not considered as target within this ***Local Biodiversity Strategy***. The remaining vegetation complexes were affected at various levels by past land uses and thus their retention and protection status varies. Vegetation complexes found in the Shire of Chittering can be divided into four groups according to their significance.

Vegetation complexes at risk regionally as less than 30% remains and less than 10% is protected across the region

The first group consists of seven vegetation complexes that are of highest regional significance because less than 30% of their original extent across the region remains and less than 10% of the original extent is formally protected in conservation reserves or through other mechanisms. In addition, Noonung vegetation complex is of highest priority within the Shire of Chittering because 99% of this vegetation complex occurs within the Shire. There are no other opportunities to protect this vegetation complex outside the Shire's boundaries. The aim is to protect all remaining examples of these seven high priority vegetation complexes within the Shire within areas where no constraints to retention have been identified.

Vegetation complexes protected at less than 10% regionally

The second group of regionally high priority vegetation complexes includes those vegetation complexes that are under-protected at the regional scale. While there are still opportunities to protect them as more than 30% of these complexes are retained within the region, less than 10% is formally protected in conservation reserves. One of vegetation complexes in the second group has been identified as being of higher priority within the Shire of Chittering because more than half of its original extent occurs within the Shire boundaries. 69% of the pre-European extent of the Mogumber Complex South occurs within the Shire. Considering that 61% of the current extent is also within the Shire, there are limited opportunities outside the Shire to seek protection of this vegetation complex at the regional scale.

For the second group, the aim is to protect a representative area of each of the vegetation complexes to contribute to the protection level at the regional scale. When calculating the level of contribution, the historical extent of each vegetation complex as well as current extent within the Shire and level of protection was taken into account.

Vegetation complexes retained at less than 30% locally

The third group consists of vegetation complexes that are still retained at more than 30% of their original extent across the region and are protected at more than 10% within the region. However, locally they were affected by historical land uses and less than 30% of pre-European extent within the Shire remains. There are five vegetation complexes within this category and Pindalup vegetation complex is of highest priority as only 5% of its original extent within the Shire remains, while all the others still retain at over 20%. For the third group the aim is to ensure 10% local protection.

Other vegetation complexes

The last group includes seven vegetation complexes that are adequately retained and protected regionally, and also more than 30% of their original extent within the Shire remains. Therefore the aim is to ensure that in the long term, these vegetation communities remain within the Shire and the proposed targets represent a balance to achieve 10% protection locally. There was no need to propose a target for Dwellingup vegetation complex as 84% is already locally protected.

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**TABLE 10: PROPOSED PROTECTION TARGETS¹ FOR REPRESENTATIVE VEGETATION COMPLEXES
WITHIN THE SHIRE OF CHITTERING**

Vegetation complexes (EPA, 2003) and vegetation classes for RFA area (DEC, 2007)	Pre-European extent (ha)	Local Natural Areas (> 4 ha) ha in HCVA	% of protected locally	Proposed protection targets (ha)
Vegetation complexes at risk regionally as less than 30% remains and less than 10% protected				
Yanga complex	6494	197	2%	187
Reagan (Re)	51	23	0%	15
Wannamal	642	12	0%	9
Bindoon	5929	804	2%	764
Michibin	12902	1226	0%	1165
Nooning	4168	242	4%	230
Williams	1336	72	0%	68
Vegetation complexes protected at less than 10% regionally				
Bassendean Complex Central and South Transition	1549	0	0%	0
Karrakatta Complex – North Transition	2915	0	0%	0
Coonambidgee complex	1155	84	1%	80
Reagan complex	2023	686	0%	600
Cullula Complex	2492	705	0%	632
Cullula (Cu)	62	12	0%	10
Moondah	380	159	0%	87
Mogumber Complex South	9518	2424	1%	2100
Mogumber	2316	533	0%	338
Wannamal Complex	46	45	0%	43
Vegetation complexes retained at less than 30% locally				
Yalanbee 6 (Y6)	27581	4482	1%	2743
Coolakin (Ck)	11414	1602	1%	1027
Murray 2 (My2)	8877	1484	4%	532
Pindalup	1476	75	0%	71
Yalanbee 5 (Y5)	3860	701	0%	386

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Other vegetation complexes				
Bassendean Complex North	6244	202	0%	20
Bassendean Complex North- Transition	3122	19	0%	2
Karamal Complex South	2159	1086	0%	215
Moondah Complex	1962	617	1%	176
Cooke	251	111	0%	25
Dwellingup (D4)	173	23	84%	0
Helena 2 (He2)	637	194	6%	25
Totals	121,735	16,562	1%	11,550

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Vegetation complexes in bold font in Table 12 show complexes of highest priority for protection within the Shire as no or limited opportunities exist outside the Shire's administrative boundaries to retain and protect representative areas at a regional scale.

The spatial distribution of the four groupings of vegetation complexes is in Figure 5.

Special biodiversity features and ecological processes

Table 10 lists a range of criteria that reflect the guidelines established for the selection of locally significant natural areas by the *Local Government Biodiversity Planning Guidelines* (Del Marco *et al*, 2004). These criteria should be used in conjunction with the vegetation community representational targets set out in Table 3. Where possible, preference should be given to protect areas which consolidate biodiversity attributes, are assessed as being in good or better condition, or have been assessed for viability and management needs.

TABLE 11: CRITERIA TO ADDRESS SPECIAL ECOLOGICAL FEATURES AND PROCESSES WHEN IDENTIFYING HIGH CONSERVATION VALUE NATURAL AREAS

Criteria No.	Description of criteria ²
(i)	Protect all natural areas which contain Declared Rare Flora, Specially Protected Fauna and Priority One or Priority Two Species and other significant flora and fauna or significant habitat for these species.
(ii)	Protect all natural areas which contain Threatened ecological communities (TECs) and Potentially Threatened ecological communities (PECs).
(iii)	Protect all habitats (natural areas and parkland-treed areas) of Carnaby's black cockatoo, where such habitat occurs on properties proposed for development. This is designated a locally characteristic species under the Local Biodiversity Strategy.
(iv)	Protect all natural areas which contain wetlands and wetland vegetation in good or better condition plus a buffer of upland vegetation. ³
(v)	Protect all riparian natural areas where they occur on land undergoing subdivision
(vi)	Protect all natural areas on Regional Ecological Linkages (REL) or Local Ecological Linkages (LEL), so that protected natural areas on REL and LEL are no greater than 500 metres apart.

1 Targets are specified levels or ranges of measurable parameters that decision-makers have agreed they will try to achieve; targets are policy tools, but they have a scientific base; they may be associated with one or more indicators (Williams *et al* 2001).

2 All protected areas are to be established so as to be ecologically resilient in the long-term. This may require restoration and management of the natural area (and revegetation in some cases).

3 Significant habitat or populations are those that, if lost, would change the formal conservation status of the species. For example, a species may change status from Priority One to become listed as Declared Rare Flora or Specially Protected Fauna.

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4 Wetland buffers shall be at least 50 metres for Conservation Category Wetlands and 30 metres for Resource Enhancement Wetlands.

5 This may not always be possible, as some areas containing rare species may be in poor condition. Protection of these areas is a priority, often supported by legislation or Government policy.

The benefit of setting specific biodiversity feature criteria is that they can assist in the identification of priority areas and demonstrate that most local natural areas have regionally significant features.

Use of the ecological features and processes contained in Criteria (i) to (vi) requires detailed ecological assessment using standardised methods such as the Natural Area Initial Assessment (NAIA) Template (Perth Biodiversity Project & Del Marco *et al*, 2004). Ecological assessment of native vegetation on private lands in the Shire is limited and hence the location of rare species, TECs, PECs and other features are poorly known.

While vegetation condition and ecological viability of natural areas are not recommended as stand-alone targets, they should always be assessed as part of the selection of protected areas.

4.3.2 High biodiversity value areas owned or vested in the Shire

Table 5 lists six natural areas owned by the Shire that were assessed using the Natural Area Initial Assessment (NAIA) Templates. Information collected through the Templates enabled the application of the ecological prioritisation framework developed by the Perth Biodiversity Project (Del Marco *et al*, 2004). The prioritisation framework can be used to identify the highest priority natural areas for protection, ranking natural areas as Priority 1A-1C being of high regional significance to Priority 2 and Priority 3 as being of local significance. Out of seven natural areas assessed to date within the Shire, six are meeting the criteria for regional significance.

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TABLE 12: PRIORITISATION OF SELECTED SHIRE OF CHITTERING RESERVES ASSESSED USING THE NATURAL AREA INITIAL ASSESSMENT TEMPLATES

Priority Rank	Reserve name, Locality	Area (ha) of native vegetation remaining	Vegetation complex represented
1A	Djidi-Djidi Reserve, Chittering	60.6	Williams, Murray
1A	Wannamal Old School Site and Bushland, Wannamal	4.8	Wannamal
1A	Hidden Gully Reserve	2.64	Coolakin
1A	Mooliabeenee Reserve, Chittering	22.21	Yalanbee 6, Coolakin
1B	Evergreen Reserve, Chittering	7.06	Yalanbee 6
0	Harris Road Reserve, Chittering	7.08	Mogumber

It is important to note that there are other reserves within the Shire of Chittering that were set aside as Public Open Space, or vested in the Shire and still retain native vegetation but were not assessed using the NAIA Templates. Ecological values of all Shire of Chittering owned land with native vegetation remaining should be assessed for its regional and local significance. The newly assessed areas should be added to the above list of reserves and prioritised for protection.

The Shire understands and appreciates the need for regulated movement throughout these reserves, since prevention of access to the public is not intended or reasonable. Additionally, promoting the biological values through networks of trails and compatible land uses (a mountain bike park or similar recreation use for example), is a key priority for the Shire from both an environmental and tourism perspective. Accordingly, the goals set out in this strategy are intended to enhance protection through knowledge and regulated access only.

4.3.3 Summary advice to identify significant Local Natural Areas for protection

In summary, all protected areas should:

- Contribute to at least one of the targets in Table 3;
- Meet at least one of the criteria listed in Table 4;
- Where possible protected areas should contain vegetation in Good or better condition5;
- Be assessed for ecological viability and management needs (See Appendix 6, Part 2 Local Biodiversity Strategy, 2010);
- Be managed to conserve their ecological values; and
- Be managed in such a way that promotes its usability and advantages.

Identification of Indicative High Conservation Areas provides a guidance to which areas of remnant vegetation could meet the above listed criteria.

4.3.4 Potential mechanisms to achieve the protection of significant natural areas

The proposed protection targets can be used as decision support tools that identify the priority areas for protection and management for conservation.

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There are several implementation mechanisms available to achieve the proposed biodiversity protection targets:

- Develop and adopt a Local Planning Policy to guide the implementation of the proposed Local Biodiversity Strategy protection targets;
- Implement bushfire mitigation strategies and methods to minimise the risk of destruction from bushfire. Prioritisation of target areas is mapped by the “Office of Bushfire Risk Management”, with any works being undertaken in liaison with Chittering Landcare;
- Require environmental management plans for all new developments in areas that may have environmental value;
- Seek opportunities to ensure all new developments maintain a planting regime that extends the natural flora values of the area;
- Seek to incorporate the biodiversity values into a GIS program for the Shire;
- Reassess roadside vegetation previously classified as excellent;
- Work with private landowners and Chittering Landcare to maximise retention of biodiversity and minimise weed and animal damage on private lands.

4.4 Goal 3: Management of natural areas

Management of Local Natural Areas for conservation is a priority once they have been protected. Standard management practices include access control, fencing, environmental weed and feral animal control, fire planning and dieback management. There are three areas of action suggested under this goal:

- Preparation and implementation of Management Plans for new public conservation areas or protected areas in conjunction with recreation uses;
- Ongoing management of public conservation areas owned by the Shire; and
- Advisory support for private owners of bushland.

4.4.1 Preparation and implementation of management plans

Under the current State Development Control framework, proponents are required to show Public Open Space Areas for residential development as part of rezoning documents. Proponents should also be required to plan for the initial management of the site, including any natural areas.

The Shire can ensure that this requirement is set down as part of the adoption of the scheme amendment. For example, a provision such as the following may be included as part of the Development Plan:

“A management plan shall be prepared and implemented for the POS land shown on the Development Plan. The purpose of the Plan shall be to conserve the site’s environmental values and plan for its compatible use.”

To ensure consistency in the quality of information being used to describe the ecological values of natural areas, the Shire could request that all proponents use the NAIA Template to record the ecological values on any areas within proposed ‘vegetation protection’ areas.

4.5 Bushfire fuel reduction measures

Bushfire risk reduction is a relatively recent improvement to the Shire's retention of biodiversity. Standard practices for mitigation treatments include:

- Cold burning, or burning of natural areas after cold or rain patches;
- Mechanical works, or slashing, sawing or otherwise reducing the fuel on the ground or in the canopies of trees;
- Chemical works; and/or
- Constructing / creating of strategic firebreaks.

Each method has an impact on the biodiversity values, particularly following completion of a treatment. This strategy recommends actions that will help to both retain biodiversity values while reducing weed proliferation.

4.6 Additional overarching actions

Actions recommended in the document so far are designed to ensure the four main goals of the Shire's *Local Biodiversity Strategy* are met. To secure and maintain long term support for these goals, community awareness and reporting on implementation are crucial.

Principles of biodiversity conservation

The local biodiversity planning process is guided by principles supported by research, policy and legislation and are reflected in this Local Biodiversity Strategy:

1. Retention of at least 30% of the pre-European extent of each ecological community, here represented by vegetation complexes, is required to prevent further loss of species and failure of ecosystem processes. The 30% threshold is a level considered by many scientists as a criteria for biodiversity conservation in a region. This is also supported by the State policy (EPA, 2008).
2. Protect regionally and locally significant areas. While regionally significant natural areas are being reserved through the State's strategic planning processes, locally significant natural areas are also important for the following reasons:
 - To maintain the basic level of natural diversity in an area
 - To buffer and provide connectivity between protected areas
 - To benefit local communities, providing places of passive recreation, local environmental services, sense of place and amenity.
 - Many areas identified through the local biodiversity planning process are of regional significance.
 - Biodiversity is best conserved in-situ – protect what you have before revegetating.
 - Regeneration is of higher priority than revegetation.
 - Prioritise protection and management of the highest biodiversity value natural areas.
 - Best biodiversity outcomes are achieved with strong community involvement.
 - The process of determining biodiversity values is transparent.
 - Site specific field survey is essential to fully understand biodiversity value.
 - Natural area conservation is a legitimate land use.

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Awareness Raising

Awareness of the shire's biodiversity is continuously achievable through the continuation of promotion efforts. These efforts will help to protect biodiversity and sustainable land use practices, including the services offered by the Chittering Landcare Centre through its website and other media. Regulated access through recreation and interpretative signage is an example of improving knowledge and understanding use throughout the country. It will be beneficial to include information on a range of benefits to local communities of protecting biodiversity.

Evaluation and Monitoring

To enable monitoring of progress towards implementing the proposed actions and achieving the protection and retention targets, a simple recording system can be set up.

5 Local Biodiversity Action Plan

This Action Plan has been developed to meet the biodiversity conservation targets set out in the ***Local Biodiversity Strategy***. While the local biodiversity strategies are not statutory documents, relevant components of this Strategy can be incorporated into the Shire's planning framework, including the Local Planning Strategy and the Local Planning Scheme. The support of the local community and relevant State agencies is required to fully implement the proposed actions.

It is recommended that the Shire adopts the proposed Action Plan as a way towards achieving the local biodiversity conservation goals agreed to in this ***Local Biodiversity Strategy***. The implementation timeframe for the Action Plan is for the next ten years, followed by a comprehensive review.

Progress to be reviewed every 2 years.

PRIORITY SCALE

Ongoing – actions requiring on-going commitment
High – to be completed within 1-2 years of the endorsement of the final Local Biodiversity Strategy by the Council
Medium – to be completed within 3-4 years of the endorsement of the final Local Biodiversity Strategy by the Council
Low - to be completed within 5-10 years of the endorsement of the final Local Biodiversity Strategy by the Council

Action	Priority	Key Performance Indicator	Responsibility
Planning Framework			
Local Planning Scheme			
Amend the Aim of Local Planning Scheme No.6 h. to include a reference to regional and local ecological linkages as identified in the Local Biodiversity Strategy	Medium	Regional and Local ecological linkages are being recognised in LPS6	Development Services
Strengthen zone specific provisions to provide for multiple conservation lots (applicable to Rural Conservation, Rural Small Holdings, Rural Retreats and Rural Residential)	Medium	New provisions that provide for biodiversity conservation endorsed by the Council and WAPC	Development Services
Change vesting of Shire owned natural areas of high conservation value to include Conservation or similar, to protect the regionally significant areas, having regard to recreation strategies and projects	High then On-going	Number of reserves and area of native vegetation vested for conservation	Development Services, Technical Services
New natural areas ceded as part of Scheme Amendments are vested for the purpose of Recreation and Conservation	On-going	Number of reserves and area of native vegetation in new residential developments vested for conservation	Development Services

Action	Priority	Key Performance Indicator	Responsibility
Planning Framework			
Local Planning Policies			
<p>Develop a LPP for Biodiversity Conservation that should include but not be limited to:</p> <ul style="list-style-type: none"> • Map of IHCVAs and LNAs Figure 7 and Figure 9); • Setting the Council's position on vegetation clearing and preference for new development in already cleared areas Defining the criteria for determining IHCVAs and prioritising significant LNAs (Table 3 & Table 4); • Guidance on the level of detail required when preparing proposals for rezoning to allow higher density development, including a need to address biodiversity conservation targets adopted in this Strategy; • Recognition of the importance of biodiversity conservation features and priorities for conservation; • Recognition of the importance of ecological linkages and the need for their protection and enhancement; • Set standards for ecological assessments required of proponents (use of the NAIA Templates); • Setting out the level of information required from other agencies to inform the decision; 	High	LPP endorsed by the Council.	High

Action	Priority	Key Performance Indicator	Responsibility
<ul style="list-style-type: none"> Detail the protection mechanism appropriate to LNAs in different zones; Providing guidance on development adjoining conservation reserves, properties under conservation covenants and other voluntary bushland management programs and flora conservation roads; and Providing guidance on retention of mature trees within development sites. 			
Develop a landscaping policy for the Shire to encourage use of locally indigenous plants in landscaping on public and private land	Medium	Landscaping policy endorsed by the Council	Development Services, Technical Services
Natural Area Management			
Assess ecological values of Shire owned natural areas with remnant native vegetation using the NAIA Template (targeting natural areas not assessed in 2006)	Medium/Low	All Shire owned natural areas assessed and prioritized for conservation	Technical Services in partnership with Chittering Landcare Group
Develop a policy and prioritise the Shire's conservation reserves for management, including roadside vegetation of high conservation value—this document will form a basis for future grant applications for on-ground works	Medium	All Shire Reserves and flora conservation roads (managed by the Shire) prioritised for protection and management	Technical Services in partnership with Chittering Landcare Group
Improve knowledge of biodiversity values in applying fuel reduction and weed mitigation strategies in bushfire risk management.	High and On-going	Appropriate techniques applied to risk reduction methods that also reduce weed growth	Development Services in partnership with Chittering Landcare

Action	Priority	Key Performance Indicator	Responsibility
<p>Develop a Private Landholder Incentives Strategy or support mechanisms for private landholders that wish to maintain native vegetation on their properties:</p> <ul style="list-style-type: none"> • Promote covenanting programs available in Western Australia • Conduct a survey of private landholders on desirable private landholder incentives • Adopt criteria for prioritising assistance • Allocate a budgeted amount towards small grants for on-ground works • Develop a reporting/monitoring framework to assess effectiveness 	High- Medium	<p>Private landholder survey report presented to the Council</p> <p>Private Landholder Incentives Strategy endorsed by the Council with adequate resources allocated for its implementation</p>	Development Services in Partnership with Chittering Landcare Group
<p>Continue working with developers ensuring that natural areas in new local reserves are handed over to the Shire with:</p> <ul style="list-style-type: none"> • An approved management plan; • Initial works such as fencing, signage, initial weed control and rehabilitation of degraded areas; and • At least 3 years of post-development management and monitoring. 	On-going	All local reserves created as a result of new subdivision are managed according to an approved bushland management plan.	Development Services

Action	Priority	Key Performance Indicator	Responsibility
<p>Develop a Private Landholder Incentives Strategy or support mechanisms for private landholders that wish to maintain native vegetation on their properties:</p> <ul style="list-style-type: none"> • Promote covenanting programs available in Western Australia • Conduct a survey of private landholders on desirable private landholder incentives • Adopt criteria for prioritising assistance • Allocate a budgeted amount towards small grants for on-ground works • Develop a reporting/monitoring framework to assess effectiveness 	High-Medium	<p>Private landholder survey report presented to the Council</p> <p>Private Landholder Incentives Strategy endorsed by the Council with adequate resources allocated for its implementation</p>	Development Services in Partnership with Chittering Landcare Group
<p>Continue working with developers ensuring that natural areas in new local reserves are handed over to the Shire with:</p> <ul style="list-style-type: none"> • An approved management plan; • Initial works such as fencing, signage, initial weed control and rehabilitation of degraded areas; and • At least 3 years of post-development management and monitoring. 	On-going	All local reserves created as a result of new subdivision are managed according to an approved bushland management plan.	Development Services
<p>Develop a monitoring system to:</p> <ul style="list-style-type: none"> • Track the adequateness and level of implementation of Management Plans prepared as a condition of future subdivision • compliance with subdivision conditions • level of protection and vegetation retention achieved in new subdivisions 	High-Medium	Annual reports are being submitted as part of activity reporting	Development Services

Action	Priority	Key Performance Indicator	Responsibility
Continue support to community members actively involved in sustainable land use. For example, as the Shire contributes to the Chittering Landcare Centre	On-going	Community Landcare Centre actively supports private landholders with training and technical advice and other landcare activities	Council
Promote the Local Biodiversity Strategy objectives to local residents	On-going	Number of publications and responses	Communications / Council
Implement a GIS system to incorporate new datasets showing LNAs and IHCVAs, properties registered in Land for Wildlife, voluntary bushland management program, properties covered by conservation covenants, significant flora conservation roads with such information being periodically updated	High-Medium	Shire Planners are using the IHCVAs and LNAs in land use planning	Development Services
All staff and contractors conducting works in the Shire within or near natural areas are educated and agree to adhere to best practice techniques to prevent the spread of Dieback and weeds	High	All staff involved in planning and implementation of on-ground works within the Shire use best practice on-ground works techniques. Encourage all staff who need to manage Dieback Phytophthora in their work activities to undergo Green Card training. All future contracts for on-grounds works within the Shire stipulate the requirements for best practice on-ground works techniques.	Governance / Contractors
Ensure time and resource allocations are made to monitor and report on achievement of LBS goals	Within one year and then on-going	Progress report presented to the Council within a year since final adoption	Executive Team

Action	Priority	Key Performance Indicator	Responsibility
Ensure progress towards implementing of LBS actions and achievements of targets are publicly reported every two years	Within two years and then on-going.		Development Services

Glossary

Biodiversity is the variety of all life forms – the different plants, animals and microorganisms, 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:

- 1) Its intrinsic value at the genetic level, individual species level, and species assemblages levels; and
- 2) 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.

Bush Forever is a 10-year strategic plan to protect some 51,200 ha of regionally significant bushland in 287 Bush Forever Sites, representing, where achievable, a target of protecting at least 10% of each of the original 26 vegetation complexes on the Swan Coastal Plain portion of the Perth Metropolitan Region.

Bushland is land on which there is vegetation which is either a remainder of the natural vegetation of the land or, if altered, is still representative of the structure and floristics of the natural vegetation, and provides the necessary habitat for fauna (Bush Forever, Volumes 1 & 2). ‘Bushland’ falls into the following condition classes: Pristine, Excellent, Very Good and Good (after Keighery 1994).

CALM Estate (now DBCA Estate) consists of indigenous State Forest and timber reserves and formal reserves designated for the purpose of conservation. The formal conservation reserves are either national parks, nature reserves, conservation parks or Conservation and Land Management Act Section 5(1)(g) or (5)(1)(h) reserves (Conservation Commission 2003). Informal conservation reserves are also maintained by CALM within the State Forest and timber reserves (Conservation Commission 2003).

Catchment (as in river catchment) is the area from which the river’s water is collected; usually defined on maps as a surface water catchment boundary.

Clearing refers to the killing or destruction of; the removal of; the severing or ringbarking of trunks or stems; or the doing of any other substantial damage to some or all of the native vegetation in an area. It includes the draining or flooding of land, the burning of vegetation, the grazing of stock, or any other act or activity that causes the killing or substantial damage to some or all of the native vegetation in an area (adapted from Government of Western Australia, 2002c).

Vegetation Condition refers to vegetation condition as assessed using published methodologies. In the Perth Metropolitan Region, the methodologies of Keighery (1994) or Kaesehagen (1994) are often used.

Connectivity refers to the degree of connection between natural areas. Effectiveness will vary according to the type and mobility of different species.

Corridors are contiguous natural areas or revegetated areas that directly connect larger natural areas allowing the movement over time of organisms between these larger areas.

Covenant is a restriction on the use of land recorded on the property title and binding on successive owners. Covenants may be ‘negative’ (imposing restrictions) or ‘positive’ (imposing positive obligations).

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Declared Rare Flora (DRF) are those species protected under the *Wildlife Conservation Act 1950*, as identified in the current listing. At time of, the current listing is *Wildlife Conservation (Rare Flora) Notice 2018* (Government of Western Australia 2001b).

Development shall have the same meaning as in the Planning and Development Act 2005

Ecological community is a naturally occurring biological assemblage that occurs in a particular type of habitat (English & Blyth 1997; 1999). 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:

- i. inhabits a particular natural area; and
- ii. 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.

Ecological viability is the likelihood of long-term survival of a particular ecosystem or species. For further information see Appendix 6.

Environmental Protection Policies (EPP) are policies prepared by the Environmental Protection Authority under their powers as set in the Environmental Protection Act. EPPs have the force of law and can cover the protection of any portion of the environment or the prevention, control or abatement of pollution.

Environmentally Sustainable Development (ESD) refers to development that uses, conserves and enhances the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future can be increased.

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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 (Environmental Protection Authority 2003c). This term can be applied at a range of scales (Environmental Protection Authority 2003c). Vegetation can become a reasonable surrogate for outlining habitat when its main components, structure and associated landform are also described (Environmental Protection Authority 2003c). 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 (Williams et al 2001).

Local bushland strategies are prepared by or for local governments to identify the values of bushland areas and plan for their protection and management where possible. Local Bushland Strategies focus on bushland and do not cover other types of natural areas.

Local Natural Areas (LNAs) are natural areas that exist outside of Bush Forever Sites (Swan Coastal Plain). In the past these areas have been referred to as Local Biodiversity Areas.

Provenance refers to patterns of genetic variation exhibited by a species over its geographic range. The characteristics of the plants being collected from, or the area in which they are located, should sufficiently match those of the planting location or its local vegetation (Mortlock 1999).

Native vegetation is indigenous aquatic or terrestrial vegetation. It does not include vegetation that was intentionally sown, planted or propagated unless that vegetation was sown, planted or propagated as required under the **Environmental Protection Act (1986)** or another written law; or that vegetation is of a class declared by regulation to be included in this definition.

Native vegetation does not include dead vegetation unless that dead vegetation is of a class declared by regulation to be included in this definition. Native vegetation does include non-vascular plants (for example, mosses, fungi, algae) and marine plants (seagrass, macro algae [seaweed]). Native vegetation is more than trees and includes understorey and groundcover plants.

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 watercourses (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.

Offset is an action that occurs on a site away from the development site that seeks to compensate for the loss of vegetation caused by that development site. It may take the form of monetary compensation, revegetation of another site, or formal protection or restoration of another natural area away removed from the development site.

Priority flora are plant taxa that are under consideration as threatened flora but need further survey to adequately determine their status, or are adequately known but require monitoring to ensure that their security does not decline. Priority Flora lists are maintained by the State agency for biodiversity.

Priority fauna are those ‘Conservation significant’ animal species listed by DBCA’s Threatened Species Consultative Committee but which are not currently listed under Section 14 (2) (ba) of the **Wildlife Conservation Act 1950** as Specially Protected Fauna.

Protection of a natural area means that the area is explicitly managed for conservation and is either:

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- i. Protected in a public conservation reserve;
- ii. Protected under a Conservation Zone in the Scheme,
- iii. Protected in a conservation covenanted area.

Regionally significant is a component of remnant vegetation that collectively aims 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).

Reserves are areas of Crown land reserved for various public purposes, for example, parks, recreation, drainage or church sites.

Resilience (as in ecological resilience) – see ecological viability and Appendix 7 (Chittering Biodiversity Strategy Part 2, 2010).

Retention is all the processes of ensuring a natural area is retained but not necessarily afforded protection to ensure its continued existence and viability.

Riparian refers to the zone along or surrounding a water body where the vegetation and natural ecosystems benefit from and are influenced by the passage and storage of water (Water and Rivers Commission 1998)

Specially Protected Fauna are species protected under the Wildlife Conservation Act 1950. The current listing is Wildlife Conservation (Specially Protected Fauna) Notice 2018 (Government of Western Australia 2001c).

Swan Coastal Plain refers to the IBRA Swan Coastal Plain Bioregion as defined in Commonwealth of Australia (2001a).

Targets are specified levels or ranges of measurable parameters that decision-makers have agreed they will try to achieve; targets are policy tools, but they have a scientific base; they may be associated with one or more indicators (Williams et al 2001).

Threatened ecological community (TEC) is an ecological community that has been assessed through a procedure (coordinated by CALM) and assigned to one of the following categories related to the status of the threat to the community. The categories are ‘Presumed Totally Destroyed’, ‘Critically Endangered’, ‘Endangered’ or ‘Vulnerable’ (English & Blyth 1997; 1999).

Threatened flora are plant species likely to become extinct or which are rare, and declared so, under Section 23F of the **Wildlife Conservation Act 1950**.

Threatened fauna are animal species likely to become extinct or which are rare, and declared so, under Section 14(2)(ba) of the **Wildlife Conservation Act 1950** (Government of Western Australia 2000b). See Specially Protected Fauna.

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 (as defined by Heddle, Loneragan & Havel 1980; Mattiske & Havel 1998). 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

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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).

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Appendix. 1

Reserves in the Shire of Chittering.

TABLE 10: LIST OF THE SHIRE OF CHITTERING RESERVES AS AT 2022.

Reserve Name /locality	Reserve number	Area (Ha)	Special considerations	Vesting	Purpose	Native vegetation remaining Ha	Vegetation complex represented
Aquila Hart Dr Chittering Hts Estate Upper Chittering	R38837		creekline	SoC	Protection of waterway		
Archibald Muchea South Rd	R39007	1.01	TEC, PEC, DRF, Aboriginal				Degraded Yanga
Barracca Springs Reserve Rd Muchea	Lot 209	30.1	Wetland Aboriginal Heritage Priority Flora Conservation Reserve	SOC	Conservation Reserve		Reagan, Coonambidgee
Bell Hill Forrest Hills Pde/ Ridgetop Ramble Country Club Estate Bindoon	R44213	2.141 1	Communications tower Degraded	SoC		2.14	Degraded Yalanbee 6
Blackboy (Djidi Djidi) Ridge Chittering Rd Lower Chittering	R24129 & R44196	64.56 26	Priority Flora good bushland	SoC	Recreation	60.6	Williams, Murray
Carty GNH Hart Dr Chittering Heights Estate Upper Chittering	R38837	27.68 94	dam and creekline	SoC	Protection of waterway		Murray & Bindoon
Chittering Springs Wisteria Wy	R49943	9.208	Waterways	SoC	Rehabilitated waterways.		Mogumber South?

Reserve Name /locality	Reserve number	Area (Ha)	Special considerations	Vesting	Purpose	Native vegetation remaining Ha	Vegetation complex represented
Clune Park BMX track Gray Rd Bindoon		9.29	Waterway and Brockman River	SoC	Recreation		Nooning
Ellen Brook	R44070	16.60 61			reserve type 3 R transfer of land act type 1		
Reserve Name /locality	Reserve number	Area (Ha)	Special considerations	Vesting	Purpose	Native vegetation remaining Ha	Vegetation complex represented
Evergreen Robin Gr/ Evergreen Rise Country Club Estate Bindoon	R43686	7.061 5		SoC	Recreation	7.06	Yalanbee 6
Faull St Reserve Muchea	R231127	3.86	TEC (mound Spring) Aboriginal Heritage	UCL DBCA	Conservation		Yanga
Ghost Gum Lot 859 Ghost Gum Ridge Chittering Rise Estate	?	2.93	waterhole, adjoins Barracca NR	SOC	Recreation, protection of waterway		Moondah
Harris Muchea East Rd Lower Chittering	?	9.030 2	DRF	SOC freehold		7.08	Mogumber
Heron Hill	R38691	6.394 3	Dieback	SoC	Recreation		
Hidden Gully Whistler Cl/ Woodland Lane Country Club Estate Bindoon	R39759	0.226 7		SoC	Recreation	2.64	Coolakin (Bindoon)
Hideaway Dr Country Club Estate Bindoon	R44198	4.982 6		SoC			

Reserve Name /locality	Reserve number	Area (Ha)	Special considerations	Vesting	Purpose	Native vegetation remaining Ha	Vegetation complex represented
Marbling Lot 18 Muchea East Rd opp FB Lower Chittering	R50788	8.9485	Marbling Brook	SoC	Recreation		Mogumber South
McGlew McGlew Rd (Telstra Tower) Lower Chittering	?	88.6	in developer hands at present wandoo woodland	not yet			Yalanbee Coolakin
McKenzie St Muchea	R51155	1.0488	TEC, PEC, DRF, Aboriginal	SoC	Protection of rare flora		Yanga
Mooliabeanee Airstrip	R42008	16.8224	airstrip & bush & rifle range		Recreation		Mogumber?
Reserve Name /locality	Reserve number	Area (Ha)	Special considerations	Vesting	Purpose	Native vegetation remaining Ha	Vegetation complex represented
Mooliabeanee Mooliabeanee Rd Mooliabeanee	R12458, R17753, R21812	22.212	disused sand & gravel pits, old school site Heritage site Dieback infested north side of road	SoC	Recreation	22.21	Yalanbee 6, Coolakin, Cullalla
Muchea Hall and Oval 48 Archibald St Muchea	R11260	3.1437			Reserve (type 3 R) Land Act (type 2)		
Navelina Navelina Dr Chittering Retreat of Morley		4	Undergoing rehabilitation to native vegetation.	SoC	Recreation.		
Old Golf Course Myrtle Wy Bindoon		16.08			Recreation		

Reserve Name /locality	Reserve number	Area (Ha)	Special considerations	Vesting	Purpose	Native vegetation remaining Ha	Vegetation complex represented
Old School Site 20 Carl St Muchea	R9213	1.6	TEC, PEC, DRF, Aboriginal		Reserve (type 3) Land Act (type 2)		degraded
Orchid Rd cnr Ridgetop Ramble Country Club Estate Bindoon		1.94			Rereation		
Patens Reserve cnr Patens and Caladenia Wandena Estate Lower Chittering	R45925	3.9727	Wetland undergoing rehabilitation	SoC	Rereation		Mogumber South?
Payne #852& 853 Payne St Muchea	R49987	7.6678	Wetland in good condition.	SoC	transfer of land act type reserve type 3R		Yanga, Bassendean North Transition
Pioneer Reserve Pioneer Rd Country Club Estate Bindoon	R44197	0.6997		SoC			
Sandown Park 7 Chittering St (cnr Granary Dr) Muchea	R24724	12.8306		SoC	reserve type 3R land act type 2		cleared land
Reserve Name /locality	Reserve number	Area (Ha)	Special considerations	Vesting	Purpose	Native vegetation remaining Ha	Vegetation complex represented
Spoonbill cnr Spoonbill Cl & Hart Dr Upper Chittering	?	12.7	Rehabilitated wetlands and creekline adjoins Fire Station	SoC	transfer of land Act (type 1)		Murray & Bindoon, Coolakin
Sussex Bend Lot 8001 Maryville Lower Chittering	?	5.71	Wetland ex farmland undergoing rehabilitation	SoC	Recreation		Mogumber South?

Reserve Name /locality	Reserve number	Area (Ha)	Special considerations	Vesting	Purpose	Native vegetation remaining Ha	Vegetation complex represented
			playground BMX track				
Wannamal E of Hwy UCL (north of Rest Area?) E side of GNH/Bindoон Moora?	?	21.6	Good condition bushland	UCL			Was Darling Scarp now Wannamal(?), Michibin
Wannamal Hall W of Hwy UCL? W side GNH	?	1.88		UCL	Recreation		Was Darling Scarp now Wannamal?,
Wannamal Rest Area (Old School site) Bindoon Moora Rd Wannamal	R27759	4.269 2		SoC	Recreational	4.8	Was Darling Scarp now Wannamal?
Wannamal tip Bindoon Moora Rd Wannamal	R9937	4.499 6	disused tip and gravel pit undergoing rehabilitation	SoC			Was Darling Scarp now Wannamal?
Yearby and Belle Caddy Reserves (Spoonbill Cl to GNH Upper Chittering to Lake Chittering.		2.68	Waterway	SoC	Recreation		