Beeliar Regional Park

Final Management Plan

2006

PLANNING TEAM

This plan was co-ordinated by a consultancy team led by Thompson Palmer Pty Ltd working closely with the managers of Beeliar Regional Park – the Department of Conservation and Land Management (CALM), the City of Melville, the City of Cockburn, the Town of Kwinana and Murdoch University. The Planning Team prepared the plan for the Conservation Commission of Western Australia.

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How to Use This Plan.

This plan is divided into sections as set out in the table of contents. Within each section are subsections. Each subsection begins with the objectives to be achieved by management, followed by a discussion of the main issues, and then strategies, accompanied by the agencies responsible for achieving each objective and a priority rating. Priority ratings provide an indication of the relative importance of a strategy. The management agencies names have been abbreviated and a list of all abbreviations used and their meaning is listed in Appendix A. Key Performance Indicators are listed in the plan and outline performance measures, targets, and reporting requirements.

A number of issues raised in the plan are interrelated and are dealt with under more than one section. Where this is the case, the discussion refers the reader to other related sections.

ACKNOWLEDGMENTS

Numerous individuals and groups have contributed valuable ideas and information in the preparation of this management plan and their efforts are gratefully acknowledged. In particular, the contributions of members of the planning team, the Beeliar Regional Park Community Advisory Committee and workshop attendees for this management plan have been most appreciated.

NOMENCLATURE

Inclusion of a name in this publication does not imply its approval by the relevant nomenclature authority.

THE CONSERVATION COMMISSION OF WESTERN AUSTRALIA AND THE DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

All national parks, conservation parks, nature reserves, and other similar reserves are vested in the Conservation Commission of Western Australia. These reserves are managed on behalf of the Conservation Commission of Western Australia by CALM.

As the controlling body, the Conservation Commission of Western Australia is responsible for having management plans prepared for all lands that are vested in it. This plan has been prepared by CALM on behalf of the Conservation Commission of Western Australia.

Preface

Regional parks are areas of regional open space that are identified by planning procedures as having regionally significant conservation, landscape and recreation values. Regional parks provide the opportunity for a consortium of management agencies and private landowners to develop coordinated planning and management strategies.

Regional parks were first proposed in the Stephenson - Hepburn Report of 1955, which was the basis of the Perth Metropolitan Region Scheme in 1963. Since then, State planning agencies have been acquiring land in anticipation of the time when regional parks would be formally created.

In 1997, the State government announced a commitment to introduce legislation to give regional parks legal standing and vesting in the former National Parks and Nature Conservation Authority, now the Conservation Commission of Western Australia. Eight regional parks were recognised as formal identities with the coordination of their management progressively transferred to the Department of Conservation and Land Management (CALM).

The role of CALM in managing the Beeliar Regional Park is two-fold. Firstly, it is to manage the areas of the Park that are vested in the Conservation Commission of Western Australia. Secondly, it is responsible for coordinating the management of the Park. The latter is initiated through the preparation of this management plan. The local governments of Melville, Cockburn and Kwinana as well as Murdoch University comprise the other managing agencies involved in Beeliar Regional Park.

Beeliar Regional Park has been created primarily around two chains of wetlands and also incorporates an area of coastal limestone cliff (Henderson foreshore). The Park will be managed as a single entity as the wetlands in each chain are derived from similar geomorphological processes.

Over 75% of the wetlands of the Swan Coastal Plain have been lost since European settlement and there is a need, as well as a community expectation, that remaining wetlands should be conserved for their particular environmental, cultural and social values (Department of Planning and Urban Development, 1992).

The many discrete parts that make up the Beeliar Regional Park are subject to a wide range of pressures mainly derived from the increasing surrounding urban and industrial development. The result is, in many instances, a degrading environment with areas of disturbed vegetation cover and reduced water quality in the wetlands and lakes.

While it is not the intent of this Plan to try and recreate the original wetland environment, it does aim to minimise further degradation to the quality of the wetlands and surrounding vegetation. To do this, an integrated approach by the managing agencies is needed to respond to the pressures that are now brought to bear on the Park.

Significant planning has already occurred for some areas of the Park. Management plans have been prepared and are currently being implemented for many of the wetlands. This Plan will act as an 'umbrella' document that coordinates the implementation of existing plans and seeks to draw them together in an integrated manner to conserve and enhance Park values.

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A. INTRODUCTION

1 - Purpose and status of the management plan

PURPOSE OF THE PLAN

This management plan ("the Plan") provides broad direction for protection and enhancement of the conservation, recreation and landscape values of Beeliar Regional Park ("the Park"). It does this by developing strategies aimed at conserving the special features of the Park and providing for future community requirements. The Plan helps ensure the Park is managed appropriately and is capable of sustaining its high nature conservation and cultural values as well as use by the community.

Given the strategic nature of this Plan, more detailed planning (referred to as subsidiary plans) is required prior to significant operational works taking place within the Park (these are listed in Section 43).

STATUS OF THE PLAN

This Plan has been prepared by the Department of Conservation and Land Management (CALM) on behalf of the Conservation Commission of Western Australia in accordance with the *Conservation and Land Management Act 1984*. It provides statutory direction for lands within the Park vested in the Conservation Commission of Western Australia and managed by CALM on the Commission's behalf. CALM also has the responsibility for coordinating the management of the Park.

The Plan acts as an "umbrella" document, coordinating existing plans for specific areas of the Park. The implementation of existing plans will need to be consistent with the overall direction of this Plan. The Conservation Commission of Western Australia and CALM will seek to ensure that future plans for areas within the Park are consistent with the overall direction and principles of this Plan.

In consultation with CALM, the Western Australian Planning Commission (WAPC) will use this Plan to assist with the assessment of development proposals on lands within and adjoining Beeliar Regional Park.

The local governments of Melville, Cockburn and Kwinana have worked closely with CALM in the preparation of this Plan. In partnership with CALM, the local governments will use the Plan to manage their respective landholdings, and the many issues that have an overall impact upon the Park. Melville City Council, Cockburn City Council and Kwinana Town Council have formally endorsed the strategies contained in this Plan.

Murdoch University will also use this plan to manage its landholdings in the Park. The University has also endorsed this Plan.

2 - Regional parks

WHAT IS A REGIONAL PARK?

Regional parks are areas of regional open space that are identified by planning procedures as having regionally significant conservation, landscape and recreation values. Regional parks are a land management system that provides the opportunity for a coordinated planning and management strategy by different land management agencies and private landowners.

Regional parks may comprise Crown lands vested in State government agencies and local governments as well as private lands where the agreement of the landowner is obtained.

As such regional parks could consist of lands with a variety of tenures. They could be a package of reserves vested with different agencies for a variety of purposes and drawn together for coordinated management by CALM. Currently, Beeliar Regional Park consists of land comprising Crown reserves vested in the City of Melville, City of Cockburn, Town of Kwinana and the Conservation Commission of Western Australia as well as freehold land owned by the WAPC and other government agencies and individuals.

Those lands that have been acquired by the WAPC for inclusion in the Park are now to be transferred to the Conservation Commission of Western Australia or the respective local governments, for management as part of the Park.

It is intended that the overall management objectives for lands already vested in the Conservation Commission of Western Australia (such as nature reserves) will continue as the regional park concept is implemented. That is, nature reserves will continue to be managed for the maintenance and restoration of the natural environment, and to protect, care for and promote the study of indigenous flora and fauna and to preserve any feature of archaeological, historic or scientific interest.

THE REGIONAL PARK CONCEPT

The concept of regional open space was first introduced to Western Australia by the Stephenson - Hepburn Report in 1955, which recommended a statutory region plan be prepared for Perth which reserved private land required for future public purposes. In 1963, the Perth Metropolitan Region Scheme (MRS) was established and land was reserved for "Parks and Recreation." This land (subject to amendments of the MRS) has been gradually acquired by State planning authorities with the intention to protect open space of regional significance for conservation and recreation.

The Environmental Protection Authority's *Conservation through Reserves Report for Western Australia (1983)* identified areas (called System Six areas), which were

considered worthy for conservation. It also recommended that some of these areas be managed as regional parks. A system of regional parks was envisaged which included Beeliar Regional Park (System Six Recommendations M91, 92 and 93).

In 1989, the State government decided that the responsibility for regional park management be established within CALM and that the responsibility for planning the acquisition of lands for regional open space be retained by the former Department of Planning and Urban Development (DPUD) now Department for Planning and Infrastructure (DPI) on behalf of the WAPC.

In 1991, a *Regional Parks Taskforce Report* was prepared outlining proposed administration, planning and management of regional open space (DPUD and CALM, 1991).

The Environmental Protection Authority's (EPA's) *Red Book status report* (Department of Conservation and Environment, 1993) describes the transformation of regional parks from concept to reality as being difficult because of the range of land tenure involved and the funding requirements for continual management of the parks.

In June 1997, the State government announced a commitment to introduce legislation to give regional parks legal standing and vesting in the former National Parks and Nature Conservation Authority (NPNCA) now the Conservation Commission of Western Australia. The coordination of management of eight metropolitan regional parks would be progressively transferred to CALM.

REGIONAL PARK PLANNING

Planning for regional parks occurs at a number of levels. Regional park management plans are a part of a broad suite of planning undertaken by the relevant managing agencies. Figure 1 illustrates the planning levels typically undertaken for regional parks.

Source: ANZECC 2000.

Figure 1 - Regional park planning hierarchy

3 - Beeliar Regional Park

Urban growth in the vicinity of the Beeliar Wetlands has led to concern regarding the potential impact on the wetlands. The Cockburn Wetlands Study (Newman, 1976) identified the condition and resource values of the lakes in both the eastern and western chains of the Cockburn wetlands. The study recommended a proposal to establish an integrated park system.

In 1986, the Wetland Conservation Society made representations to the government and obtained a commitment to establish the Beeliar Regional Park.

In 1992, the document *Proposals for the Establishment, Administration and Use of Beeliar Regional Park* was prepared by the former Department of Planning and Urban Development (DPUD). The document sought to establish the boundaries for the Park and addressed issues of land tenure, land use conflicts and management structures. The WAPC continued acquiring land to add to those areas that were already controlled by government agencies.

In 1997, the State government proposed that a management plan for Beeliar Regional Park be prepared by CALM in conjunction with the local governments of Melville, Cockburn and Kwinana.

OVERVIEW

Beeliar Regional Park is located in the south west of the Perth metropolitan area (see Figure 2). The northernmost area of the Park (Blue Gum Lake) is located approximately 10 kilometres from Perth's Central Business District (CBD) while The Spectacles, being the southernmost area, is approximately 33 kilometres from the CBD.

The Park comprises 19 lakes and many other associated wetlands in two main chains located parallel to the coast. The western chain is approximately two kilometres from the coast and the eastern chain is between five and six kilometres from the coast. Coastal limestone cliffs along the Henderson foreshore are also contained within the Park.

The western chain of wetlands consists of a number of depressions behind the coastal dune system. This chain comprises Manning Lake, Market Garden Swamps 1 and 2, Lake Coogee, Brownman Swamps, Lake Mount Brown. Mount Brown and the Henderson foreshore (System Six, M91 reserve) adjoin the wetland chain to the southwest. The entire western chain of wetlands and coastal areas are within the municipal boundaries of the City of Cockburn.

The eastern chain of wetlands is more extensive than the western chain and encompasses Blue Gum Lake, Booragoon Lake and Piney Lakes Reserve (within the City of Melville), North Lake, Bibra Lake, South Lake, Little Rush Lake, Yangebup Lake, Kogolup Lake, Thomsons Lake and Banganup Lake (within the City of Cockburn) and The Spectacles (within the Town of Kwinana).

ONE ENTITY

The concept of managing the Beeliar Wetlands as a single entity is not new. In 1986, the Wetlands Conservation Society proposed that a number of wetlands in the Cockburn area should be managed collectively as Beeliar Regional Park (DPUD, 1992). This is supported by its geomorphological history, which indicates that the foundation of the Park is based on two consanguineous chains of wetlands. Consanguineous wetland suites are 'natural groupings of wetlands having common or interrelated features due to similarity in their physical setting and causative factors of wetland development' (Semeniuk, 1997). This means that the wetlands in each chain have derived from similar, often linked, geological or other events or processes.

Note: due to its proximity and connectivity, the Henderson foreshore is regarded as an extension to the western chain of wetlands. It is however understood, that the foreshore has particular management issues which distinguish it from the remainder of the Park. These issues are addressed in the body of this Plan.

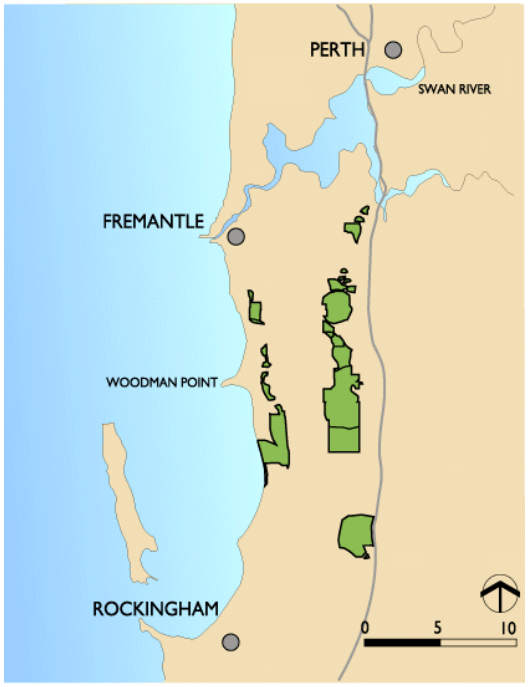

Figure 2 - Park location

PARK VALUES

Natural Environment Value

Much of Beeliar Regional Park has high nature conservation value due to its rich diversity and complexity of ecosystems which are limited in distribution across the Swan Coastal Plain. Even though the wetlands within the Park are by no means pristine, they form one of the most important systems of wetlands remaining within the Perth metropolitan region (DPUD, 1992).

The vegetation communities found within Beeliar Regional Park are significant as they represent communities once widespread on the Swan Coastal Plain but now significantly cleared. The vegetation within the Park comprises both structural and floral diversity expressed as a diverse series of landscapes (Keighery 1996). A number of Park areas contain priority flora species, as well as a large number and wide range of plant communities some of which are in very good condition.

The diversity of habitat is important to wildlife utilising the Park. The wetlands and surrounding areas provide important nesting and feeding habitats and because of their high biological productivity, they directly or indirectly support most of the wildlife of the region. Additionally, some of the wetlands in the Park act as summer refuges for a diverse bird population, many of which are transequatorial migratory waders.

The Beeliar Wetlands can be considered of international and national significance. The entire Park has been placed on the Interim List of the Register of the National Estate, while Booragoon Lake, Thomsons Lake and The Spectacles have been listed on the Directory of Important Wetlands in Australia (Environment Australia 2001). Thomsons Lake (in conjunction with Forrestdale Lake) has been listed as a wetland of international importance under the Ramsar convention. Many wetland areas in the Park have also been identified as locations for JAMBA / CAMBA migratory bird species.

Cultural Value

Beeliar Regional Park has cultural significance to both Aboriginal and non-Aboriginal people.

There are numerous Aboriginal sites within, or immediately adjacent to the Park which have been identified by the Department of Indigenous Affairs (refer Section 27).

The wetlands of Beeliar Regional Park holds significance for the local Aboriginal people (Nyungars) as they were important camping, ceremonial areas and sources of food. The eastern chain of wetlands was a part of a major trade route between Aboriginal people in the Swan and Murray River areas (Polglaze, 1986). North Lake and Bibra Lake in particular are areas of spirituality for the Nyungar people.

Non-Aboriginal people also have historical connections to the area. Thomas Peel first occupied the area in 1830 as the Clarence settlement. However, it was not until the late nineteenth century that intensive agriculture commenced in the area, coinciding with the gold rush in the 1890s. Berison (1978) provides an insight into European settlement and the development of the Cockburn area.

Landscape Value

Beeliar Regional Park provides significant landscape and amenity value to the region. Many landscapes contribute to the overall high visual quality of the Park. These include vegetated uplands consisting of mature woodland and forest areas, vegetated wetland areas, extensive areas of open water and areas of well maintained grassed parkland. The coastal environments of the Henderson foreshore area, which comprises limestone cliff formations and coastal vegetation, also add another positive dimension to the Park's landscape amenity.

Significant views of the major wetland areas can be appreciated from many vantage points around the Park. These views are an important part of the Park's identity. The relationship of adjoining land uses to the Park's landscape often has a significant impact on the overall amenity of the Park.

Recreation Value
Beeliar Regional Park provides for a range of passive and active recreation opportunities. Of particular significance is the opportunity to recreate in natural environments that are relatively undisturbed yet close to urban areas. A wide variety of natural features such as the lakes, wetlands and bushland areas as well as coastal environments, provide visitors with a variety of recreation opportunities and experiences.

The Park also contains a number of smaller recreation nodes offering a diversity of settings, uses and facilities. Existing and proposed recreation facilities are described in area management plans for specific areas of the Park and are illustrated in the Recreation Masterplan (Appendix B).

The Park provides excellent opportunities to promote CALM's Healthy Parks Healthy People programme which encourages people to visit and enjoy themselves in parks by raising the awareness of the physical, mental and social health benefits of spending time in nature.

Education and Research Value
The Park has significant research and scientific value. On one hand it contains rich, dynamic ecosystems with seasonal and periodic variations, subject to considerable external pressures and inputs. Conversely, it has areas with high recreational demand requiring an understanding of human use, landscape design, and changing social use of natural areas for recreation.

In particular, the collection of technical data on wetland habitats, water quality and water quantity make it an extremely valuable resource in gaining technical and managerial expertise that can be applied to other wetlands across the Swan Coastal Plain.

4 - The management plan and community involvement

COMMUNITY INVOLVEMENT IN THE PREPARATION OF THIS PLAN

The community was made aware of the preparation of this management plan through liaison, newspaper advertising, articles and publications produced by the Park's managing agencies.

A community workshop was held in October 1998 as part of the management planning process. The workshop was attended by people representing broad community interests as well as representatives from the relevant local governments and CALM.

CALM also undertook specific consultation in the preparation of this Plan with key stakeholder groups. The Beeliar Regional Park Community Advisory Committee also commented on the draft plan prior to its release for public comment (Section 41). Native Title claimants were also notified of the Plan's preparation at the commencement of the process.

MANAGEMENT PLAN PREPARATION

This management plan has been prepared in five phases:

1. The first phase was aimed at identifying the relevant planning and management issues as well as Park values. This was achieved by undertaking a literature review, analysing the existing condition of the Park and organising a community workshop. Public involvement in this phase was encouraged through newspaper articles and canvassing key stakeholders for the community workshop.

2. The second phase was the preparation of the Draft Management Plan. This involved preparing planning strategies to protect Park values and address issues identified in phase one. Within this phase, CALM, the City of Melville, City of Cockburn and Town of Kwinana provided advice on the development of the Plan.

3. The third phase involved presenting the Draft Management Plan for public comment. The Draft Plan's availability for review was widely advertised, and was open for public comment for a period of three months.

4. The fourth phase covered the acknowledgement and analysis of public submissions.

5. The fifth phase involved the preparation of this final management plan incorporating issues or comments raised within the public submissions and comments from State government agencies and local government. The Conservation Commission of Western Australia considered the revised final plan and then submitted it to the Minister for the Environment for approval.

B. PRINCIPAL MANAGEMENT DIRECTIONS

5 - The vision for the Park

The long-term vision for Beeliar Regional Park is:

"Beeliar Regional Park will encompass two quality chains of wetlands and an adjoining coastal foreshore which will support a diversity of wetland and upland habitats and ecosystems. The Park will be managed as a single entity for conservation purposes as well as for a range of sustainable community uses that recognise Aboriginal and non-Aboriginal heritage in a harmonious way."

Strategy

1. **Manage the Park for biodiversity conservation, and encourage recreation and other uses to occur to the extent that they do not adversely impact on the other values of the Park. (CALM, CM, CC, TK, MU) [High]**

6 - Legislation, management policies and existing area management plans

The objective is for CALM to manage the Park in accordance with the Conservation and Land Management Act 1984 and to integrate the policies of the other managing agencies to support the vision for the Park.

LEGISLATION

This Plan has been prepared in accordance with the *Conservation and Land Management Act 1984*. In managing the Park, CALM will utilise the provisions of the *Conservation and Land Management Act 1984*, *Wildlife Conservation Act 1950* and associated regulations, as well as the provisions of any new legislation under which CALM may have responsibilities for implementation.

The *Conservation and Land Management Act 1984* will need to be amended to specifically include the management of regional parks

MANAGEMENT POLICIES

Department of Conservation and Land Management Policies
This Plan is consistent with CALM policies. These policies provide direction and guidance for the application of the *Conservation and Land Management Act 1984*, *Wildlife Conservation Act 1950* and associated regulations.

CALM policies specifically mentioned in this Plan relate to the management of fire; rehabilitation; visitor risk; recreation, tourism and visitor services; beekeeping, radio – telecommunications, community involvement, weeds (draft) and pest animals (draft). These policies are listed in Appendix C.

A number of policies mentioned in this Plan were under review at the time of writing. Should there be any inconsistencies between this Plan and the revised policy, future management will be in accordance with the new policy.

Local Government
The policies and management actions of the City of Melville, City of Cockburn and Town of Kwinana will be consistent with this Plan.

Murdoch University
The policies and management actions of Murdoch University will be consistent with this Plan.

EXISTING AREA MANAGEMENT PLANS

Areas within the Park have been the subject of numerous studies, and a wide range of literature exists that covers the biological, cultural and recreational aspects of the Park. This Plan draws on the available information and is prepared as an 'umbrella document', establishing a framework for the management of the Park as a single entity.

Detailed area plans have been prepared previously for the following Park areas:

- Blue Gum Lake (2004);
- Booragoon Lake (2004);
- Piney Lakes (2004);
- North Lake (1986);
- Bibra Lake (1983) currently being revised;
- Little Rush Lake (1995);
- Yangebup Lake (1995);
- Thomsons Lake Nature Reserve (2005);
- Lake Coogee (1992);
- Market Garden Swamps (1995);
- Henderson Region (Mount Brown and Brownman Swamps) (1990).

In addition to the above area plans, numerous others have been prepared which address the management of specific areas or issues within the Park (e.g. The Jervoise Bay Conservation and Recreation Enhancement Plan and The Spectacles Concept Plan).

Care has been taken to ensure the *Thomsons Lake Nature Reserve Management Plan (2005)* and this Plan are able to be implemented consistently. If there are concerns regarding the consistency of the plans, the Thomsons Lake Nature Reserve Management Plan will take precedence.

Strategies

1. **Apply CALM policies in managing the Park. (CALM) [Ongoing]**

2. **Assist the City of Melville, City of Cockburn and Town of Kwinana in preparing a local government policy statement that reflects the intent of this Management Plan. (CALM) [High]**

3. **Assist Murdoch University in preparing a policy statement that reflects the intent of this Management Plan. (CALM) [High]**

4. **Continue to prepare and review existing area management plans for specific park areas in the context of implementing this Management Plan. (CALM, CM, CC, TK, MU)**

7 - Park boundary

The objective is to clearly define the park boundary for the implementation of this Plan.

The Beeliar Regional Park boundary has been determined by the Department for Planning and Infrastructure (DPI) and largely reflects the boundary advocated by the State Planning Commission (now the WAPC) in the *Beeliar Regional Park Proposals for Establishment, Administration and Use (1992).*

A number of changes, however, have occurred to the boundary since 1992 through amendments to the Metropolitan Region Scheme (MRS). Additionally, there is likely to be future changes to the boundary as a result of infrastructure projects and other development proposals. Future changes to the Park boundary will be consistent with the Parks and Recreation reservation in the MRS.

In relation to proposed major transport corridors adjoining the Park such as the Roe Highway and the Fremantle – Rockingham Controlled Access Highway, the Park boundary is defined by the extent of the Parks and Recreation reservation in the MRS. These existing road reservations are outside of the Park.

Murdoch University has also advised CALM that it is interested in having three areas of its campus included into the Park, namely Melaleuca Swamp, Chelodina Reserve and Banksia Woodland Reserve.

The existing Park boundary is shown in Figure 3 (page 9).

Inclusion of other lands into Beeliar Regional Park

The WAPC has jurisdiction for overall planning and the acquisition of lands for regional parks. The inclusion of additional areas into Beeliar Regional Park is therefore the responsibility of the WAPC, in consultation with CALM and the Conservation Commission of Western Australia. Other key stakeholders including the local governments of Melville, Cockburn and Kwinana should also be consulted.

The WAPC is guided by *Bush Forever* in determining areas to be acquired for conservation purposes (Government of Western Australia, 2000). *Bush Forever* is a ten-year strategic plan that aims to identify and conserve regionally significant bushland on the Swan Coastal Plain portion of the Perth Metropolitan Region. *Bush Forever* proposes that certain areas of regionally significant bushland be reserved for Parks and Recreation in the MRS and/ or acquired by the WAPC for inclusion in the conservation estate.

The criteria for determining additions to a regional park such as Beeliar are:

1. that the area is identified by *Bush Forever* as being regionally significant;
2. that the area is reserved for "Parks and Recreation" in the MRS;
3. that the area has an appropriate tenure (such as an existing Crown reserve or freehold land acquired by the WAPC for inclusion in the Park); and
4. that the area provides a physical link to another area of the Park.

Once potential additions to the Park have been identified against the above criteria, the following considerations are taken into account to ensure that the Park boundary is manageable: provision for sufficient buffers; condition of the land; future recreational demand; the enhancement of views; fire management; and provision of future services and roads.

The addition of any new lands to the Park, irrespective of tenure, will increase demand on management resources.

A number of other wetlands outside of the Park boundary have been identified as deserving formal protection. These include:

- Market Garden Swamp No. 3 in the City of Cockburn;
- Wattleup Lake, Long Swamp and Bollard Bullrush Swamp in the Town of Kwinana.

These areas were identified in a landscape protection zone which was proposed to help ensure inappropriate developments such as filling of wetlands, or clearing of vegetation is controlled (DPUP, 1992). Should these wetland areas be reserved for Parks and Recreation in the MRS and either ceded to the Crown or acquired by the WAPC, they will be included into the Park. If this occurs, local government involvement in managing the areas and appropriate management resources will need to be considered.

Importantly, planning has also commenced to include the following areas into the Park:

- a buffer on the eastern side of Yangebup Lake at the former Wool scourers site; and
- the eastern portion of Lot 502 North Lake Road adjacent to South Lake;

Strategy

1. **Adopt the Park boundary as shown on Figure 3. The boundary is likely to be modified in the future based on the Parks and Recreation reservation in the MRS. (Conservation Commission, CALM, CM, CC, TK, MU, DPI, WAPC) [High]**

8 - Land tenure

The objective is to ensure that the values of the Park are protected by security of tenure and reserve purpose.

The Park consists of reserves administered under the *Land Administration Act 1997* and vested in a number of State government agencies and local governments, as well as unallocated Crown land and freehold land owned by State government agencies, Murdoch University and private organisations. The land tenure of the Park is shown in Figure 3 (page 9).
This Plan identifies the most appropriate tenure arrangements for the land comprising the Park and proposes to vest it in either the Conservation Commission of Western Australia, or the relevant local government/s.

Crown reserves will be created using the management areas outlined in the Plan's Park Management Zones as a guide (Figure 4 – Page 10). The precise boundaries of new reserves in the Park will be determined following on-ground fieldwork and survey where necessary.

The tenure arrangements for reserves already vested in the Conservation Commission of Western Australia will not change, for example Thomsons Lake Nature Reserves will retain its Class A status and existing reserve purpose.

Should additional land be included within the boundary of the Park during the term of this Plan, its tenure arrangements will be consistent with the protection and enhancement of the Park's values.

Transfer of WAPC-owned freehold land
Freehold lands owned by the WAPC will be converted into reserves under the *Land Administration Act 1997* and vested in the Conservation Commission of Western Australia or the relevant local government and managed in accordance with this Plan.

Reserves created from WAPC freehold land and vested in the Conservation Commission of Western Australia will be afforded an appropriate purpose for the protection and enhancement of Park values and will be classified as Class A under the *Land Administration Act 1997* (refer to Table 1, Page 11).

Reserves created from WAPC freehold and vested with local government will be reserved for the purpose of "Conservation and Recreation" and afforded similar tenure arrangements as the reserves vested in the Conservation Commission of Western Australia.

Cockburn City Council has advised that prior to accepting vesting of Areas 30, 31 and 32 proposed financial arrangements for their management need to be agreed with the WAPC. Additionally, the Council has decided that it will not accept management of the Yangebup Lake water body (Area 21) until the contamination issue is resolved with the WAPC to the satisfaction of the Council.

Crown reserves and unallocated Crown land
Existing Crown land reserved for utilities or services such as drainage will retain their existing reserve purpose and tenure arrangements where appropriate.

The purpose and tenure arrangements of other reserves within the Park will be reviewed and their extent and management may be modified using Figure 4 (page 10) as a guide.

Road reserves in the Park considered unnecessary by planning and management agencies will be closed and afforded an appropriate reserve purpose and tenure arrangements consistent with the protection and enhancement of Park values (refer to Table 1 and Figure 4).

Unallocated Crown land is to be created as reserves and transferred to the Conservation Commission of Western Australia. These reserves will also be afforded an appropriate reserve purpose and tenure arrangements consistent with the protection and enhancement of Park values (refer to Table 1 and Figure 4).
During the process of preparing this Plan, Cockburn City Council resolved to transfer Reserve numbers 24309, 39455, 37426, 39584, 39752 (at Henderson Region Open Space) to the Conservation Commission of Western Australia.

Murdoch University
The three areas of Murdoch University campus included in the Park will remain as freehold land owned by the University.

Private property
This Plan is not the mechanism by which freehold land, held by private individuals or organisations, is to be acquired by the WAPC. The Department for Planning and Infrastructure on behalf of the WAPC will continue its voluntary land acquisition program within regional parks. Until acquired by the WAPC these lands will remain protected under Perth's Metropolitan Region Scheme by their "Parks and Recreation" reservation.

This Plan will not dictate the management of privately owned freehold land held by individuals or organisations in the Park. However, when the land is acquired by the WAPC, management will be in accordance with the Plan's Park Management Zones (Section 10).

Access by Park visitors to areas of private property owned by individuals or organisations in the Park is not available until it is acquired by the WAPC.

A significant portion of The Spectacles is under the private ownership of Alcoa Pty. Ltd. (see Figure 3, page 9). Alcoa has implemented and supported a number of conservation, recreation and cultural initiatives at The Spectacles including the preparation of a concept plan for the area in conjunction with CALM. Park visitors can access Alcoa's landholdings at The Spectacles.

Strategies

1. **Liaise with the Department for Planning and Infrastructure to create reserves for vesting in the relevant managing agency in accordance with Table 1 and Figure 4. (CALM, CM, CC, TK) [Medium]**

2. **Support the WAPC in seeking to acquire the remainder of the private land within the Park as soon as practicable from willing landowners. (CALM) [High]**

3. **Liaise with the Department for Planning and Infrastructure to close road reserves in the Park considered unnecessary by the planning and management agencies. (CALM, CM, CC, TK) [Medium]**

Key performance indicators for land tenure
The success of the strategies will be measured by: 1. Tenure actions for which CALM and Conservation Commission are responsible.
Target: 1. Complete all tenure actions for which CALM and the Conservation Commission are responsible.
Reporting: 1. Every 5 years.

9 - Interim management

The objective is to ensure that interim management arrangements facilitate the appropriate management of the Park.

INTERIM MANAGEMENT ARRANGEMENTS

Prior to the transfer of lands to the relevant agencies, there is a need to clearly define interim management arrangements between the Park's managing agencies.

CALM will coordinate the interim management of the Park through the preparation of this Plan and by management agreements prepared for Crown reserves and freehold lands.

A regional park management agreement for interim Park management may comprise either:

- a Section 16 Agreement under the *Conservation and Land Management Act 1984*; or
- a Memorandum of Understanding.

Interim management of WAPC-owned land

Section 16 of the *Conservation and Land Management Act 1984* allows CALM to enter into agreements for the management of private (freehold) land.

Following June 1997, when the management responsibility for regional parks was progressively transferred to CALM, the WAPC and CALM agreed to enter into a Section 16 agreement under the *Conservation and Land Management Act 1984*. This formal agreement acts as an interim management arrangement prior to the land being vested in the Conservation Commission of Western Australia or the relevant local government.

The agreement includes all WAPC-owned lands within the Park, except those leased.

Interim management of Crown land and freehold land controlled by government agencies

Government agencies will be responsible for managing land under their control. The interim management of unallocated Crown land and unvested Crown reserves will involve discussions between the land managing agencies involved in the Park and the Department for Planning and Infrastructure. CALM will coordinate an overall approach to the interim management of Beeliar Regional Park through the preparation of this Management Plan.

Interim management arrangements for private property

Where individuals or organisations hold private property within the Park, the owner is responsible for its management. CALM may seek formal management or maintenance arrangements with individual private landowners within the Park.

Strategies

1. **Implement the WAPC – CALM Regional Park Management Agreement under Section 16 of the *Conservation and Land Management Act 1984* (CALM, WAPC) [High]**

2. **Prepare management agreements for interim park management for areas controlled by State government, local government, or private landholders as required. (CALM) [Medium]**

10 - Management zones

The objective is to adopt a management zoning system that protects conservation values, provides for appropriate recreation and other uses, and provides for efficient management of the Park.

Management zones are a framework for protecting the Park by minimising existing and potential conflicts between uses and activities. They provide a broad guide to the uses and management activities which are appropriate in certain Park areas and indicate which management objectives have priority in a given area. A clear zoning scheme also helps to communicate management intentions to the public.

The management zones and areas for the Park are illustrated in Figure 4 (page 10). They provide a guide for the future vesting of Park areas, however, given there are numerous service and utility reserves in the Park, they should not be used as a detailed schedule for changing land tenure arrangements in the Park.

Within the Park five management zones have been identified:

a) Conservation and Protection
b) Natural Environment Uses
c) Recreation
d) Sport and Recreation
e) Special Use

Refer to Table 1 (page 11) for the management emphasis and acceptable uses and facilities within each zone.

The zoning scheme does not direct the management of privately owned freehold land held by individuals in the Park. However, when the land is acquired by the WAPC, management will be in accordance with the Plan's Park Management Zones.

Strategy

1. **Manage the Park in accordance with the zoning plan. (CALM, CM, CC, TK, MU) [Ongoing]**

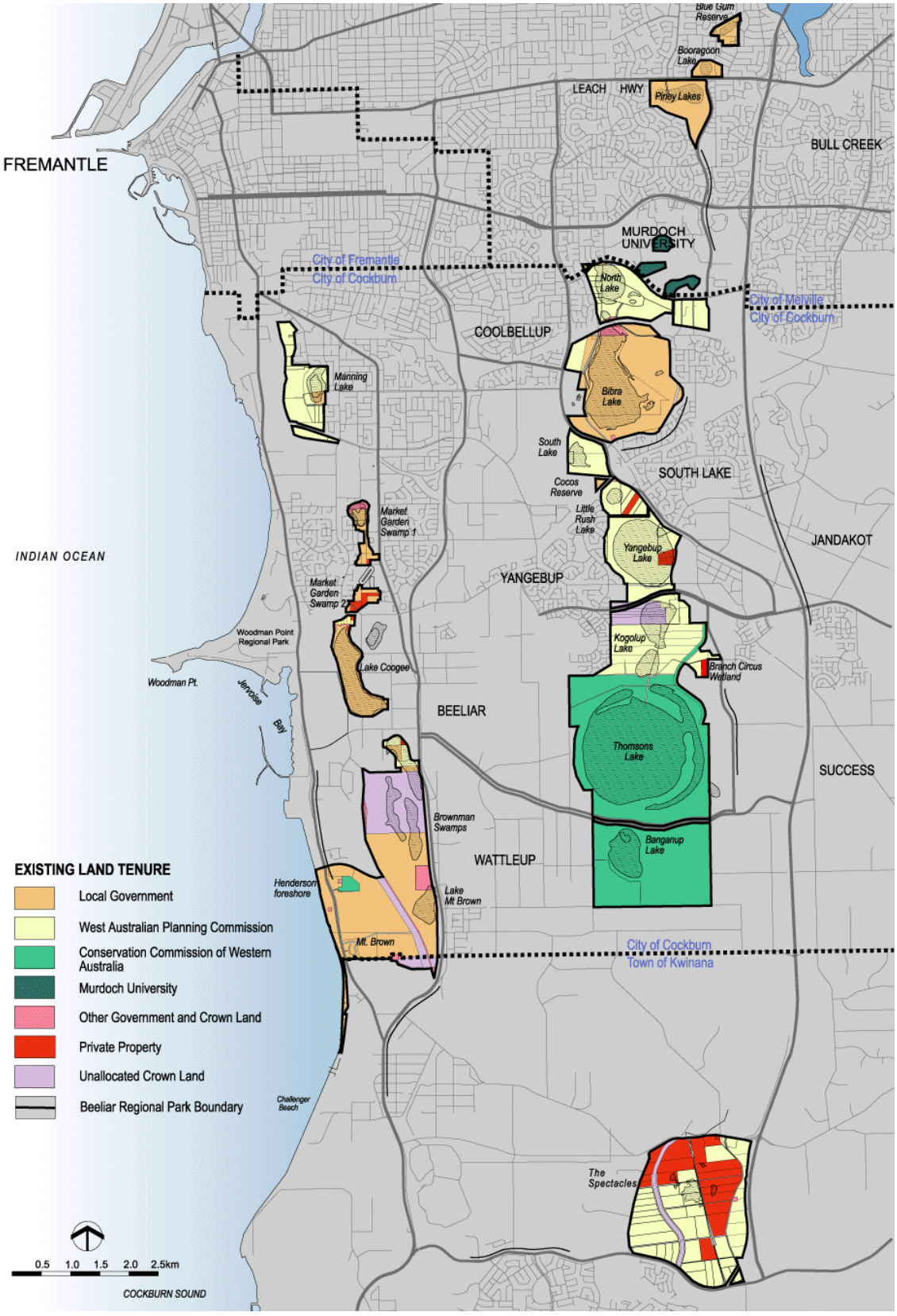

Figure 3 - Existing land tenure and park boundary

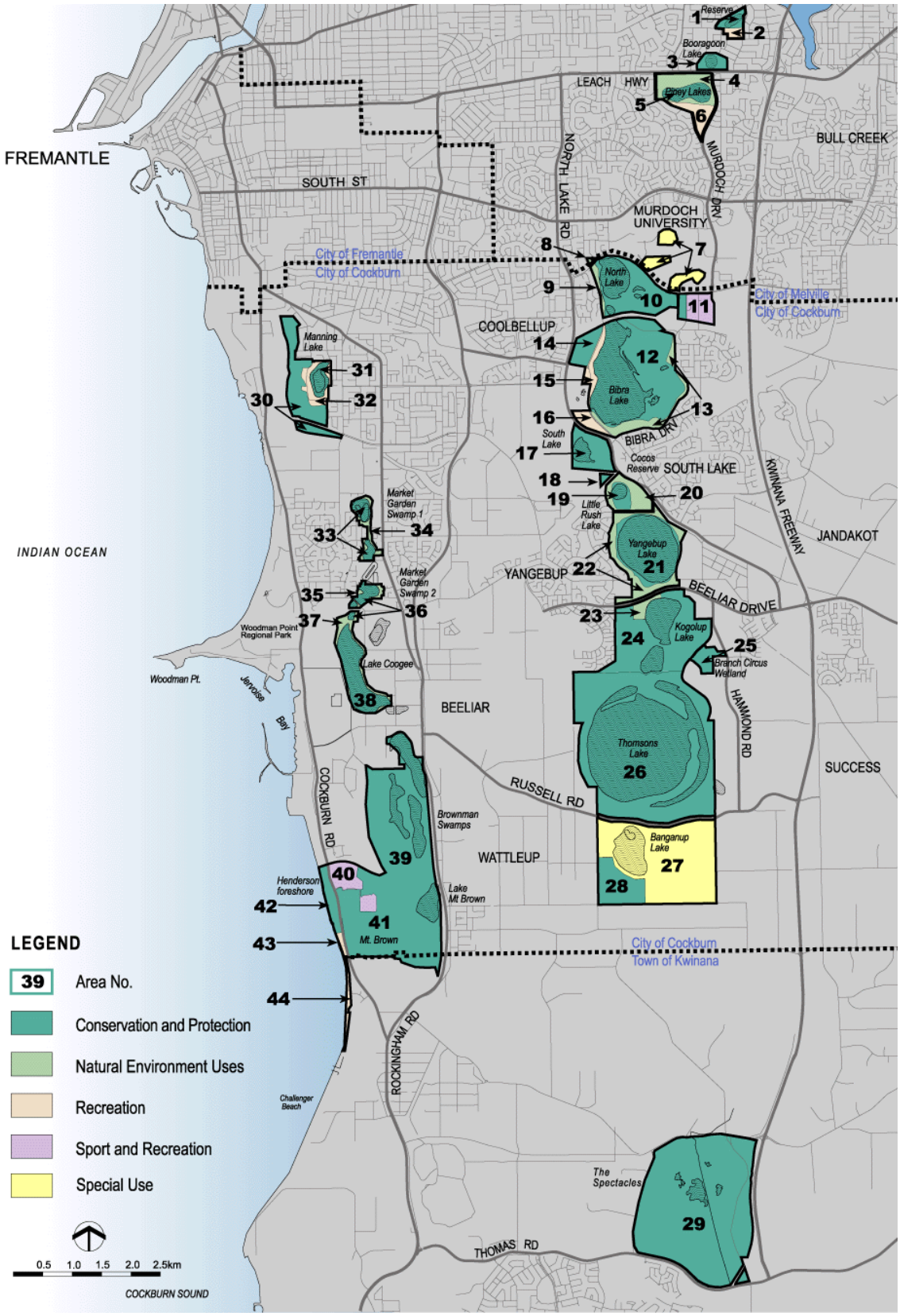

Figure 4 - Proposed management zones and areas

Table 1 - Management zones and future tenure arrangements

MANAGEMENT ZONES					FUTURE TENURE ARRANGEMENTS		
Management Zone	**Plan Area**	**Management Agency**	**Management Emphasis**	**Acceptable Uses and Facilities**	**Plan Area**	**Reserve Purpose**	**Vested Authority**
Conservation and Protection	Area 1 Area 3 Area 5 Area 10 Area 12 Area 14 Area 17 Area 18 Area 19 Area 21 Area 24 Area 25 Area 26 Area 28 Area 29 Area 30 Area 31 Area 33 Area 36 Area 38 Area 39 Area 41 Area 42	City of Melville City of Melville City of Melville CALM City of Cockburn City of Cockburn CALM City of Cockburn City of Cockburn City of Cockburn CALM CALM CALM CALM CALM City of Cockburn City of Cockburn City of Cockburn City of Cockburn City of Cockburn CALM CALM CALM	The management emphasis of this zone is to protect and where possible, enhance the biodiversity conservation values and landscape qualities of the Park. Priority will be given to maintaining the natural state of Conservation and Protection areas with a minimum of impairment. Visible evidence of management will be minimal.	<u>Wetland Areas:</u> Restricted public access. Unauthorised watercraft and vehicles prohibited. Development of facilities such as boardwalks and observation platforms are acceptable in certain locations (see Appendix B - Recreation Masterplan). Protection and enhancement of natural habitats to ensure survival of wetland ecosystems is considered essential. Education and research uses allowed. <u>Upland Areas:</u> Public access restricted predominately to nature trails, cycle tracks and through access ways (in certain locations). Development of facilities such as observation platforms and car parks are acceptable in limited locations (see Appendix B - Recreation Masterplan). Rehabilitation of vegetation. Habitat protection for bird species and other fauna is considered essential. Education and research uses and facilities allowed.	Area 1 Area 3 Area 5 Area 10 Area 12 Area 14 Area 17 Area 18 Area 19 Area 21 Area 24 Area 25 Area 26 Area 28 Area 29 Area 30 Area 31 Area 33 Area 36 Area 38 Area 39 Area 41 Area 42	Recreation & Conservation of Fauna Parkland, Public Recreation Drainage Parkland & Environment Centre Conservation Park Recreation; Recreation & Education* Pioneer Park; Recreation & Education* Conservation Park Public Recreation Recreation Recreation Conservation Park Conservation Park Nature Reserve Conservation Park Conservation Park Recreation Public Recreation Public Recreation and Drainage Public Recreation and Drainage Recreation Conservation Park Conservation Park Conservation Park	Melville City Council Melville City Council Melville City Council Conservation Commission Cockburn City Council Cockburn City Council Conservation Commission Cockburn City Council Cockburn City Council Cockburn City Council Conservation Commission Conservation Commission Conservation Commission Conservation Commission Conservation Commission Cockburn City Council Cockburn City Council Cockburn City Council Cockburn City Council Cockburn City Council Conservation Commission Conservation Commission Conservation Commission
Natural Environment Use	Area 4 Area 9 Area 13 Area 20 Area 22 Area 23 Area 34 Area 35 Area 37	City of Melville CALM City of Cockburn City of Cockburn City of Cockburn CALM City of Cockburn City of Cockburn City of Cockburn	The management emphasis is to provide for appropriate uses that do not adversely affect the natural environment. Areas will be managed jointly for public use, conservation and enhancement of flora and fauna, and improvement of landscape qualities. Public use must be compatible with the assigned purpose of the relevant reserve. Visible evidence of management may be moderate to high. Management will encourage uses that promote conservation and education.	Areas are readily accessible by walking trails and cycle paths. Some development of facilities necessary. These may include education nodes and facilities (such as car parks) associated with visitor nodes. Commercial concessions compatible with the values of the area may be considered appropriate within this management zone. The provision of facilities will depend on the values of the area and the community demand for facilities. Rehabilitation and habitat protection will be necessary.	Area 4 Area 9 Area 13 Area 20 Area 22 Area 23 Area 34 Area 35 Area 37	Parkland and Environment Centre Conservation Park Recreation & Education Uses Recreation Recreation Conservation Park Public Recreation and Drainage Public Recreation and Drainage Recreation	Melville City Council Conservation Commission Cockburn City Council Cockburn City Council Cockburn City Council Conservation Commission Cockburn City Council Cockburn City Council Cockburn City Council

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Table 2 (continued) – Management zones and future tenure arrangements

MANAGEMENT ZONES					FUTURE TENURE ARRANGEMENTS		
Management Zone	**Plan Area**	**Management Agency**	**Management Emphasis**	**Acceptable Uses and Facilities**	**Plan Area**	**Reserve Purpose**	**Vested Authority**
Recreation	Area 2	City of Melville	The prime emphasis of management will be to provide a variety of recreation opportunities. The type and scale of facilities provided will depend on the values of any given area, community demand for recreation and the appropriate management of the Park. Management involves minimising the impact of visitor activities through the sensitive placement and provision of access and facilities. Visible evidence of management may be high.	Public use may be high in these areas. Predominantly passive recreation pursuits, allowing for park and picnic facility development. Commercial concessions may be considered appropriate within this management zone. Rehabilitation, landscaping and reticulation of areas may be necessary	Area 2	Recreation and Conservation of Fauna; Recreation; Parking; Child Health Centre*	Melville City Council
	Area 6	City of Melville			Area 6	Parkland and Environment Centre	Melville City Council
	Area 8	City of Melville			Area 8	Recreation and Drainage	Melville City Council
	Area 15	City of Cockburn			Area 15	Recreation & Education Uses; Parking*	Cockburn City Council
	Area 16	City of Cockburn			Area 16	Recreation	Cockburn City Council
	Area 32	City of Cockburn			Area 32	Public Recreation	Cockburn City Council
	Area 43	City of Cockburn			Area 43	Recreation and Camping	Cockburn City Council
	Area 44	Town of Kwinana			Area 44	Recreation and Dune Protection; Recreation*	Kwinana Town Council
Sport and Recreation	Area 11	City of Cockburn	Sport and Recreation allows for areas to be used for indoor and outdoor sporting activities. Given these areas are high use, management will endeavour to minimise incompatibilities with surrounding Park areas. Management involves minimising the impact of visitor activities through the sensitive placement and provision of access and facilities. Visible evidence of management is likely to be high.	High use areas developed for active recreation pursuits. May include sporting ovals, car parking, buildings and reticulated and landscaped areas. Commercial concessions may be considered appropriate within this management zone.	Area 11	Recreation	Cockburn City Council
	Area 40	CALM			Area 40	Recreation	Conservation Commission
Special Use	Area 7	Murdoch University	This zone will be managed for conservation, teaching and research purposes.	Private property or private lease or licence. No public access. Protection and enhancement of natural habitats to ensure survival of upland and wetland ecosystems is considered essential.	Area 7	Not Applicable	To remain freehold with Murdoch University
	Area 27	CALM			Area 27	Nature Reserve	Conservation Commission

* More than one reserve currently comprises the Plan Area.

Note: Conservation Parks are reserves established to meet as much of the demand for recreation by members of the public as is consistent with the proper maintenance and restoration of the natural environment, the protection of indigenous flora and fauna and the preservation of any feature of archaeological, historic or scientific interest. Nature reserves are reserves established to maintain and restore the natural environment, and to protect, care for, and promote the study of, indigenous flora and fauna, and to preserve any feature of archaeological, historic or scientific interest *(Conservation and Land Management Act 1984)*.

11 - Integrated management and planning of the Park and adjacent areas

The objectives are to provide for the effective involvement of the managing agencies and the community in managing the Park and to integrate the management and planning of the Park with adjacent areas.

THE PARK MANAGEMENT STRUCTURE

The joint managers of the Park are CALM, the City of Melville, City of Cockburn, Town of Kwinana, and Murdoch University and their areas of responsibility are set out in the previous section on Management Zones. It is proposed that once this Plan is in operation, management will be in accordance with the strategies outlined in this Plan.

CALM is the most appropriate agency to provide a strong integrated framework for the management of complex conservation and recreation areas. CALM is responsible for managing areas of the Park vested in the Conservation Commission of Western Australia and for the overall coordination of the Park's management. The local governments and Murdoch University will manage areas of the Park to be vested in them in accordance with the strategies outlined in this Plan.

Close cooperation is required by the Park's managing agencies and the community for this Plan to be implemented efficiently and effectively. Strategic and management decisions will involve input from, and negotiation between, the land managing agencies. CALM will refer strategic and policy issues to the Conservation Commission of Western Australia for consideration as required. Joint working parties comprising representatives from CALM, other State government agencies and relevant local governments will be established to facilitate the preparation of detailed subsidiary plans for the Park. These plans will be prepared in consultation with the community.

A common management direction

The establishment of a management structure, common objectives and agreement on priorities are necessary for safeguarding this regional resource where a number of land managing agencies, the general public and interest groups are involved. This management plan will act as an agreement between the agencies involved in the management of the Park and will provide the basis for greater coordination of management activities including the integration of grant applications and funding expenditure. The managing agencies will prepare annual project lists for the Park as a means of integrating park management and establishing a common management direction. The Beeliar Regional Park Community Advisory Committee will have input into the projects list.

LAND USE PLANNING FOR AREAS ADJACENT TO THE PARK

Many impacts and threatening processes on the Park emanate from surrounding land uses and activities, particularly from within the catchments of the Park's wetlands.

Planning for areas surrounding the Park is determined at both the State and local level. At the State level, the WAPC is responsible for administering the Metropolitan Region Scheme (MRS). The MRS directs land use in the Perth metropolitan area by defining the future use of land, and dividing it into broad zones and reservations. At the local level, the MRS requires local government town planning schemes to provide detailed plans for their part of the region. These town-planning schemes must be consistent with the MRS.

It is not the intent of this Plan to provide strategies to guide land uses and activities outside of the boundary of the Park. Planning mechanisms such as the MRS and local government town planning schemes as well as environmental assessment procedures have been established to guide land use decisions. Land use planning within the catchments of the Park needs to consider the potential adverse environmental impacts on the Park, and in particular, the Park's wetlands. Planning and environmental assessment authorities should discourage adjacent land-use practices that may lead to the leaching and run-off of nutrients and pollutants into the wetland system, or other unacceptable impacts on the values of the Park.

OTHER STATUTORY PLANNING CONSIDERATIONS

Responsibility for statutory planning under the *Town Planning and Development Act 1928* and the *Metropolitan Region Town Planning Scheme Act 1959*, such as changes to the MRS for regional parks is retained by the WAPC.

The majority of lands within the Park are currently protected under the MRS by their Parks and Recreation reservation. Areas which are not reserved as Parks and Recreation in the MRS include Blue Gum Lake, Booragoon Lake, Market Garden Swamps 1 and 2, and Murdoch University. CALM will liaise with the DPI to amend the MRS so that the entire Park (except Murdoch University lands) is reserved for Parks and Recreation.

Strategies

1. **Establish, where appropriate, joint working parties representing relevant managing agencies and the community for subsidiary plans. (CALM, CM, CC, TK, MU) [High]**

2. **Consult with the Beeliar Regional Park Community Advisory Committee when preparing subsidiary plans and annual projects lists for the Park. (CALM, CM, CC, TK, MU) [High]**

3. **Refer policy issues to the Conservation Commission of Western Australia for consideration as required. (CALM) [Ongoing]**

4. **Liaise with the Department for Planning and Infrastructure to amend the MRS so that the entire Park (except Murdoch University lands) is reserved for Parks and Recreation. (CALM, CM, CC) [High]**

12 - Key performance indicators and monitoring and reporting

The objective is to set performance criteria for assessing and auditing the implementation of this Plan, in order to track the effectiveness of the Plan in meeting its objectives.

KEY PERFORMANCE INDICATORS

In order to establish an efficient and effective means for achieving this objective, key performance indicators have been defined. This reflects the need for Park managers to take an outcome-based approach, from which the effectiveness of management can be assessed.

The role of key performance indicators in this Plan is to provide an indication of:

1. ecosystem health in the Park;
2. use of the Park by the community; and
3. the performance of CALM in implementing this Plan.

Key performance indicators do not cover all objectives or strategies, but they have been selected to give a strategic indication of how well the values of the Park are being maintained. Key performance indicators have been established in this Plan and relate specifically to the key ecological and social values of the Park (see Table 2).

Key performance indicators have been identified in the following sections of the Plan:

- Land Tenure
- Lakes and Wetlands
- Flora and Vegetation
- Fauna
- Weeds
- Visitor Use
- Working with the Community

Key performance indicators underpin the audit process of this Plan (see Section 45).

MONITORING AND REPORTING

CALM will monitor the key performance indicators. Appropriate and valid monitoring methods, intervals and baseline data will be established for each key performance indicator. Monitoring will need to take into account natural variability.

CALM will periodically report to the Conservation Commission of Western Australia regarding the key performance indicators and include responses to any target shortfalls. The Commission will take action as appropriate where performance targets are not met.

CALM will coordinate all monitoring undertaken in the Park to ensure an integrated approach that avoids duplication and allows programs to be assigned appropriate priorities.

Strategies:

1. **Establish baseline information and implement ongoing monitoring programs within the Park, focusing on the key performance indicators. (CALM) [High]**
2. **Monitor and measure the key performance indicators and report findings as required to the Conservation Commission of Western Australia for action as required. (CALM) [High]**
3. **Assess the performance of CALM in carrying out and complying with this plan using key performance indicators and other mechanisms as appropriate. (Conservation Commission of Western Australia) [Ongoing]**

13 - Research

The objective is to further develop and maintain knowledge in regard to natural processes, visitor use, management, cultural heritage and external influences on the Park.

There are many opportunities for research within the Park and a great need for these studies to be integrated. The managing agencies of the Park are fortunate to have two universities involved in the Park. Murdoch University contains a centre of environmental studies and has been involved in research projects in the Park for many years. The University is currently undertaking research on a variety of issues including water quality, groundwater extraction and midges (Section 16).

The University of Western Australia (UWA) is involved through research undertaken at the Harry Waring Marsupial Reserve. UWA has been operating the Harry Waring research facility for a number of years for research into wetlands and marsupial breeding. Ongoing research by the two universities and other groups should be encouraged and supported by the Park managers.

The vegetation of the Park is representative of communities that were once more widespread on the Swan Coastal Plain. They therefore offer an insight into changes that have occurred since European settlement.

Visitor impacts and management responses need to be subject to continual review and evaluation. CALM will periodically undertake studies to provide information on management decisions (e.g. water supplementation at Thomsons Lake Nature Reserve).

The involvement of educational institutions, community groups and individual researchers is encouraged, so as to promote community ownership while also gaining valuable knowledge for use in the management of the Park. The involvement of individuals, groups and organisations is valuable as it reduces the cost of research and monitoring for the managing agencies.

Strategies

1. **Support and where possible seek grant applications to underatke research within the Park. (CALM, CM, CC, TK, MU) [Ongoing]**
2. **Encourage the participation of volunteers, educational institutions and other organisations in research projects within the Park. (CALM, CM, CC, TK, MU) [High]**

C. CONSERVING THE NATURAL ENVIRONMENT

14 - Guiding principles for conserving the natural environment

1. Conservation and protection of the natural environment

Natural processes and biodiversity will be managed to maintain their inherent values. External impacts from human use, the surrounding urban area and management practices will be minimised in order to maintain the biodiversity of natural systems over the long-term.

2. Park management priorities

The Park will be managed for conservation and environmental enhancement. Recreation and other uses will be allowed to occur to the extent that they do not impair the sustainability of the natural environment.

3. Restoration of the natural environment

Restoration of the natural environment will be undertaken to maintain biodiversity, and protect and enhance natural systems. Areas with high conservation significance will be considered priorities for restoration.

4. Features requiring special protection

Declared Rare Flora, Priority Flora species, Threatened Ecological Communities, Priority Fauna and other Specially Protected Fauna will be given priority for conservation and restoration.

5. Consistency of management policies

The land managers involved in the Park will apply consistent and coordinated management policy.

6. Appropriate Reserve Purpose

Reserves within the Park will be assigned an appropriate purpose for the protection and enhancement of Park values under the *Land Administration Act 1997*.

7. Recognition of cultural and social values

The Park will be managed in a way that delivers community benefits by maintaining cultural traditions and attributes and by providing opportunities for recreation, education and research.

8. Precautionary principle

If there are threats of serious or irreversible environmental damage, the lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

Strategy

1. **Apply the above principles as required in conserving the natural environment of the Park. (CALM, CM, CC, TK, MU) [Ongoing]**

15 - Geomorphology, soils and landform

The objective is to protect and conserve the existing geomorphological structure and soil associations of the Park.

GEOMORPHOLOGY

The geomorphic elements of lands that comprise Beeliar Regional Park are typical of the Swan Coastal Plain. The three most westerly geomorphic units of the Swan Coastal Plain from west to east are Quindalup, Spearwood and Bassendean Dune Systems. Each dune system is the result of accumulation and subsequent distribution of beach sands of successive shorelines. The major factors influencing their formation are thought to be a series of marine transgressions and prevailing westerly winds (Murdoch, 1986).

The Park contains both Bassendean and Spearwood Dune Systems. The latter, nearer to the coast is the younger of the two. Both systems originated during the Pleistocene age.

In the Park, the interface between the two dune systems occurs along the eastern chain of wetlands which are formed in a depression between the two systems. According to Newman (1976) the depression at the eastern chain indicates an old coastline. It is therefore possible to say, in very general terms, that the eastern chain straddles two soil types – to the east Bassendean sand, and to the west Spearwood sand.

The Spearwood Dune System is split into two associations based on limestone formations. The eastern section (Karrakatta Association) is deep sand with little limestone. In the western section (Cottesloe Association) the limestone is more extensive and several outcrops are present. In many cases the limestone forms long ridges which run parallel to the coast. The western chain of wetlands lies in such a depression between two limestone ridges.

SOILS

The dune soils of the Swan Coastal Plain are aeolian and differ only in age and degree of leaching (Murdoch, 1988).

The soils of both the Spearwood and Bassendean Dune Systems are considered infertile. The Bassendean sand is highly leached grey quartz which is extremely infertile. Spearwood sand is not so highly leached and has a characteristic yellow colour due to the presence of iron. A small quantity of clay is also present which, together with the iron, creates some fertility (Newman, 1976).

Within the wetland areas soils have been modified by the addition of organic matter and finer grain sedimentary material. Generally, the eastern chain of wetlands comprises peaty clays and silts, and sandy silt, with variable clay content, formed over the western part of the Bassendean Sand and over quartz sand derived from the Tamala Limestone (Gozzard, 1983). In the western chain of wetlands deposits are partly calcareous silt with some fine sands in places, formed over sand derived from the Tamala Limestone (Gozzard 1983).

The wetland soils of Brownman Swamps and Lake Mount Brown are significant in that they are underlain by carbonate and dolomite muds and muddy sands. This is due to the different hydrological formation of the layers.

Additionally, Lake Coogee has a different soil base to the other wetlands. It has heavy clay deposits thought to have originated from a former estuary (at one stage a river outlet came through the limestone ridge at this point). The estuarine depression has remained as a lake (Newman, 1976).

LANDFORM

The landform surrounding both chains of wetlands is generally characterised by slightly undulating land with gentle slopes toward the wetland bodies.

There are areas of exception to this gently undulating landform, for example at Manning Lake and the Henderson Region. At Manning Lake the coastal component of the reserve has some steep slopes within a series of ridge and valley formations. This area is comprised of a superficial layer of limestone deposition over sand.

The Henderson Region is again steep in sections with outcrops of limestone and cliff faces present at the Henderson foreshore. The foreshore is typical of the coastal formations on Swan Coastal Plain where carbonate has been precipitated below surface geology to form layers and columns of hard, compact limestone. The carbonate has been deposited by percolating waters - hence the cliff formations. The cliffs are an important remnant expression of their type in the Perth Metropolitan Region. In fact, the entire landscape of the Henderson Region is important as it stands as an uncommon example of diversity of landforms and vegetation in the Spearwood Dunes from swale to ridge crest and from hinterland to coast (Semeniuk, 1997).

THREATS TO GEOMORPHOLOGY, SOILS AND LANDFORM

Three threats to the geomorphology, soil associations and landforms of the Park are:

1. erosion caused by uncontrolled access;
2. soil contaminants; and
3. mining.

Erosion

Erosion is a localised problem occurring at a number of upland and wetland areas within the Park where uncontrolled access is damaging vegetation.

Unrestricted vehicle, equestrian and pedestrian access has in the past created tracks and pathways in unsuitable locations, causing erosion of the surface by direct contact, but also opening the possibility of erosion by water runoff, where vegetation cover has been reduced. The level of erosion and disturbance caused by equestrian activities at Kogolup Lake is unacceptable and as such horse riding will be prohibited from Kogolup Lake. (see Section 32)

Uncontrolled access in the Park will be reduced by formalising and restricting access in areas at risk from erosion. Mt Brown and the dunes at Manning Lake are two areas particularly at risk from uncontrolled access and therefore erosion. Wind erosion has, in the past, caused problems at fire access tracks and cleared areas at these two sites.

Shoreline movement maps prepared by the former Department of Transport (1942 – 1994), now DPI indicate that there has been no coastal movement at the Henderson foreshore (M91 coastal reserve) over that period. Access to the cliffs has been better defined to limit the impact of pedestrians on the limestone cliffs.

Soil contaminants

Filling has occurred in the past in many of the wetlands in both the eastern and western chains. Of particular concern is the extensive sanitary landfill that has occurred on the western and southern sides of Bibra Lake and in several areas of the Market Garden Swamps (DPUD, 1992). A threat to the integrity of the wetlands is the leaching of contaminants within the landfill areas. Additionally, there may be possible health implications for Park visitors.

Mining and extraction of basic raw materials

Mining and the extraction of basic raw materials is also considered a threat to the landform of the Park. The Conservation Commission of Western Australia does not consider it an appropriate land use in the Park, hence there is a presumption against these activities. The processes to consider applications for mining or extraction of basic raw materials affecting the Park are outlined in Section 37.

Strategies

1. **Restrict access to areas at risk from erosion by implementing the Recreation Masterplan (Section 30) and providing signs and information (Sections 33 and 42) (CALM, CM, CC, TK, MU) [Ongoing]**

2. **Undertake soil studies when proposing works in areas affected by sanitary landfill to determine levels of contamination. (CC) [Ongoing]**

16 - The lakes and wetlands

The objective is to protect and conserve the lakes and wetlands of the Park.

WETLAND SYSTEM

The wetlands in Beeliar Regional Park are surface expressions of the groundwater and as such respond to events which cause variations to the quality and quantity of groundwater supply.

The water regimes of the Beeliar Wetlands respond to both natural processes such as rainfall and evaporation, and to modified landuses within catchment areas (e.g. urban and industrial development, and groundwater extraction). In order to protect the wetland ecosystems and maintain public amenity, the impacts of existing and proposed land uses and activities, which influence the wetlands' water regimes, need to be understood and managed.

It is important to note that the complex underlying stratigraphy of impervious and porous layers and perched water tables associated with some of the Beeliar Wetlands means that there may be significant departures from the so-called 'normal' hydrological patterns of wetlands on the Swan Coastal Plain.

The Eastern Chain
The eastern chain of wetlands has formed in a depression between two of the geomorphic elements of the Swan Coastal Plain – the Spearwood Dune System and the Bassendean Dune System. The wetlands in this chain are shallow, freshwater and are of a similar altitude (15 - 20m AHD) (Australian Height Datum is the height above mean sea level). Seasonal changes in lake water levels reflect fluctuations in the groundwater level (DPUD, 1992).

The wetland chain is located at the western edge of the Jandakot Groundwater Mound. There is a complex series of connections and groundwater flows vary between the wetlands. In general, however, groundwater flows to the eastern wetland chain in a westerly direction from the Jandakot Groundwater Mound, which is a source of water used to supplement Perth's water supply.

Of less importance is the north to south flow of groundwater within the chain. In reality it only occurs when there is significant rainfall in one area of the chain and not in another. The ground water will then move from one wetland to the other, as a balancing process.

Additionally, there is some groundwater movement from a relatively small catchment area to the west of the eastern chain. Again the extent of water movement is determined by weather patterns and rainfall. During high rainfall when the wetlands are full, there will only be a relatively slight flow from the west, however, this flow will increase when rainfall follows dry periods.

The Western Chain
The wetlands of the western chain, are only a partial surface expression of the groundwater and their water regimes are very different from the eastern chain.

The western chain is located in a depression between two limestone ridges within the Spearwood Dune System. The water in these lakes is more saline and the lakes occur at an altitude of approximately -0.22m to 1.8m AHD (DPUD, 1992).

Groundwater movement at the western chain is seasonal. During winter the groundwater flows from the east to the western chain, but in summer, a small groundwater mound develops to the west of Lake Coogee, and the groundwater flow is reversed. This groundwater movement influences the presence of a wedge of saline groundwater protruding eastward from the ocean. Additionally, excessive abstraction of groundwater in the summer draws the saltwater eastward and upward with the potential of bringing it in contact with the abstraction bores. The winter recharge of freshwater pushes the interface, between the saline and fresh water toward the coast.

The groundwater hydroperiod of the western Beeliar Wetlands has been found to be cyclical, with the annual rise and fall superimposed onto a longer term cycle of around 22 years, which has an amplitude of up to three times the annual rise and fall (Deeley and Page, 1997). It is likely that these types of complex cycles of annual and longer term rise and fall have been an important part of wetland hydrological cycles for hundreds of years and probably longer, and have undoubtedly influenced the formation and the maintenance of the various wetland vegetation communities.

THREATS TO WETLANDS

The Proposals for the Establishment, Administration and Use of Beeliar Regional Park (DPUD, 1992) identified a number of key threats to the condition and status of the wetlands in the Park. These were:

- Drainage, excavation and filling;
- Pollution including eutrophication;
- Water level changes;
- Salination;
- Aesthetic disruption (Section 24);
- Aquatic or declared weeds (Section 19); and
- Insect pest control (Section 21).

Additionally, other significant problems included new urban proposals in close vicinity to the wetlands, the potential effects of airborne pollutants from the Kwinana Industrial Area (DCE, 1982), wildfires, uncoordinated recreation activities, invasive wetland weed species and loss of riparian vegetation and the follow-on effect of reduced capacity to filter nutrients.

Many of the threats identified above are addressed in other sections of this Plan. The threats to be addressed in this section of the Plan are:

1. Drainage, excavation and filling;
2. Pollution including eutrophication;
3. Water level changes; and
4. Salination.

Drainage, excavation and filling

As discussed in Section 15, sanitary filling has occurred in the past in many of the wetlands in both the eastern and western chains and places constraints on their future management and use. The management of drainage, excavation and filling works (including de-watering activities) associated with urban and industrial development is an issue that has concerned the Park managers and the community in the past. It is important that there are no physical impacts, either during or post construction, to the lands or waters that comprise the Park from developments that adjoin the Park. This can be achieved by ensuring appropriate conditions are placed on the proponents of developments when planning and environmental approvals are being sought.

Pollution including eutrophication

Prior to European settlement, the Beeliar Wetlands would have been recharged only by rainfall and groundwater accession. The nutrient levels in the wetlands would therefore have been very low. The dark coloured waters of most wetlands would have supported very low levels of phytoplankton activity. Much of the wetland primary production would have been associated with the fringing wetland vegetation communities.

Today, however, stormwater runoff from rural, urban and industrial areas contains a range of pollutants including compounds of nitrogen and phosphorus, suspended solids, oils and other hydrocarbons, pesticides, heavy metals, litter and other gross pollutants. The levels of many of these pollutants in runoff are generally low, but the limited capacity of the wetlands to assimilate these pollutants is quickly exceeded.

With regard to the eutrophication of wetlands, highly nutrient-enriched wetlands are usually associated with regular blooms of blue-green algae. Most of the wetlands of the Park currently experience blooms of blue-green algae and many support nuisance populations of midges.

One of the major issues affecting the water quality of the Beeliar Wetlands is the use of fertilisers, pesticides and herbicides in private gardens and surrounding market gardens. The use of fertilisers, when viewed individually, may appear to be insignificant, however, when this effect is multiplied many times and occurs over an extended period, the issue becomes very serious. Implementing initiatives of integrated catchment management and providing community information regarding appropriate fertiliser use within catchment areas of the wetlands will help to reduce the nutrient inputs into the wetland system.

The feeding of water birds especially on the western edge of Bibra Lake has localised effects on water quality. Birds congregate in large numbers, uneaten food and faeces sink to the bottom of the lake and nutrient loading in the local area increases. Artificial feeding also has adverse effects on bird health and populations and will be discouraged (see Section 18).

The Water Corporation monitors water quality in Yangebup, Kogolup, Thomsons Lake and Market Garden Swamps Nos. 1 and 2 as an Environmental Condition for the development of the South Jandakot Drainage Scheme.

The Department of Environment conducts annual vegetation monitoring at North, Bibra, Kogolup, Thomsons and Banganup Lakes. Twice-yearly macro invertebrate and water quality monitoring occurs at Thomsons, Yangebup, Banganup and Kogolup Lakes, and annual waterbird monitoring occurs at Bibra, Yangebup, Thomsons, and Kogolup. The results of this monitoring are reported annually to the EPA.

The City of Melville has been undertaking twice-yearly water quality monitoring of Bluegum, Booragoon and Piney Lakes. Postgraduate research students have also collected data on inputs into Bluegum Lake and Piney Lake in the past.

The City of Cockburn has undertaken monthly (up to fortnightly) monitoring of water levels and water quality at North, Bibra, Yangebup, Coogee, Market Garden Swamp, Manning and Kogolup Lakes as part of their ongoing midge control program for the past three years.

Water level changes

As described by DPUD (1992) the management of the water balance of the wetlands is the most fundamental task facing the managing agencies of Beeliar Regional Park. The main factors involved are the variations in water table (caused by seasonal and long-term fluctuations in rainfall), inputs from developing urban areas which are likely to increase the water levels in the wetlands, and the effects on the water table of water abstraction from private and public bores on the Jandakot Mound.

The disposal of stormwater runoff into the wetlands has had a significant impact on the hydrological cycles in the wetlands. Importantly, changes to the cycle of water level rise and fall in the wetlands may influence the germination, survival and composition of particular wetland fringing vegetation associations. This will in turn alter the ecology and threaten the wildlife species which inhabit the wetland systems. Additionally, semi-aquatic fringe vegetation helps to maintain water quality by reducing the influx of nutrients through filtration and storage. A lack or reduction in important drying cycles may also affect the wetlands ability to assimilate nutrients. Conversely, extended periods of low water levels and excessive drying of the wetland may allow the encroachment of weeds into the wetland bed and may affect water quality through concentration of salts or by acidification of the wetland, as has occurred in some

wetland on the Gnangara Mound. This, in turn, has an adverse effect on wetland fauna.

In respect to managing water level changes in the eastern chain of wetlands, it is important to note that in 1988 the State Planning Commission resolved to rezone a substantial area of rural land east of Thomsons Lake to urban and urban-deferred in the Metropolitan Region Scheme. The EPA and Minister for the Environment agreed that the proposed rezoning could be implemented, subject to various conditions including the preparation of an overall drainage management plan for the new urban area and the Beeliar wetlands (DPUD, 1992).

The South Jandakot Drainage Management Plan was prepared in January 1990 and fulfilled that particular ministerial condition. The primary function of the South Jandakot Drainage Management Plan was to protect the Beeliar Wetlands from adverse impacts of urban stormwater drainage. As a secondary benefit, the plan provided a mechanism for managing water levels in the wetlands in accordance with the recommendations of the EPA and CALM. In effect, the South Jandakot Drainage Scheme diverts drainage water from these new urban areas away from Kogolup and Thomsons Lakes in order to maintain their levels and protect them from further nutrient loading. Diverted water is transported by the South Jandakot Brach Drain to Yangebup Lake where the maximum water level is controlled by pumping excess water to Cockburn Sound via the Woodman Point Waste Water Treatment Plant emergency outfall.

CALM, in consultation with the Water Corporation and Department of Environment, has initiated a water supplementation program at Thomsons Lake, to help ensure that water levels remain adequate for the protection of the reserve's Ramsar values and water bird habitat, and to enable the fledgling cygnets to survive at the lake until they are able to fly. The program commenced in spring 2004 in accordance with the *Water Supplementation Operational Management Plan for Thomsons Lake Nature Reserve* (CALM, 2004a). The plan outlines:

- procedures and responsibilities for reviewing water supplementation activities;
- water level and water quality monitoring requirements and the timing and duration of supplementation activities; and
- management procedures and agency responsibilities in relation to maintaining and manipulating drainage infrastructure.

The water supplementation program diverts water into Thomsons Lake from the Bartram Road Buffer Lakes, and includes the implementation of environmental controls and an appropriate monitoring regime. If supplementation is found to be having a significant adverse impact on the wetland ecosystem of the reserve, it will not be continued. However, should it be determined that the water supplementation program is not having a significant adverse impact on the wetland, CALM will determine the need for its implementation on an annual basis.

Together with the Water Corporation, the Department of Environment also monitors water levels in all of the wetlands in the Park with the exception of Piney Lakes, Branch Circus Wetlands and Brownman Swamps.

As part of the Jandakot Groundwater Scheme Stage II, the Minister for the Environment set statutory conditions for the Department of Environment regarding wetland monitoring for a number of wetlands across the Jandakot Groundwater Mound, under Section 46 of the *Environmental Protection Act 1986*. Environmental Water Provisions (EWPs) were also set which include a preferred minimum water level and an absolute minimum level. These levels apply to several wetlands within the Park, including Thomsons, Yangebup, Banganup, Kogolup, Bibra and North Lakes, with the aim of maintaining the historical water regimes and protecting wetland ecology.

These Ministerial conditions are currently under review, following breaches at a number of sites across the Jandakot Groundwater Mound. The breaches mainly occurred as a result of water extraction being excessive given the declining wetland water levels resulting from drier climatic conditions.

Climate variability, long-term groundwater level behaviour and abstraction management will be considered as part of the Section 46 review and, subsequently, a revised management program and water resource management plan will be prepared for the Jandakot Mound. For the protection and conservation of the Park's biodiversity values, it is critical that the minimum water levels set are sufficient for the lakes and wetlands to be self sustaining ecosystems and that these minimum water levels are not breached.

Through the implementation of other drainage operations, the Water Corporation also monitors the levels of Lake Coogee and Bibra Lake. Additionally, Market Garden Swamp No. 1 is proposed as a drainage compensation area with a maximum water level controlled by the Water Corporation via an ocean outfall.

Salination

Increasing salination is affecting the western chain of wetlands through changes to the hydrology of the area resulting from the removal of deep rooted native vegetation, water abstraction and irrigation in market gardening and urban areas (DPUD, 1992). As discussed earlier, excessive abstraction of groundwater in the summer, draws the saltwater eastward and upward with the potential of bringing it in contact with abstraction bores.

Although Lake Coogee is a naturally saline lake, other lakes in the western chain are freshwater. Increasing salinity can impose adverse changes if a wetland is a freshwater environment.

Integrated Catchment Management

Integrated catchment management is a process to help coordinate the management of factors affecting water quality on a whole of catchment basis.

Urban surface water runoff does pose an increasing risk to the wetlands of the Park. Integrated catchment management initiatives such as best management practices for stormwater, incorporating water-sensitive urban design principles, and provision of community

information regarding appropriate fertiliser, herbicide and pesticide use in urban areas close to the Park, will help reduce nutrients and other inputs into the wetland and groundwater systems. Integrated catchment management plans should be prepared and implemented for selected catchments affecting wetlands in the Park. The plans should consider land use planning and potential adverse environmental impacts on the Park, and in particular, the Park's wetlands. The plans should include environmental water provisions and performance indicators relating to water quality and wetland health.

WETLAND MONITORING

While regular monitoring of wetland water levels, water chemistry, flora and fauna does occur at most wetlands within the Park, existing monitoring programs span a number of State and local government agencies and provide incomplete coverage of all wetlands within the Park. There is currently no co-ordinated, comprehensive monitoring program for all wetlands within the Park.

The number of species of predatory invertebrates recorded at a wetland can be used as an indication of the state of the aquatic food chain (Rolls, Davis, Balla, and Bradley, 1990). An assessment of the health of the wetland ecosystems can be undertaken by considering higher taxonomic levels of invertebrates such as genus and family, rather than needing to identify individual species.

This type of assessment (rapid bio-assessment) means the costs of assessing wetland health are reduced and allows for the possible involvement of community or school groups in assessment. Davis and Christidis (1997) prepared *A Guide to Wetland Invertebrates of Southwestern Australia,* which provides appropriate taxonomic keys for assessment.

Given the concerns relating to the condition of the wetlands in the Park, the following indicators of wetland health will be included as performance indicators for proposed integrated catchment management plans for selected wetlands within the Park.

- the level of nutrients and chlorophyll-a concentrations;
- the presence of blue-green algae cells,
- the species diversity and structure of aquatic macro-invertebrates and avian communities.

ANZEC guidelines will be used in reviewing the above indicators of wetland health. Additionally, consideration will also be given to water quality indictors such as heavy metals and other toxicants found in stormwater. If these water quality indicators are used, ANZECC guidelines will be followed.

To reduce the cost of monitoring and to ensure a coordinated and consistent program, data from existing wetland monitoring programs operated by the Department of Environment and Water Corporation should be used where possible.

Strategies

1. **Encourage the local governments to prepare and implement integrated catchment management plans for selected catchments affecting the Park. The plans are to include environmental water provisions and performance indicators relating to water quality and wetland health. (CALM) [High]**

2. **Encourage the formation of community catchment groups for the Beeliar Wetlands. (CM, CC, TK, CALM, MU) [High]**

3. **Promote the implementation of wetland and water sensitive urban design techniques for developments within the catchments of the Park. (CM, CC, TK, CALM) [High]**

4. **Adopt management practices throughout the Park that do not add nutrients and pollutants to the wetland systems, e.g. planting, fertiliser and irrigation management practices based on minimal nutrient loss and irrigation run-off. (CALM, CM, CC, TK, MU) [Ongoing]**

5. **Provide interpretive material to the community:**
   - **outlining the effects of pollution on the wetlands;**
   - **appropriate use of fertilisers; and**
   - **discouraging the feeding of waterbirds.**

   (CALM, CM, CC, TK, MU) [Medium]

6. **Protect and re-establish wetland fringing vegetation in disturbed areas (Section 23). (CALM, CM, CC, TK, MU) [High]**

7. **Implement the water supplementation program at Thomsons Lake as required. (CALM) [Ongoing]**

8. **Liaise with the Department for Planning and Infrastructure and Department of Environment to ensure appropriate conditions are placed on proponents of developments that adjoin the Park to help ensure there are no adverse physical impacts, either during or post construction to the Park. (CALM, CM, CC, TK) [High]**

9. **Liaise with the Department of Environment and Department for Planning and Infrastructure to ensure that proposed developments surrounding the Park adhere to relevant groundwater allocation limits and that appropriate buffers are maintained between groundwater extraction points and wetlands. (CALM, CM, CC, TK) [Ongoing]**

10. **Liaise with the Department of Environment in relation to the setting and ongoing monitoring of revised Environmental Water Provisions for relevant wetlands in the Park. (CALM) [Ongoing]**

Key performance indicators for the lakes and wetlands
The success of the strategies will be measured by: 1. Changes in abundance, species diversity and structure of naturally-occurring aquatic macro-invertebrate populations. 2. Existence of integrated catchment management plans for selected catchments affecting the Park.
Target: 1. No decline in the abundance or diversity of naturally-occurring aquatic macro-invertebrate populations. 2. Approval of integrated catchment management plans.
Reporting: 1. Every 3 years. 2. Every 5 years.

(Note: monitoring needs to take into account natural variability.)

17 - Flora and vegetation

The objective is to protect, conserve and rehabilitate local flora species and vegetation communities in the Park.

Altered water regimes, disturbance and subsequent weed invasion have modified large areas of local vegetation in the Park. Many areas of the Park are becoming increasingly isolated due to a loss of surrounding native vegetation and increased development. Past uses, roads and infrastructure have fragmented the Park, and disturbances and continuing weed invasion are steadily degrading natural ecosystems. Pressure on the Park is also increasing from a variety of recreation pursuits.

As discussed by Keighery (1996), the flora of the Park has not been the subject of integrated studies. However, the compilation of a series of studies identifies 406 native taxa in the Park. This probably represents 85% of the area's flora, and this reflects a range and diversity of flora typical of the geomorphological units on which it occurs.

No species of Declared Rare Flora have been recorded in the Park, however over 20 taxa are considered to have special significance as they are uncommon or at the limits of the species' range, representing outlying populations of the taxa. Examples include Hackett's hopbush (*Dodonaea hackettiana*) and *Hibbertia spicata* sub-species *leptotheca.* For further information refer to Keighery (1996).

The vegetation of the Park can be broadly described in three units:

1. upland vegetation communities and assemblages;
2. wetland vegetation communities and assemblages; and
3. coastal vegetation communities and assemblages.

An outline of Park vegetation units is shown on Figure 5 (page 24). A description of the vegetation communities and assemblages present in the Park is contained in Appendix D.

UPLAND VEGETATION COMMUNITIES AND ASSEMBLAGES

Significant disturbances and other activities in the past such as agriculture, market gardening, drainage schemes, land filling and fire have removed much of the original upland vegetation within the Park. Upland areas of the Park are characterised by Low Woodlands and Open Forests of *Banksia* and *Eucalyptus* species (refer Appendix D).

There are six types of upland vegetation communities or assemblages present in the Park. The threats to these communities and assemblages are as follows:

- importation of soil into the Park;
- unplanned fire;
- weeds;
- threat of Phytophthora dieback and other diseases;
- urban interface issues and uncontrolled access by vehicles, pedestrians and horses.

Importation of soil into the Park
It is important that soil imported into the Park is free of Phytophthora dieback and weed seed, and is similar to the natural soil types of the area. Measures for the control of Phytophthora dieback and weeds are discussed below.

Unplanned fire
Increased urban development around the Park and greater visitor use of the Park are likely to increase the incidence of unplanned fire. Refer to Section 20 for the management of fire within the Park.

Weeds
Weeds are a major problem in the Park and require immediate action by the managing agencies. Measures (including the preparation of an integrated Weed Control and Rehabilitation Plan) for the control of weeds in the Park are discussed in Section 19.

Phytophthora Dieback
Phytophthora dieback, an oomycete or 'water mould', refers to the deadly plant disease caused by the pathogen *Phytophthora cinnamomi* and other related species. The disease is considered to be a significant threat to the Park given the existing upland plant communities in the Park contain a number of susceptible

species, for example jarrah, banksias and grasstrees (*Xanthorrhoea)*.

Limited sampling for Phytophthora has been undertaken in the Park. Sections of Yangebup, Kogolup and Thomsons Lakes were assessed for Phytophthora dieback as part of the construction of the Southern Lakes Drainage Scheme. The findings show that part of the north-eastern section of Thomsons Lake Nature Reserve is affected by dieback. The Jarrah-Banksia Woodland at Yangebup Lake shows some damage which could be by dieback, but no definite conclusion could be made without sampling. And at Kogolup Lake, the death of Jarrah-Banksia Woodland species along most edges indicates that dieback may be present, however, the area was too degraded to be assessed without sampling (Hart, Simpson and Associates, 1998).

A further survey for Phytophthora was undertaken at Thomsons Lake Nature Reserve in 2005, which identified three dieback-infested areas, all on the Bassendean dune system in the east and southeast parts of the reserve. A survey was also undertaken at Bibra Lake in 1999 with results indicting that there was no sign of the disease.

Phytophthora dieback could have an impact on revegetation programs in the Park if the species planted are vulnerable to the disease. The risk of impact from Phytophthora dieback can be reduced by modifying activities that spread the pathogen, or by controlling access to highly susceptible areas. Modifying activities may involve cleaning machinery, vehicles or footwear, scheduling activities for dry soil conditions, or using materials that are free of *Phytophthora cinnamomi.* Controlling access may involve track rationalisation, upgrading tracks, or restricting off-road and management vehicles access (Dieback Working Group, 2000).

Urban interface issues and uncontrolled access
Maintaining the integrity of bushland adjoining urban areas raises many issues such as weed invasion, uncontrolled access, and rubbish dumping. These issues are addressed in Sections 19, 32 and 38 respectively.

The inappropriate clearing of vegetation and willful damage to vegetation in upland areas has been a problem in the past. Native flora is protected by the *Wildlife Conservation Act 1950* and the *Environmental Protection Act 1986 - Environmental Protection (Clearing of Native Vegetation) Regulations 2004.* Any incidences of willful damage to vegetation in the Park will be investigated and appropriate action taken.

WETLAND VEGETATION COMMUNITIES AND ASSEMBLAGES

Much of the Park's wetland vegetation is recognised as having high conservation value and is representative of the area's natural vegetation associations.

The wetland vegetation has evolved and is influenced by features such as the water levels, salinity of the wetlands and lakes, as well as the differing soil types and geomorphic features, for example, it would appear that the flooded gum *(Eucalyptus rudis)* and the paperbark *(Melaleuca preissiana)* are present in the eastern chain but not in the western chain, due to the greater presence of limestone and the saline water in the west.

The threats to wetland vegetation in the Park include uncontrolled access, weed invasion, and unplanned fire. Additionally, the management of water levels and water quality is a key issue in the context of conserving the natural processes associated with the wetlands (Section 16).

COASTAL VEGETATION COMMUNITIES AND ASSEMBLAGES

As with the Park's wetland vegetation, the coastal vegetation is recognised as having high conservation value and is representative of the area's natural vegetation associations.

At the Henderson foreshore (System Six M91coastal reserve) and Manning Lake where coastal limestone is present, soils are shallow and this, combined with exposure to salt laden winds, produces a very different plant regime from that elsewhere in the Park. In the coastal environment, the vegetation is susceptible to the pressures of close urban development. Hence the issues to be addressed include uncontrolled access, disease (such as *Armillaria luteobubalina*), weed invasion and unplanned fire.

Honey Fungus (*Armillaria luteobubalina*)
In comparison to Phytophthora dieback, *Armillaria* occurs on the coast (coastal dunes and on the Spearwood Dune System) and rarely occurs on the Bassendean Dune system. *Armillaria* kills up to 40% of coastal species including many of the dominant small trees and shrubs (Shearer and Dillon, 1996) impacting on both the structure and composition of coastal dune vegetation. The disease results in open disease centres composed mainly of sedges or small shrubs and creepers with more bare ground than nearby healthy vegetation.

Although *Armillaria* occurs naturally in the south-west of Western Australia, its normal slow rate of spread by direct root contact may be exacerbated by the movement of infected root material associated with track construction and maintenance. The characteristic fruiting bodies generally grow in clumps on tree bases, stumps or roots, and appear in June/July each year. There are no known controls for the disease, except clearing the site. *Armillaria* is present in the Spearwood dune systems at Thomsons Lake Nature Reserve.

Strategies

1. **Prepare and implement a weed control and rehabilitation plan. The plan will include principles and priorities for weed control and rehabilitation works as well as a basis for monitoring selected local species. (Section 19). (CALM) [High]**

2. **Reduce the impact of wildfire, utilising the strategies set out in Section 20. (CALM, CM, CC, TK, MU) [Ongoing]**

3. **Investigate any wilful damage to vegetation in the Park and take appropriate action. (CALM, CM, CC, TK, MU) [Ongoing]**

4. **Provide information and interpretive material which:**
   - **promotes an understanding and appreciation of the Park's flora and vegetation; and**
   - **encourages the planting of local flora species in areas surrounding the Park (Section 42).**

   (CALM, CM, CC, TK, MU) [Ongoing]

5. **Investigate the presence of plant diseases prior to undertaking capital works in the park. If plant diseases are present review access requirements. (CALM, CM, CC, TK, MU) [Ongoing]**

6. **Reduce the risk of introducing and spreading plant diseases by modifying activities or controlling access to areas with susceptible vegetation. (CALM, CM, CC, TK, MU) [Ongoing]**

7. **Ensure local species are used for landscape and amenity plantings within the Park. If non-local species are required, non-invasive species are to be used. (CALM, CM, CC, TK, MU) [Medium]**

Key performance indicators for flora and vegetation
The success of the strategies will be measured by: 1. Changes in the abundance of selected local wetland flora species. 2. Changes in the occurrence of *Phytophthora cinnamomi* infections at Thomsons Lake Nature Reserve. 3. Existence of a weed control and rehabilitation plan.
Target: 1. No decline in the abundance of selected local wetland flora species. 2. No new human-assisted occurrences of *Phytophthora cinnamomi* at Thomsons Lake Nature Reserve. 3. Approval of a weed control and rehabilitation plan.
Reporting: 1. Every 3 years. 2. Every 3 years. 3. Every 5 years

(Note: monitoring needs to take into account natural variability.)

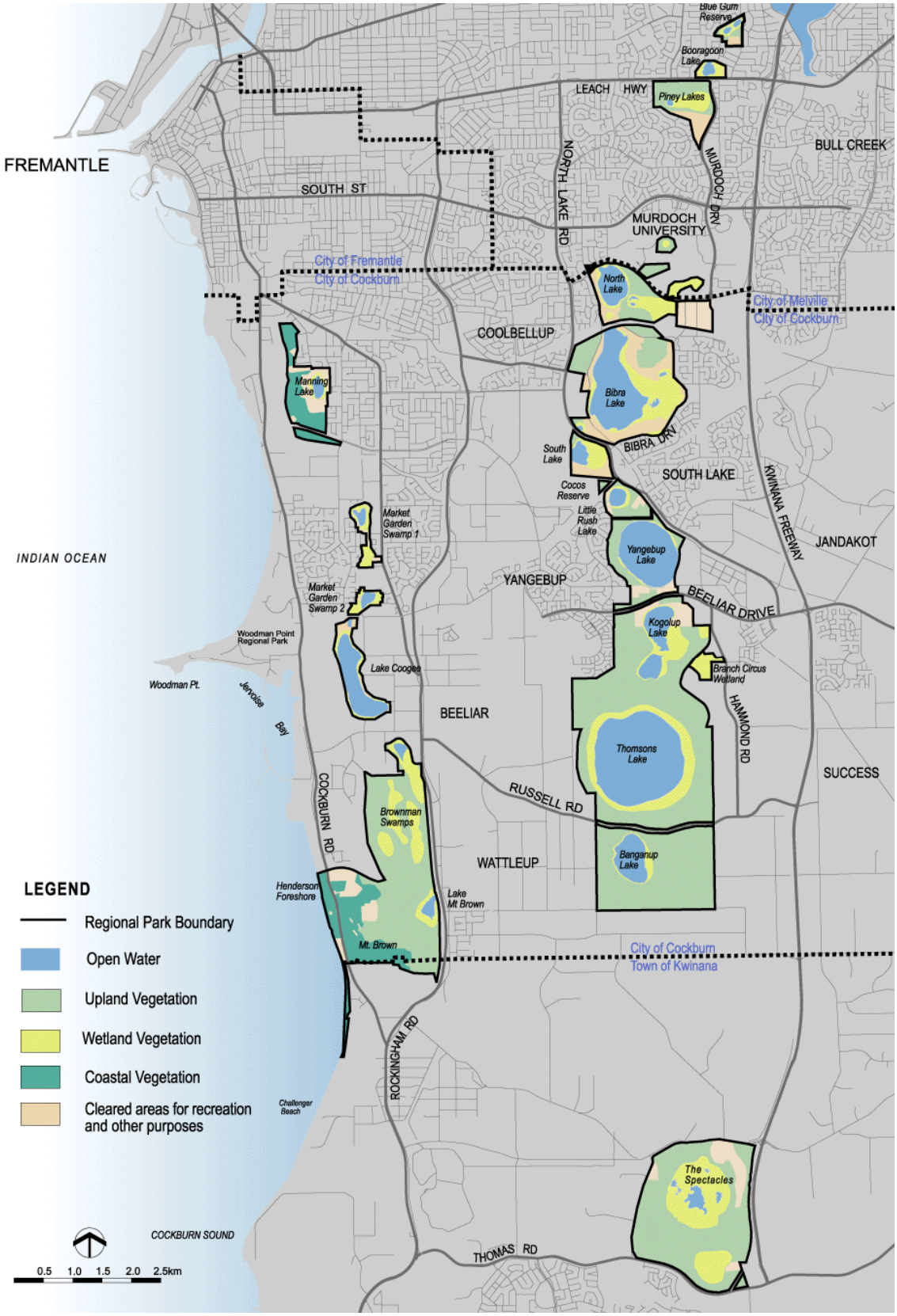


Figure 5 - Park vegetation

18 - Fauna

The objective is to protect and conserve naturally-occurring fauna species in the Park, particularly threatened and priority species.

Conservation of native fauna and their habitats is one of the primary reasons for establishing Beeliar Regional Park. The Park provides refuge for an abundance of birds as well as shelter and habitat for many reptiles, marsupials, amphibians and insects.

AVIAN FAUNA

The Beeliar Wetlands serve as an important breeding ground and summer refuge for a diverse bird population, some of which are trans-equatorial migratory wading birds. When shallow inland breeding grounds begin to dry out in spring and summer, large concentrations of birds have been recorded at the wetlands in the Park.

The Park's upland and coastal areas provide habitat for a diversity of bush birds. The distribution of bush birds in the Park is determined by the presence of food, the structural diversity of vegetation and the proximity of developed land. The structural diversity of the vegetation determines the range of suitable habitats available for birds. A high structural diversity provides a range of different habitats and hence a diverse range of species (Newman, 1976).

An abundance of bird species (e.g. North Lake - 123, Bibra Lake - 112 and Thomsons Lake - 105) have been recorded in the Park (Government of Western Australia 2000). The Blue-billed Duck (*Oxyura australis*), Musk Duck (*Biziura lobata*), Hardhead (*Aythya australis*) and Pink-eared Duck (*Malacorhynchus membranaceus*) as well as Dusky Moorhen (*Gallinula tenebrosa*) and Australasian Shoveler (*Anas rhynchotis)* and Freckled Duck (*Strictonetta naevosa*) have all been recorded in the Park. An extensive list of bird species recorded in the Park is available from Birds Australia (1996).

A number of migratory birds listed under the Japan-Australia Migratory Birds Agreement (JAMBA) and the China-Australia Migratory Birds Agreement (CAMBA) have been recorded at the Park. Australia is a signatory to these two international agreements which support the conservation of migratory birds and their habitats. The intent of the JAMBA and CAMBA migratory bird agreements will be applied in the management of the Park.

Thomsons Lake in conjunction with Forrestdale Lake is listed as a Ramsar site. The Ramsar Convention identifies wetlands of international importance and provides a framework for international cooperation in the conservation and wise use of the wetlands.

Three species of birds recorded in the Park, the Australasian Bittern (*Botaurus poiciloptilus*), Carnaby's Cockatoo (*Calyptorhynchus latirostris*) and Peregrine Falcon (*Falco peregrinus*) are listed as specially protected under the *Wildlife Conservation Act 1950.*

Cygnets at Thomsons Lake

Declining groundwater levels have resulted in Thomsons Lake drying out prematurely over the past few years. This has resulted in fledgling cygnets, which have not matured to a stage where they can fly, being trapped inside the vermin-proof fence whilst trying to find alternative water sources. A water supplementation program should help to alleviate this problem by diverting stormwater into the lake during winter so that additional water is present in November and December (see Section 16). This will allow the cygnets to mature to a stage where they can fly to other water bodies as Thomsons Lake dries.

Should there still be insufficient water in the lake, CALM has prepared a cygnet management plan, whereby the vermin proof fence around Thomsons Lake (particularly the northern boundary) will be monitored in spring and early summer. If cygnets are present at the fence, a management gate will be opened, allowing safe passage for the fledgling cygnets to access Kogolup Lake.

TERRESTRIAL AND AQUATIC FAUNA

Reptiles and Amphibians

At least 52 native species of reptiles and amphibians have been recorded or are expected to occur in wetlands affected by the Jandakot Groundwater Mound (Water Authority of Western Australia, 1991). Notably, these include the Lined Skink (*Lerista lineata*) and the Western Blue Tongue Skink (*Tiliqua occipitalis*) which is declining in the metropolitan area (Murdoch University, 1986).

Seven frog species have been recorded in the Park. These occur in both the upland and wetland areas of the Park and are the Moaning Frog (*Helioporous eyrei*), Sandplain Froglet (*Crinia insignifera*), *Crinia georgiana*, Western Bell Frog (*Litoria moorei*), Slender Tree Frog (*Litoria adelaidensis*), Pobblebonk Frog (*Limnodynastes dorsalis*) and the Turtle Frog (*Myobatrachus gouldii*) [Ecoscape (1995), Jaensch (1992) and Lynch (1995)].

Several species of lizards including three species of pygopod, two species of goanna and one species each of dragon, gecko and blind snake are thought to inhabit the Park. One species of tortoise, the Oblong Tortoise (*Chelodina oblonga*) is present in the Park (Ecoscape, 1995).

The Dugite (*Pseudonga affinis*), the Western Tiger Snake (*Notechis scutatus occidentalis*), as well as the Bandy Bandy Snake (*Vermicella bertholdi*) have been recorded in the Park (Ecoscape, 1995).

The Western Tiger Snake which is found within the Park is now considered uncommon in the metropolitan area and is an important species in the Beeliar Wetlands ecosystem. The presence of this species within the Park is important in conservation and evolutionary terms, and should be included in education programs and interpretive material to help develop an appreciation for wildlife. It is also acknowledged that the presence of the Western Tiger Snake, which is venomous, is a concern to some Park visitors and local residents. It is therefore proposed to provide contact details, within the Park, of wildlife carers and organisations that relocate injured or dangerous fauna.

Mammals
Mammal species recorded in the Park include the Quenda or Southern Brown Bandicoot (*Isoodon obesulus fusciventer)*. Other native mammals known to occur in sections of the Park, particularly Thomsons Lake and Banganup Lake include the Western Grey Kangaroo (*Macropus fuliginosus*), the Western Brush Wallaby (*Macropus irma*), the Brush-tailed Possum (*Trichosurus vulpecula*), native Rakali or Water Rat (*Hydromys chrysogaster)* and the Echidna (*Tachyglossus aculeatus*).

The Swan Coastal Plain has nine species of insectivorous bats some of which are likely to use the Park for occasional foraging, if not as a permanent home. The White Striped Mastiff Bat (*Tadarida australis)* and the Chocolate Wattled Bat (*Chalinolobus morio*) have been recorded in the Park (Ecoscape, 1995).

Fish
The native Swan River Goby (*Pseudogobius olorum*), the introduced Mosquito Fish *(Gambusia holbrooki)* and European Carp (*Cyprinus carpio*) are present within the wetlands of the Park.

Invertebrates
Aquatic and terrestrial invertebrates such as water fleas (*Daphnia*), midges (chironomid), the freshwater shrimp (*Palaemonetes australis*), and the gilgie (*Cherax quinquecarinatus*) represent a significant and important component of the wetland food web and are the major food sources for many species such as waterbirds and tortoises (Murdoch, 1994).

Monitoring of invertebrates within the Park (e.g. Yangebup, Little Rush, Kogolup, and Thomsons Lakes and The Spectacles) has shown that a large diversity of species exists. This is important as the number of species of predatory invertebrates recorded at a wetland can be used as an indication of the state of the aquatic food chain (Rolls *et al*. 1990). Moreover, reductions in invertebrate species diversity, or changes in the presence or absence of particular groups of organisms has been shown to reflect a deterioration of the overall wetland environmental quality (WAWA 1991)(see Section 16). It is for this reason that the presence of aquatic macro-invertebrates has been assigned a Key Performance Indicator (for Section 16 - Lakes and Wetlands) in the Park.

THREATS TO FAUNA

The main threats to fauna within the Park are:
- the loss and fragmentation of habitat;
- invasion of weeds (Section 19);
- changing water levels and water quality (Section 16);
- Phytophthora dieback (Section 17);
- competition and predation by problem animals and pets (Section 22);
- inappropriate recreation activities (Section 31);
- the loss of native habitat surrounding the Park; and
- death or injury of native fauna on surrounding transportation corridors is also an important management issue.

Given the above threats, it is likely that fauna populations in the Park have declined and will continue to decline. In order to maintain the diversity of fauna species in the Park it may therefore be necessary to reintroduce native wildlife into the Park or create perching sites for avian fauna within some wetlands.

Greenway corridors and other links between and within the Park, to adjoining areas of ecological significance are also important in helping to maintain the diversity and vigour of the Park's ecological systems (Section 25).

Strategies
1. **In consultation with the Conservation Commission, prepare and implement a program for fauna management within the Park. The program will:**
   - **establish baseline information for selected fauna monitoring;**
   - **specify appropriate management actions for fauna and habitat protection;**
   - **consider ways to minimise fauna deaths on roads adjoining the Park; and**
   - **consider the reintroduction of appropriate native wildlife into the Park. (CALM) [High]**

2. **Identify seasonal mowing areas and areas not to be mown to preserve bird, reptilian, marsupial and other fauna habitat and breeding sites. (CALM, CM, CC, TK, MU) [High]**

3. **Ensure the management of water levels and water quality in the Park takes into consideration waterbird and other fauna habitats (particularly at the Ramsar site of Thomsons Lake) and reflects historical regimes of inundation. (CALM, DoE, Water Corporation) [High]**

4. **Implement the cygnet management plan at Thomsons Lake to provide safe passage for fledgling cygnets to access Kogolup Lake. (CALM) [Ongoing]**

5. **Provide interpretive material which:**
   - **promotes an understanding and appreciation of the Park's fauna;**
   - **discourages the artificial feeding of birds;**
   - **informs visitors about the effects of dumping 'introduced' animals and fish in the wetland systems;**
   - **supports volunteer groups involved with the Park; and**
   - **informs the public about the adverse impacts of feral animals and domestic pets on native fauna in the Park (Section 42).**

   (CALM, CM, CC, TK, MU) [High]

6. **Ensure recreation uses are consistent with the protection and management of fauna and their habitat (e.g. dog exercising). (CALM, CM, CC, TK, MU) [Ongoing]**

7. **Provide the contact details of wildlife carers for the relocation of injured or dangerous fauna where they constitute a significant risk to people. (CALM, CM, CC, TK, MU) [Medium]**

8. **Promote the survey and study of fauna in the Park. (CALM, CM, CC, TK, MU) [Ongoing]**

Key performance indicators for fauna
The success of these strategies will be measured by: 1. Changes in species diversity of selected groups of naturally-occurring fauna. 2. Changes in the abundance of selected groups of naturally-occurring fauna species. 3. Existence of a fauna management program.
Target: 1. No decline in species diversity of selected groups of naturally-occurring fauna. 2. No decline in the abundance of selected groups of naturally-occurring species. 3. Approval of a fauna management program.
Reporting: 1. Every 3 years. 2. Every 3 years. 3. Every 5 years

(Note: monitoring needs to take into account natural variability.)

19 - Weeds

The objective is to minimise the impact of environmental weeds on the local plant species and communities in the Park.

Environmental weeds have been defined as plants that establish themselves in natural ecosystems (marine, aquatic and terrestrial) and proceed to modify natural processes, usually adversely, resulting in the decline of the communities they invade (CALM, 1999). Weeds may originate from interstate or overseas and may or may not be declared under the *Agriculture and Related Resources Protection Act 1976*.

The presence of weeds is a major problem within the Park. The area occupied by weeds continues to grow and in some areas, unless they are controlled, they will lead to the eventual demise of the local vegetation.

The invasion of weeds is a major threat to the conservation values of the Park and it is vital that measures are introduced to limit or control the degradation processes. There are many reasons for the presence of weeds in the Park including:

- past land uses such as clearing and developing pasture for grazing;
- soil disturbance from vehicle access;
- construction of paths and other facilities or drainage channels which allow weeds to establish;
- frequent wildfires which promote the growth of weeds;
- drainage outlets that carry storm water from adjoining areas and promote the spread of weeds in wetland areas
- the dumping of garden refuse which introduces many plants that vigorously compete with local vegetation;
- invasive species from adjoining gardens;
- increased nutrient levels;
- transportation of weed seeds by birds; and
- grasses planted for amenity purposes in parkland settings invading bushland areas.

Weeds appear to be spreading and are impacting on most native ecosystems in the Park. In particular Veld Grass (*Ehrharta calycina*) is impacting on many of the upland areas within the Park where some sections of the understorey have been largely replaced by the weed. Other major weeds in upland areas include Blackberry

(Rubus fruticosus), Cape Tulip (*Homeria miniata*), Castor Oil (*Ricinus communis*), Bridal Creeper (*Asparagus asparagoides*), Victorian Tea Tree (*Leptospermum laevigatum*), Pampas Grass (*Cortaderia selloana*) as well as figs *(Ficus spp.)* and thistle species (*Cirsium spp.)*.

At present there are a number of declared weeds within the upland areas of the Park. These include Apple of Sodom (*Solanum linnaeanum*), Arum lily (*Zantedeschia aethiopica*), one leaf and two leaf Cape tulip (*Moraea flaccida* and *Moraea miniata* respectively), narrow leaf Cotton bush (*Gomphocarpus fruticosus*), Paterson's Curse (*Echium plantagineum*) and Variegated thistle (*Silybum marianum*).

With regard to the wetland areas of the Park, couch, buffalo and kikuyu grasses are impacting on the local wetland fringe vegetation and Bulrush (*Typha orientalis*) is invading the emergent native vegetation. Additionally, Arum Lily, Watsonia (*Watsonia bulbillifera*) and Papyrus *(Cyperus papyrus)* have potential to significantly impact on the wetland areas. Two declared species of weed, Water Hyacinth (*Eichhornia crassipes*) and Salvinia (*Salvinia molesta)* have been recorded in the Park and pose a significant risk to wetlands areas.

WEED MANAGEMENT

All methods of weed control (chemical, physical, or biological) need to be considered for their appropriateness in the Park. Some forms of weed control may have negative side-effects on native plants, animals or habitats, which may prevent their application. There are also financial constraints on the amount of weed control that can be carried out.

Planning for weed control will consider the following priorities:

- recognition of weed potential (invasiveness, distribution and environmental impact);
- maintaining areas of the Park that have vegetation in good condition; and
- controlling weeds impacting on threatened species and communities.

Guidance for weed management in the Park is provided by *A Weed Plan for Western Australia* (State Weed Plan Steering Group, 2001), the *Environmental Weed Strategy for Western Australia* (Department of Conservation and Land Management, 1999) and CALM's proposed *Environmental Weed Management Policy* (subject to final consultation). It is recognised, however, that more detailed planning is required to develop an integrated and coordinated approach to weed management in the Park.

Bulrush *(Typha orientalis)*

As with many of the wetlands on the Swan Coastal Plain, the non-local bulrush *(Typha orientalis)* is impacting on native ecosystems in the Park. This species is an aggressive coloniser, especially following disturbance, often to the detriment of various local reeds including *Typha domingensis*.

Typha orientalis does however, perform a number of valuable functions. It provides shelter, nesting sites and is a food source for some avifauna and other wildlife. It also performs a nutrient stripping function, although its nutrient stripping capability is generally inferior to local species that grow in the same environment and are less seasonal in their growth cycle (Regeneration Technology, 2002).

Controlling *Typha orientalis* can be demanding on management resources, particularly where it has spread over substantial areas. The control of *Typha orientalis* should target areas that will maximise the benefits of its removal. Its removal needs to be coordinated with the planting or revegetation works, and staged to provide realistic control areas and to help maintain fauna habitat. Creating shaded areas through revegetation and planting will assist in limiting the spread of *Typha orientalis*. An emphasis should be placed on defining practical areas for removal such as discrete wetland areas or drainage sumps (Regeneration Technology, 2002).

Typha orientalis rapidly invades and can block newly constructed or cleared drains thus causing maintenance problems. Maintenance program should focus on the rapid colonisation of *Typha orientalis* in disturbed areas around drainage outfalls and viewing platforms.

There are significant rush beds within the Park that are currently largely weed free or have a low incidence of *Typha orientalis*. These areas have very high nature conservation values. It is important that largely weed free areas are identified, maintained and expanded.

Community involvement

Weed control can greatly benefit from community involvement. The involvement of the community in volunteer works is critical to the successful implementation of this Plan. The managing agencies have limited resources and weed control can be very labour intensive. The managing agencies acknowledge the considerable efforts by the community in undertaking weed control works within the Park. Volunteer groups have completed weed control projects successfully for many years.

Members of the community are encouraged to be involved in weed control programs by establishing or joining community volunteer groups operating within the Park and participating in activities organised by the managing agencies.

Strategies

1. Develop and implement a weed control plan in accordance with the *Weed Plan for Western Australia*, *Environmental Weed Strategy for Western Australia* and CALM's proposed *Environmental Weed Management Policy*. The plan will:

- **assess bushland condition;**
- **assess changes to vegetation communities;**
- **prioritise weed species according to invasiveness, distribution and environmental impacts; and**
- **integrate with the rehabilitation plan (Section 23).**

(CALM, Conservation Commission) [High]

2. **Liaise with the Water Corporation and relevant local governments to undertake weed control in drains that flow into the Park. (CALM) [Ongoing]**

3. **Set boundaries for grass areas used for recreation and control the spread of grasses outside these areas. (CALM, CM, CC, TK, MU) [High]**

4. **Use interpretive and educational material to inform visitors and neighbours about:**
   - **the effects of dumping rubbish and garden refuse in the Park. Neighbours will be informed that dumping aquarium contents in the local drainage system may lead to the proliferation of aquatic weed problems; and**
   - **invasive plants that pose a threat to the biodiversity of the Park.**

   (CALM, CM, CC, TK, MU) [High]

5. **Encourage and support the community in becoming involved with weed control in the Park. (CALM, CM, CC, TK, MU) [Ongoing]**

Key performance indicators for weeds
The success of these strategies will be measured by: 1. Changes in populations of high priority weeds as identified in the *Environmental Weeds Strategy for Western Australia.* 2. Changes in the abundance and distribution of priority environmental weeds (to be determined through a weed control and rehabilitation plan for the Park. 3. Existence of a weed control and rehabilitation plan.
Target: 1. No new populations of weed species rated high in the *Environmental Weeds Strategy for Western Australia.* 2. No increase in the abundance and distribution of priority environmental weeds. 3. Approval of a weed control and rehabilitation plan.
Reporting: 1. Every 3 years. 2. Every 3 years. 3. Every 5 years.

20 - Fire

The objective is to manage fire to protect and promote the conservation of biodiversity and natural values whilst also providing for the protection of human life and community assets.

Wildfire is a significant threat within Beeliar Regional Park. Large areas of local upland vegetation and infestations of bulrush (*Typha orientalis*) in wetland areas constitute a fire hazard. Fires in bulrush are difficult to control and can cause damage to fringing paperbark vegetation.

Increasing urbanisation and visitor use of the Park is likely to increase the incidence of unplanned fire, as is experienced in other bushland areas in the Perth metropolitan area.

Wildfires need to be avoided in the Park because they can threaten human life, property and natural and cultural values. Frequent wild fires in wetland areas will prevent the establishment of fringing paperbark vegetation and lead to an even greater dominance of non-local bulrush. Fire activity encourages the invasion of bulrush in wetland areas because it regenerates far quicker than other local rush species. Bulrush is highly flammable in late summer and early autumn when most of the mature leaves have died. If a fire occurs during this period permanent damage to the plants is minimal, as they are dormant.

Pre-suppression works will include maintenance of strategic fire access tracks. Fire access tracks are traditionally ploughed or graded, although in some areas the use of alternatives such as herbicide application, slashing or mowing or the use of permanent hard stand paths are viable alternatives. These alternatives can reduce erosion, weed infestation, creation of windrows and be more aesthetically pleasing.

The number of wildfires that occur in the Park needs to be reduced and those fires need to be quickly controlled. Fire suppression in the Park is the joint responsibility of the Fire and Emergency Service Authority (FESA) and the relevant local government bush fire brigade. FESA is responsible for fire suppression in the gazetted fire district, while outside the gazetted fire district, local government brigades undertake fire suppression activities in liaison with the managing agencies of the reserve.

The Fire Incident Controller is responsible for initiating post fire recovery strategies. Pre-suppression works and post-suppression follow-up works are the land managers' responsibility. When managing fire, CALM is guided by the *Bushfires Act 1954* and *CALM Policy Statement No.19 - Fire Management.*

An important consideration in pre-suppression works and post-suppression follow-up works should be the protection of environmentally sensitive areas. Measures should be initiated to help ensure the spread of plant diseases and weeds is minimised.

A Fire Response Plan has been developed by CALM in conjunction with FESA and the relevant local governments to help ensure effective response to wildfire by the responsible agencies and outlines practices such as:

- fire control actions and strategies that protect environmentally sensitive areas from wildfire;
- undertaking pre-suppression activities including reducing fuel loads by mowing or slashing large open grassed areas. Mown or slashed areas should be delineated so that mowing practices do not adversely affect natural regeneration and fauna habitat;
- maintaining a fire record system of all fires in the Park including date and cause; and
- ensuring an effective network of fire access tracks is maintained.

If selected prescribed burning is being considered for the Park, further consultation will occur with the Conservation Commission, the relevant local government and other stakeholders.

Strategies

1. **Implement and periodically update the Park's Fire Response Plan. (CALM, CM, CC, TK, MU) [High]**

2. **Co-ordinate weed control and rehabilitation works with fire prevention requirements. (Section 20). (CALM, CM, CC, TK, MU) [High]**

3. **Initiate measures in pre-suppression works and post-suppression follow-up works to minimise the spread of plant diseases and weeds in the Park. (CALM, CM, CC, TK, MU) [High]**

4. **Ensure that recreation planning takes into account fire prevention requirements. For example when constructing or upgrading paths in the Park consider building them to a standard that will carry fire control vehicles, so that access is improved for fire management (Section 31). (CALM, CM, CC, TK, MU) [Ongoing]**

21 - Mosquito and midge control

The objective is to minimise the adverse effects of mosquito and midge populations on the community in a manner that has least environmental and social impacts.

MOSQUITOES

Wetlands in urban areas often require a management response to mosquito populations. Mosquitoes are present in the Park and may cause a nuisance to nearby residences and are a public health risk as some species have the potential to transmit diseases such as Ross River Virus.

The Department of Health administers a mosquito control program. This program subsidises Contiguous Local Authority Groups (CLAGs) in areas that have been identified as having locally contracted mosquito-borne viruses, to control mosquitoes and protect from viruses. The local governments of Melville, Cockburn and Kwinana would therefore have to demonstrate known cases of locally contracted mosquito borne disease before qualifying for this assistance. It is the responsibility of the local governments of Melville, Cockburn and Kwinana to manage mosquitos at Beeliar Regional Park.

MIDGES

The Beeliar Wetlands support large numbers of non-biting midges (*Chironomid* spp.), which at times are a nuisance to local residents and visitors to the Park.

Research undertaken by Pinder, Trayler and Davis, (1991) indicates that high midge densities occur as a response to wetland nutrient enrichment and that midge problems are a symptom of a disturbed system and an effect of poor water quality. Given there are nutrient enrichment problems within the Beeliar Wetlands, it can be expected that that midges will continue to be a problem in the Park.

Poor water quality (nutrient enrichment) can be attributed to factors such as excessive nutrient use occurring throughout the many catchments of the Beeliar Wetlands (Section 16).

The nutrient load into the Beeliar Wetlands needs to be substantially reduced to improve water quality within the wetlands, which in turn should make them less able to support high midge densities.

The eutrophication of wetland environments provides conditions that allow midge numbers to proliferate and often adversely affect other invertebrates. Natural predators are limited and the midge population increases as it feeds on the algal blooms that are caused by the eutrophication of the lakes.

The current problem areas in the Park are centred around North Lake, Bibra Lake and Yangebup Lake although there is also the potential for other areas including Lake Coogee to be affected.

The City of Cockburn has developed an Integrated Midge Control Strategy, which is designed to provide

both short and long-term solutions to midge control. The long-term solutions are aimed at reducing the major causes of wetland degradation. This is to be achieved through integrated catchment management. In the short-term solutions are aimed at providing the residents of the City with some protection by the monitored application of targeted spraying.

The community can also play a significant role in establishing rehabilitation programs and assisting in water sampling of the wetlands. It is hoped that with the involvement of the community at this level, an education program can be developed within the community to control the use of phosphorus-based products such as fertilisers.

Planning agencies such as the Department for Planning and Infrastructure and local governments should also ensure that the Metropolitan Region Scheme and local town planning schemes afford appropriate vegetation buffers around lakes and wetland areas of the Park. Buffers are important as they help minimise the impacts of midges on nearby residents.

The City of Cockburn has also established a Midge Research Group in association with Murdoch University. The Group directs midge control research on the Swan Coastal Plain. CALM also supports these research initiatives to help control midges.

Strategies

1. **Continue to monitor mosquitoes at relevant times of the year and undertake appropriate control practices in accordance with relevant standards. (CM, CC, TK) [Ongoing]**

2. **Apply the principles of the Integrated Midge Control Strategy developed by the City of Cockburn for midge management across all Park areas. (CM, CC, TK, CALM, MU) [High]**

3. **Prepare and implement integrated catchment management plans for the catchments of the Beeliar Wetlands. The plans should aim to reduce the sources of nutrients entering the wetlands, thereby reducing the presence of midge swarms (Section 16). (CM, CC, TK, CALM, MU) [High]**

4. **Liaise with the Department for Planning and Infrastructure and Department of Environment to ensure urban and industrial developments within close proximity to the Park have adequate buffers. (CM, CC, TK, CALM) [Ongoing]**

5. **Do not use phosphorus-based fertilisers on grassed areas within the Park. (Section 16). (CALM, CM, CC, TK, MU) [High]**

22 - Pets and problem animals

The objective is to minimise the environmental and social impacts of pets and problem animals in the Park.

PETS

Pets such as dogs, cats and horses are impacting on the natural environment within the Park.

Domestic animals are generally not permitted in national parks, conservation parks and nature reserves, however provisions can be made to allow domestic animals in certain designated areas of national parks and conservation parks if they are under control and managed. Domestic animals are not permitted in nature reserves.

Cats

Domestic cats hunt for birds, reptiles, and other animals within the Park. Cat owners should be encouraged to keep their cats at home, especially at night and have them de-sexed to help control feral populations.

The local governments of Melville, Cockburn and Kwinana should consider the introduction of local laws for controlling cats. The City of Stirling has introduced *The Keeping and Control of Cats Local Law (1999)*. The objectives of the Law are to:

(a) control the number of cats kept on premises; and
(b) protect native fauna.

The Keeping and Control of Cats Local Law (1999) enables Stirling City Council to declare:

- A Cat Prohibited Area by designating areas where cats are prohibited from entering or remaining; and
- A Fauna Protection Buffer Zone, which is land extending 200m from the boundary of a Cat Prohibited Area and includes all of the properties within that Buffer Zone. A person cannot keep more than 1 cat on any premises in a Fauna Protection Buffer Zone except in accordance with a valid permit in relation to those premises.

The implementation of a similar Local Law within the municipalities of Melville, Cockburn and Kwinana is likely to have significant benefits to the native fauna residing and breeding within the Park.

Dogs
Dog walking is a common activity in the Park and a legitimate activity in certain areas. However appropriate restraint of dogs is necessary if they are not to have an adverse effect on wildlife and activities of other Park visitors.

The local governments of Melville, Cockburn and Kwinana are responsible for administering and enforcing the *Dog Act 1976* within their municipalities. The Dog Act states –

A dog shall not be in a public place unless it is –

(a) held by a person who is capable of controlling the dog; or
(b) securely tethered for a temporary purpose, by means of a chain, cord, leash or harness of sufficient strength and not exceeding the prescribed length.

A dog is exempt from the above requirements if it is in an area specified by a local government as a Dog Exercise Area. At Dog Exercise Areas, however, owners must ensure that their dogs are under effective control at all times. The owner is also required to carry and be capable of attaching a leash for the purpose of controlling the dog.

The *Dog Act 1976* enables local governments to make local laws in relation to dogs. Refer to the relevant local laws for the location of dog exercise areas and reserves where dogs are prohibited. The local governments of Melville, Cockburn and Kwinana should amend their local laws to prohibit dogs from the wetland and water bodies of the Park within their municipalities.

Dogs are prohibited at Thomsons Lake Nature Reserve, Harry Waring Marsupial Reserve and any of the wetlands or water bodies managed by CALM. In relation to other areas of the Park managed by CALM, dogs are permitted if they are on a leash and under effective control at all times. The City of Cockburn should amend its local laws to prohibit dogs in Thomsons Lake Nature Reserve and Harry Waring Marsupial Reserve.

Horses
Direction for the management of horse riding in the Park is provided in Section 32 - Park access and circulation.

PROBLEM ANIMALS

Problem animals are those species that have the potential to cause serious impact on natural systems through direct effects such as predation, habitat destruction, competition for food and territory, and introduction of disease, and through environmental degradation e.g. by overgrazing. Problem animals can be either native species that are impacting on natural values or introduced species that have become established as wild or naturalised populations.

Introduced animals such as feral cats, foxes, rabbits and fish all have a detrimental effect on the conservation values of the Park. Feral cats and foxes prey on waterbirds and other native fauna and are of particular concern. The control and removal of these animals is outlined in the *Regional Parks Pest and Problem Animal Control Plan (CALM, 2006)*. The fox control program at Thomsons Lake will continue to be implemented in the reserve.

There are a number of species present in the Park that might compete with native species for nest hollows, such as rainbow lorikeets, galahs, corellas and honeybees. These will be controlled when and as necessary in accordance with operational priorities, but at the time of writing this plan, the aforementioned species were not deemed to be a significant problem in the Park. The culling of the Australian Raven (*Corvus coronoides)* may continue periodically at Thomsons Lake Nature Reserve when the species is considered a problem.

The presence of introduced and hybrid waterfowl, in particular mallards (*Anas platyrhynchos)*, is also a concern to management. It is likely that hybridisation and competition between domestic and native waterfowl is adversely affecting the native species at the Park. Introduced and hybridised waterfowl will therefore be removed.

Park visitors will be discouraged from feeding ducks and other birds through educational signs (see Section 18). Artificial feeding encourages greater numbers of birds than can be naturally supported. Uneaten food such as bread also increases nutrients (in already nutrient rich lakes) and decaying bread can also allow botulism to spread in bird populations.

With regard to the removal of problem animals in the Park, the managing agencies will need to determine the extent and impacts of animals and then, where appropriate, implement control options. In managing problem animals, CALM is directed by the proposed policy *Management of Pest Animals on CALM managed land* (subject to final consultation).

Kangaroos
Thomsons Lake Nature Reserve has a population of western grey kangaroos confined within the vermin-proof fence. In 1993, prior to the construction of the fence, it was estimated that the kangaroo population of the reserve was approximately 20 – 30 animals. The vermin-proof fence around the reserve provides a secure environment for the kangaroos and limits the amount of predation. As such, the kangaroo population has the potential to quickly increase to a size that adversely affects the biodiversity values of the reserve.

With an increase in the kangaroo population, vegetation within the reserve is overgrazed, habitat is destroyed, flora values are diminished and naturally occurring rehabilitation and plant succession is inhibited.

Based on these considerations, a kangaroo management program will need to be implemented. A preferred population of approximately 22 animals, with a structure of six adult males, 10 adult females and six sub-adult animals is proposed. In order to maintain the population at a sustainable level, subsequent on-going culling by shooting will occur as necessary, with culling initiated whenever the population reaches approximately 50 animals.

Given the natural reproduction and mortality rates for Western grey kangaroos, culling may be necessary and practical every two - three years. This management program should be adequate to enable the vegetation in the reserve to recover. However, if this is not the case, culling may be implemented more frequently for the first few years to enable the vegetation to recover from its current degraded state.

While culling by shooting is considered the most effective method of control, it will be subject to review over the life of this management plan. Other options, such as the removal of the entire kangaroo population and replacement with alternative macropod species of higher conservation significance that once inhabited the area, for example the western brush wallaby and/or the quokka, will be considered.

In undertaking kangaroo management actions, CALM will consult with the Conservation Commission and stakeholders through the implementation of a communication strategy.

Strategies

1. **Use interpretive material to inform the community about the adverse effects of pets and problem animals on native fauna. Include information explaining restrictions on pet access and encouraging responsible ownership in interpretive material (Section 42). (CALM, CM, CC, TK, MU) [High]**

2. **Investigate the introduction of a local law for controlling cats and protecting native fauna. Use the City of Stirling local law - *The Keeping and Control of Cats Local Law (1999)* as a model. (CM, CC, TK) [High]**

3. **Exclude dogs and other pets from Thomsons Lake Nature Reserve, Harry Waring Marsupial Reserve and the wetlands and water bodies of the Park. In relation to other areas of the Park managed by CALM, dogs are permitted if they are on a leash and under effective control at all times. (CALM) [High]**

4. **Liaise with the local governments to review their local laws regarding dogs to be consistent with this Plan. (CALM) [High]**

5. **Consider dog excreta bins and dog excreta bags at appropriate sites within the Park. (CM, CC, TK, CALM, MU) [Low]**

6. **Implement the Regional Park Pest and Problem Animal Control Plan. (CALM, CM, CC, TK, MU) [High].**

7. **Remove introduced, hybrid and problem avian fauna species and honeybees from the Park. (CALM, CM, CC, TK, MU) [Ongoing]**

8. **As provided for in the *Thomsons Lake Nature Reserve Management Plan 2005*, implement the kangaroo management program and fox control program at Thomsons Lake Nature Reserve. (CALM) [High]**

23 - Rehabilitation

The objective is to restore degraded areas of the Park to a condition resembling the natural environment.

Environmental degradation is a major management issue in the Park. Past land uses and provision of roads, utilities and service corridors have resulted in modifications to vegetation communities and weeds have also become a major problem. It is difficult to restore severely degraded sites to natural habitat, however, considerable conservation gains can be made if a full suite of local overstorey and understorey species are used for revegetation.

A variety of techniques are available for landscape rehabilitation and the most appropriate is determined by the specific circumstances encountered.

Where possible, plant material or seed used in rehabilitation works should originate from within the Park or the nearest viable seed source, in order to conserve the genetic integrity of the vegetation communities. It is important that mulch and soil used in rehabilitation works does not contain unwanted weed seeds, plant disease (for example Phytophthora dieback) (see Section 17) or pollutants.

Seed collection from within the Park will generally only be permitted for rehabilitation projects within, or directly impacting upon the Park.

Given the Park's urban surroundings, an important consideration in Park rehabilitation will be the maintenance of views. Where possible, views will be maintained, however, the principles of effective restoration should not be compromised. Lower vegetation types may be used to maintain views over wetlands or lakes. Local residents will be informed of significant revegetation works proposed for the Park.

Where rehabilitation works are undertaken in areas where rabbits are present, consideration should be given to the use of either rabbit-proof fencing or individual tree guards.

A rehabilitation plan will provide a guide for the long-term restoration of degraded areas within the Park and will be developed in accordance with *Rehabilitation of disturbed land, Policy Statement No. 10*. The plan will identify disturbed sites within the Park and priorities for

their restoration to a condition resembling the natural environment.

In general, areas that have the highest conservation significance will be given priority in rehabilitation. Rehabilitation of areas fringing wetlands will also be given a high priority. Fringing vegetation helps to create a more natural habitat as well as reduce nutrient inputs through filtration and storage. Other matters which need to be considered in prioritising rehabilitation works within the Park include bushland condition, weed control areas, disturbed areas (such as those impacted by wildfire), aesthetics, drainage lines and community involvement.

Rehabilitation can benefit greatly from community involvement. The involvement of the community in volunteer works is critical to the successful implementation of this Plan. The managing agencies acknowledge the considerable efforts by the community in undertaking rehabilitation works within the Park. Volunteer groups have completed rehabilitation projects successfully within the Park for a number of years.

Strategies

1. **Prepare and implement a rehabilitation plan for the Park prioritising proposed works. (CALM) [High]**

2. **Coordinate rehabilitation with weed control, fire protection and recreation facility and trail development at the planning, design and implementation stages. (CALM, CM, CC, TK, MU) [Ongoing]**

3. **Inform local residents neighbouring the Park when proposing to undertake significant rehabilitation works. (CALM, CM, CC, TK, MU) [Ongoing]**

4. **Use seed collected from within the Park (where possible) for propagating plants or for direct seeding. Where seed is not available from the Park, other seed should be obtained from local provenance. (CALM, CM, CC, TK, MU) [Ongoing]**

5. **Encourage members of the local community and schools to participate in rehabilitation works and seek external funding to achieve these works where possible. (CALM, CM, CC, TK, MU) [Ongoing]**

6. **Ensure mulch and soil used in rehabilitation works does not contain unwanted seeds, pathogens or pollutants. (CALM, CM, CC, TK, MU) [Ongoing]**

7. **Where appropriate, allow licensed seed collection from within the Park for rehabilitation projects within, or directly impacting upon the Park. (CALM CM, CC, TK, MU) [Ongoing]**

24 - Park aesthetics and landscape amenity

The objective is to maintain and enhance the natural and cultural landscape qualities of the Park.

The management of the landscape is a key consideration in the overall management of Beeliar Regional Park. The following guidelines provide a practical framework for the management of the landscape within the Park:

- Alterations to the natural landscape should be subtle, remaining subordinate to natural elements by borrowing extensively from line, form, colour texture and scale found commonly in the surrounding landscape.
- Site specific visual resource factors should be carefully identified and evaluated before any management activities are undertaken.
- Where appropriate, degraded landscapes such as disused access tracks should be rehabilitated.
- Roads, management tracks and firebreaks should follow the natural landform, or landuse patterns.
- Prescribed burning operations (if required) should incorporate prescriptions and techniques that minimise the visual impact.
- Where structures are required they should be sympathetic in design, materials and colour to complement surrounding landscape elements and be carefully sited away from major natural focal points, out of viewer sight-lines and where vegetation or landform screening can be used.

The landscape description, landscape quality and landscape character of the Park are described in the following subsections.

LANDSCAPE DESCRIPTION

The Park lies within the Swan Coastal Plain landscape character type (Department of Conservation and Land Management, 1994). The coastal plain slopes gently westwards from the Darling Scarp to the Indian Ocean. A description of the Swan Coastal Plain Landscape Character Type is included as Appendix E.

The majority of the Park is comprised of two chains of wetlands and is therefore characterised by low-lying land, either permanently or seasonally inundated. Landscapes range from the open water bodies and open parkland areas to areas of low Banksia woodland, sections of Flooded Gum and Jarrah open woodland on the upland areas.

At the Henderson Region (Mount Brown and the Foreshore Coastal Reserve M91) and Manning Lake elevated positions and low coastal vegetation allow extensive views along the coast, out to the ocean and to the Darling Scarp.

LANDSCAPE QUALITY

The Park's landscape encompasses areas that can be described as being of high, medium, or low visual quality. There are many areas of high scenic quality. Most of these occur in areas with a management zoning of Conservation and Protection and include natural areas with water as a major element. Other areas of high scenic quality include well-maintained parkland areas. Areas of low visual quality include large cleared areas, highly disturbed areas (with dumped rubbish or weed infestation), built structures such as drainage outlets, back fences of houses, power lines and other utilities.

Degraded and/or inappropriate structures are found within the Park. These structures detract from the enjoyment of the environment and need upgrading, replacing, screening or removing to contribute positively to the area's amenity. Other areas of the Park are visually impacted by incompatible adjacent land uses or disturbed by past land use and are in need of rehabilitation.

LANDSCAPE CHARACTER

At the community workshop for the preparation of this Plan, the wetlands were described as an important element in 'defining the character of Perth's south west corridor'.

The landscape types represented in the Park are integral to its scenic value, and they offer visitors a range of scenic experiences. They include wetland, woodland and rural landscape types. Understanding the different landscape character types helps the managing agencies to preserve them, and enhance visitors' enjoyment of them through the provision of scenic viewing facilities and interpretation. Maintaining or improving the natural and cultural landscapes of the Park are integral components of effective management.

Strategies

1. **Identify and protect important landscapes within the Park. (CALM, CM, CC, TK, MU) [Medium]**

2. **Ensure recreation facilities and park furniture are of a high standard and suited to the surrounding landscape. (CALM CM, CC, TK, MU) [Ongoing]**

3. **Take all reasonable steps to ensure that new infrastructure and developments within or adjacent to the Park are designed to minimise impacts on visual quality. Liaise with Western Power, Water Corporation, and other infrastructure providers before works are carried. (CALM, CM, CC, TK, MU) [Ongoing]**

4. **Identify sites of low visual quality (e.g. drainage outlets, degraded and weed infested areas) and undertake appropriate remedial action. (CALM, CM, CC, TK, MU) [Low]**

5. **Consider view corridors when undertaking rehabilitation works within the Park. (CALM, CM, CC, TK, MU) [Ongoing]**

25 - Greenway corridors and links

The objective is to encourage appropriate management of greenway corridors and linkages between the Park and other conservation or recreation areas.

Greenways is a generic term that has been applied to a wide range of landscape planning strategies, concepts and plans (Tingay and Associates, 1998). It has been defined as "networks of land containing linear elements that are planned, designed and managed for multiple purposes including ecological, recreational, cultural, aesthetic, or other purposes compatible with the concept of sustainable use" (Ahern, 1995).

It is important to maintain and improve Greenway corridors and other links between and within Beeliar Regional Park to adjoining areas of ecological significance. This is necessary to help maintain the diversity and vigour of the Park's ecological systems and to help integrate the Park within the broader urban landscape.

Currently, major arterial roads and other infrastructure limit linkages between various parts of the Park and to other regional parks. Major roads divide the eastern chain of wetlands, for example Leach Highway, Farrington Road, North Lake Road, Beeliar Drive and Russell Road. Thomas Road is located on the southern boundary of the eastern wetland chain. At the western chain, Cockburn Road divides the Henderson region. Stock Road – Rockingham Road acts as a major barrier between the two wetland chains and the Kwinana Freeway impacts on the potential to link it to Jandakot Regional Park.

A study of Perth's Greenways has identified a number of proposed greenway corridors linking to and within the Park (see Figure 6). They are as follows:

Link No.	Link Name
1	Coastal Strip
73	North Lake – Bibra Lake – Roe Highway Extension
75	Stock Road to Bibra Lake
76	Russell Road – Thomsons Lake – Woodman Point Regional Park
78	Thomsons Lake to The Spectacles
80	Kwinana Freeway
81	Forrestdale Lake to Thomsons Lake
82	Piney Lakes – Wireless Hill – Swan River
85	Chain of wetlands parallel to and east of Mandurah Road including Stakehill suite of wetlands
87	Leda Ridgelines – Rockingham Road
90	Blue Gum, Booragoon, Piney, Bibra and North Lakes, Little Rush, Yangebup and Thomsons Lakes
96	Stock Road – Coast (Woodman Point)
97	Southern River – Forrestdale Lake – Thomas Road, The Spectacles - Coast
120	Extensions to 76

In Section 32 reference is made to establishing access links between the various parts of the Park. It is equally valid to endeavour to establish vegetative links between these areas.

The use of local plants in landscaping road reserves together with purpose-designed animal underpasses and fauna warning signs can assist to minimise the impact of major roads on the movement of fauna.

The type of interface between the Park and adjoining land uses plays a major role in insulating or exposing (as the case may be), the Park to undesirable impacts. The spread of invasive weed species can be minimised by the creation of appropriate buffers where none exist and by the planting of local species in existing areas. The Park's managing agencies should liaise with the landowners involved with proposed Greenways near the Park to develop a coordinated approach to their management.

Where development is to occur adjacent to the Park, it is preferable that a road is constructed between the development site and the Park, as it improves management and fire access, separates land uses, improves informal surveillance, reduces rubbish dumping and improves Park aesthetics.

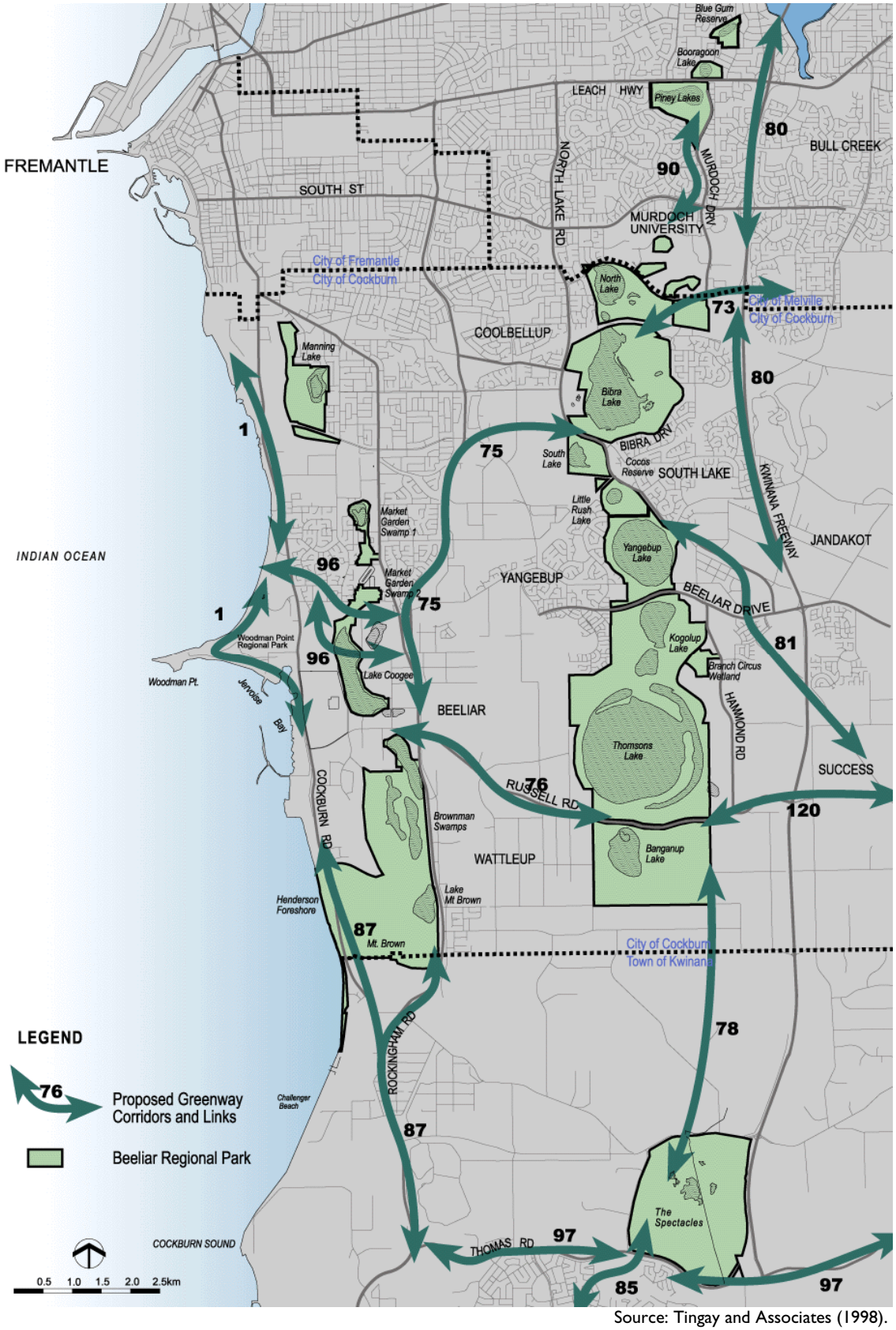
Strategies

1. **Develop a list of Park compatible plants for the local community. Discourage the planting of invasive introduced plants near the Park. (CALM CM, CC, TK, MU) [Medium]**

2. **Encourage providers of future transport and power services to adopt "wildlife friendly" designs, and management practices. (CALM, CM, CC, TK, MU) [Ongoing]**

3. **Liaise with the Department for Planning and Infrastructure and Department of Environment so that future development proposals adjoining the Park incorporate appropriate interface treatments with the Park. (CALM, CM, CC, TK) [Ongoing]**

4. **Liaise with landowners involved with proposed Greenways near the Park to develop a co-ordinated and complementary approach to management. (CALM, CM, CC, TK, MU) [Ongoing]**



Source: Tingay and Associates (1998).

Figure 6 - Proposed greenway corridors and links

D. MANAGING CULTURAL HERITAGE

26 - Guiding principles for managing our cultural heritage

1. Conservation and protection of cultural heritage

The Park will be managed in a way that delivers community benefits by maintaining cultural traditions and attributes. Heritage sites are to be preserved and maintained for their inherent cultural and social values. Impacts from human use and management practices will be minimised in order to maintain heritage values.

2. Consistency of management policies

The managing agencies involved in the Park are to apply management actions that are consistent with appropriate legislation as well as State, national and international heritage conventions.

3. Community involvement

The community is to be involved in managing sites of heritage value. Aboriginal people are especially encouraged to be involved and should be provided alternative consultation opportunities in the management of the Park.

4. Research and Interpretation

Where appropriate, interpretive information is to be provided to enhance the community's understanding of and appreciation for heritage sites. The managing agencies should provide opportunities for, and support, further research into the Park's cultural heritage value.

5. Restoration of cultural heritage

Where possible, heritage sites are to be restored to protect and maintain their value. Sites with high heritage significance will be considered priorities.

Strategy

1. **Apply the above principles as required in managing the cultural heritage of the Park. (CALM, CM, CC, TK) [Ongoing]**

27 - Cultural context

The objective is to identify, protect and appropriately manage sites with Aboriginal and non-Aboriginal cultural heritage value within the Park.

ABORIGINAL ASSOCIATION AND USE

At the time of European settlement, research indicates that the Perth region supported three districts containing the Mooro, Belloo and Beeliar clans (Seddon, 1972). The Beeliar District extended south of the Swan River encompassing the two chains of wetlands that form the basis of Beeliar Regional Park - hence the name of the Park.

Beeliar Regional Park is significant to the local Aboriginal people as parts of it were important camping areas and sources of food and other materials (Polglaze, 1986).

The eastern chain of the Beeliar Wetlands is said to have been a part of a major trade route between Aboriginal people in the Swan and Murray River areas (Polglaze, 1986). This is supported by Hammond (1933) who said that the wetlands were part of a route from North Fremantle to Mandurah.

A number of archaeological sites have been identified on the shores of Bibra and North Lakes. According to Polglaze (1986), the hydrology of the two lakes would have made them very desirable campsite locations, particularly Bibra Lake, being a largely permanent freshwater lake. Aboriginal camping grounds were situated on the southern side of Hope Road, close to the north-eastern edge of Bibra Lake and also along its southern shore (O'Conner, Quartermaine and Bodney 1989).

Although there are no recorded Aboriginal sites in the western chain of wetlands, they almost certainly would have provided desirable campsites and as such hold significance to Aboriginal people.

The lakes of Beeliar Regional Park are also important as spiritual and mythological locations. The spiritual connection between the Aboriginal community and North and Bibra Lakes continues today. This is evidenced by an oral history of the Beeliar Wetlands. According to a Nyoongar woman elder "….we still visit the area,…practice our religion, our spirituality…" (Drake and Kennealy, 1995).

According to Polglaze (1986) the wetlands provide an important link to the natural context, cultural traditions, spiritual life and history of the Aboriginal people of the Swan Coastal Plain.

A key issue in the management of the Park is to ensure that Aboriginal sites are protected from damage which may occur during maintenance operations or works projects. It is therefore the responsibility of the managing agencies to ensure that management obligations are fulfilled according to the *Native Title Act 1998* and the *Aboriginal Heritage Act 1972*, before any planning or public works take place**.**

Additionally, it is important that local Aboriginal people are included in projects and the management of the Park.

Aboriginal Heritage Act (1972)

Under the *Aboriginal Heritage Act 1972,* it is an offence to damage, alter or destroy any Aboriginal sites unless written consent has been obtained from the Minister for Indigenous Affairs. This includes sites not yet registered with the Department of Indigenous Affairs.

Listed Aboriginal sites within the Park are:

Booragoon Lake	S194
Piney Lakes	S193
North Lake	S190
	S191
	S192
Bibra Lake	S660
	S1292
South Lake	S1289
Kogolup Lake	S2667
Thomson's Lake	S2967
	S188
	S186
The Spectacles	S2729

Native Title Act 1993

The land comprising the Park is subject to one native title claim – the Combined Swan River and Swan Coastal Plains Native Title Claim. In accordance with the Commonwealth *Native Title Act 1993* the following parties require written notification of future public works constructed on reserved lands and waters managed by CALM:

- representative Aboriginal bodies;
- registered native title bodies (corporate) and registered native title claimants for CALM managed land/waters on which the operations are to be carried out.

These parties are to be given the opportunity to comment on the proposed public works. A 'public work' includes buildings, structures which are fixtures, roads, bridges, wells, bores and major earthworks. Additionally, notification is required for the preparation of management plans in the same manner as for public works. Native title claimants were notified of this Plans preparation at the commencement of the process.

NON-ABORIGINAL HERITAGE

Initial European settlement had little influence upon the wetland areas south of the Swan River (DPUD, 1992). The first European settlement of Cockburn district was Thomas Peel's failed town of Clarence on the western side of Market Garden Swamps in 1830. The settlement only lasted a couple of years (Drake and Kennealy, 1995).

The infertility of the coastal sands resulted in few land grants. Seddon (1972) states that there were twelve land grants south of Fremantle averaging about 700 acres each. Land use was confined to market gardening south from Spearwood to the Hope Valley and in the wetland fringes. The remaining areas were farmed extensively for sheep, cattle and horse grazing on poorly drained infertile soils (DPUD, 1992).

According to Berson (1978), the general nature of the area, being scattered pockets of fertile land amongst a generally infertile area, combined with the dominance of nearby Fremantle over the area, presented a barrier to the development of a large unified settlement. This is illustrated by the Pensioner Guards who were granted land in the 1870s on the western banks of Lake Coogee. The pensioner settlement was later abandoned as the land proved to be too infertile to be sustainable as productive land. There are numerous remnants of historical cottages present in the area which relate back to the pensioner settlers, however, all of these are outside of the boundary of Beeliar Regional Park.

The area became more popular as a food production area with the coming of the gold rush in the late 19th century, when the population of the state trebled and the demand for fresh fruit and vegetables increased (Berison, 1978).

Market gardening began to surround the wetlands in the region in the late 1800s (Drake and Kennealy, 1995). Extensive areas were cleared for the creation of market gardens and particularly so when irrigation became available.

In 1920, the State government bought Thomas Peel's Estate (established in 1829) and launched the ill-fated Peel Estate Group Settlement Scheme. A once complex network of wetlands and streams was drained extensively for agriculture. By the mid-1920s over 400 kilometres of drains had been constructed. The Peel Main Drain connects The Spectacles to the Serpentine River and Peel Inlet (Drake and Kennealy, 1995). The area surrounding The Spectacles contained several market gardens, other crops and dairies around the wetlands in the 1930s and 1940s, however, it was not considered successful in terms of agricultural land use (Drake and Kennealy, 1995).

Farming was also present at the wetland area of Piney Lakes reserve until 1924. The wetland area was utilised as the other soils in the area were too infertile for farming purposes. When the land was transferred to the ownership of the University of Western Australia in 1924 it was cleared and the university, in conjunction with the then Forests Department, established a pine plantation. A nursery for the propagation of pines was also established and operated until 1951. The majority of the plantation was cleared in 1976 (Ecoscape and Landmarc, 1992).

Another key heritage site within the Park is the Azalea Ley homestead, Davilak House, built in 1905 and located at Manning Lake. Charles Manning purchased Manning Lake in 1860 and the Manning family farmed a 923-acre (approximately 377.5 hectare) estate from North Lake to Coogee. The National Trust has assessed the Azalea Ley Homestead as significant given it "…demonstrates a way of life and forms a unified setting… a stately place…(with) evidence of a life style (of the area) before the City of Cockburn was built" (The National Trust Register of Significant Places). Today, the homestead contains a private museum with both general and local artefacts and documents of interest. It is also the start of the Davilak Heritage Trail.

The City of Cockburn also has a rich railway history (probably more than any other local government in the State). It has a disused railway along the coast which serviced the ammunition storage depot at Woodman Point, a disused railway between Spearwood and Armadale (along Armadale Road), and a Tramway Reserve which was possibly created to service an explosives depot south of Baldivis Road in the City of Rockingham. These historical features provide significant opportunities for the development of trails and interpretive material within the Park (Maher Brampton Associates, 1999).

Heritage of Western Australia Act 1990
The Azalea Ley Homestead is the only site in the Park listed on the Western Australian Heritage Register.

Registration of a place on the Register is official recognition by the community of its cultural significance to the heritage of Western Australia. The main implications of the registration is that the places are given legal protection under the *Heritage of Western Australia Act 1990* and that development proposals which may affect the places are required to be referred to the Heritage Council of Western Australia for its advice.

Strategies

1. **Seek involvement of Aboriginal and historic groups in the management of the Park. (CALM, CM, CC, TK, MU) [Medium]**

2. **Ensure management obligations are fulfilled according to the *Aboriginal Heritage Act 1972*, the *Native Title Act 1993* and the *Heritage of Western Australia Act 1990* before any planning or public works take place. (CALM, CM, CC, TK) [Ongoing]**

3. **Research and incorporate information on Aboriginal and non-Aboriginal history of the Park into interpretive material where appropriate (Section 42). (CALM, CM, CC, TK, MU) [High]**

4. **Nominate significant sites for heritage listing on either the relevant Municipal Heritage Inventory, or State and National Heritage Registers. (CALM, CM, CC, TK, MU) [Medium]**

E. MANAGING RECREATION

28 - Guiding principles for managing recreation

1. Preservation of the values of the land itself
Natural systems should be able to sustain the recreation that is occurring or proposed. The intensity and distribution of recreational activities may need to be controlled to maintain the amenity of the Park and the enjoyment of visitors. Recreation planning will seek to foster appreciation of the Park's natural value.

2. Consistency of recreation with reserve purpose
Recreational activities must be compatible with the assigned purpose of reserves within the Park. Reserves within the Park will be assigned an appropriate purpose for the protection and enhancement of Park values under the *Land Administration Act 1997*.

3. Equity
A range of activities consistent with a reserve's purpose should be allowed in the Park. However, uses that impair other forms of acceptable use or jeopardise the safety of other visitors should be specifically managed, directed to more appropriate places or not permitted. Priority will be given to low impact activities and those that promote recreation or increase awareness, appreciation and understanding of the natural environment.

4. Management
Activities and facilities must comply with the managing agencies' requirements. If effective management of recreational activities or facilities cannot be provided they should be restricted, relocated or removed from the Park.

5. Recreation opportunities
A range of recreation opportunities should be provided for in a local and regional context thereby providing Park visitors with a choice of recreation activities and experiences. The Recreation Opportunity Spectrum (ROS) is a planning tool that enables managers to provide for the greatest possible range of opportunities in a given area, while limiting unintended incremental development (Stankey and Wood, 1982). Principles of the ROS have been utilised in developing the Recreation Masterplan (Appendix B).

Strategy

1. **Apply the above principles as required in managing recreation in the Park. (CALM, CM, CC, TK, MU) [Ongoing]**

29 - Visitor use

The objective is to encourage visitor use whilst ensuring that the level and type of visitor use are sustainable and minimise conflict with other Park visitors and values.

Surveys have been carried out into recreation use of the Park by Barnes (1998) and Colmar Brunton (2001). The information presented in these reports provides a basis for understanding visitor requirements and demand.

Barnes (1998) identified that while surrounding local residents regularly use the Park on a daily basis, it should be viewed as a regional resource given people from at least 36 Perth metropolitan suburbs as well as others from interstate and overseas visited Bibra Lake during a six-week period in April and May 1998.

Barnes (1998) also suggested people visit the Park for a wide range of reasons. Visitor use can be attributed to the Park's amenities, aesthetics, safety for small children, accessible car parking and its 'central' location within the metropolitan area.

Another visitor survey was undertaken by Colmar Brunton in 2001 aimed to quantify the number of visitors to specified Park areas as well as qualify the attitudes and satisfaction of Park visitors. Colmar Brunton (2001) listed a number of recreational activities that are popular at the Park, including:

- walking;
- walking the dog;
- riding bikes;
- exercising/fitness;
- birdwatching/observing wildlife;

Two sites were surveyed by Colmar Brunton:
1. North Lake; and
2. The Spectacles.

An estimated 43,000 visits to North Lake occur annually. The main activities at North Lake were walking, walking the dog and riding a bike. At The Spectacles, visitor numbers were lower and it was estimated that 2,000 visits occurred per year with walking the dog and nature observation popular (Colmar Brunton, 2001).

In relation to visitor use, 87% of visitors to North Lake lived locally with an additional 11% living in other locations in the Perth metropolitan area. Only 32% of the visits to North Lake used vehicles to access the location, with the majority (57%) either walking or jogging. In comparison, at The Spectacles, all visitors surveyed lived locally and all travelled to the location by private vehicle (median trip of 10 minutes).

At North Lake 86% of users surveyed by Colmar Brunton (2001) were repeat visitors on a weekly basis.

The majority of visits were between 15 - 30 minutes in duration. The survey size at The Spectacles was not large enough to draw reliable conclusions.

The estimated total number of visits to the areas managed by CALM within the Park is over 72,000 per year (Colmar Brunton, 2001). This does not include the visits to recreation areas managed by the City of Melville, City of Cockburn or Town of Kwinana.

Observation and community input also suggest that the natural features, serenity and abundant wildlife attract visitors to the Park.

Inappropriate visitor use – vandalism and other antisocial behaviour

Vandalism and thefts from cars are known problems at isolated bushland sites in the Park such as The Spectacles. This may be addressed in part by designing recreation sites to improve the circulation of traffic and increase the visibility of parked cars. CALM will consider this issue when designing recreation facilities and sites in the Park.

Strategies

1. **Prepare and implement a visitor survey program to gain an understanding of visitor use, numbers and satisfaction within the Park. Use CALM's VISTAT as a basis for the program. Following the survey take appropriate action where necessary. (CALM, CM, CC, TK, MU) [High]**

2. **Investigate and implement site design measures to reduce anti-social behaviour in the Park. (CALM, CM, CC, TK, MU) [Medium]**

Key performance indicators for visitor use
The success of these strategies will be measured by: 1. Changes in visitor numbers and satisfaction levels. 2. Provision of formalised access in the Park (Appendix B – Recreation Masterplan). 3. Existence of a visitor survey program.
Target: 1. No decline in visitor satisfaction. 2. Completion of access and circulation components of Recreation Masterplan. 3. Approval of a visitor survey program.
Reporting: 1. Every 3 years. 2. Every 5 years. 3. Every 5 years.

30 - Recreation Masterplan

A Recreation Masterplan (Appendix B) has been prepared to help ensure that a variety of recreation opportunities are offered in the Park. The Masterplan will also help coordinate recreation developments within the Park and allocate appropriate facilities and services to those areas of the Park best able to accommodate them in a sustainable manner. Developments, where possible, will utilise already degraded sites.

The Masterplan reflects the management zones and land uses described in Section 10 of this Plan. The five management zones (Conservation, Natural Environment Use, Recreation, Sport and Recreation and Special Use) provide a guide to acceptable facilities and uses at a given site (see Table 1, page 11). The Recreation Masterplan considers access, internal circulation and the type of facilities to be provided within the Park.

The Conservation and Protection Areas of the Park will have access limited to boardwalks, nature trails and cycling paths with an emphasis being on the enjoyment of nature.

The Natural Environment Use Areas will have greater access with an emphasis on rehabilitation, education and interpretation. Provision of some facilities within these areas is anticipated.

The Recreation as well as Sport and Recreation Areas will be the most intensively used and modified sections of the Park. The emphasis will be on providing well-designed recreation areas without detracting from the natural or cultural values of the Park.

The Special Use Areas will be managed for conservation, teaching and research purposes. There is no public access to these areas unless authorised by the relevant land managing agency.

The type and proposed alignment of access ways as well as facilities proposed at recreation nodes in the Recreation Masterplan are indicative only and are subject to review over the term of this Plan. Should the type of access way need to be changed or re-aligned, or facilities added to recreation nodes consultation will occur with the community (and the Conservation Commission if the proposed change is contentious) prior to works taking place in the Park.

Strategy

1. **Implement the Recreation Masterplan that allocates appropriate facilities and services to those areas of the Park best able to accommodate them in a sustainable manner. (CALM, CM, CC, TK, MU) [High]**

31 - Recreation sites and facilities

The objective is to provide and manage a range of quality recreation sites and facilities that allow for a diversity of recreation opportunities without conflicting with other Park values.

Although the Park provides for a range of recreation opportunities, of particular significance is the opportunity to recreate in a natural environment within an urban area. Maintaining this experience will be a key consideration in providing recreation sites and facilities within the Park as it is this experience that attracts many people to the Park.

In the past there has been limited direction for the coordinated development of recreation sites within the Park. This has lead to a proliferation of facilities some of which are poorly located, while others could be considered inappropriate or surplus to demand. Conversely, there are areas in the Park that could sustain greater public use provided appropriate facilities are developed. These include Kogolup Lake and the Henderson Region including Mt Brown, Mt Brown Lake and the Henderson foreshore area (refer to the Recreation Masterplan, Appendix B).

Site development plans should be prepared prior to any works taking place in the Park. Consultation between the managing agencies and with the community will occur in the preparation of the site plans.

The provision of adequate shade at recreation sites is also a consideration for the managing agencies. In siting new recreation facilities under existing mature trees, management needs to be cognisant of safety issues such as falling branches. Additionally, when developing shade structures in conjunction with recreation sites, management needs to consider the potential impacts that structures can have on the quality of visitor experience and landscape amenity.

The development of recreational facilities in the Park will be guided by Australian standards.

Strategies

1. **Prepare site development plans for significant works within the Park. The plans will be prepared in consultation with the community. (CALM, CM, CC, TK, MU) [Ongoing]**
2. **Develop facilities and structures in a manner that is sympathetic to the surrounding landscape. (CALM, CM, CC, TK, MU) [Ongoing]**
3. **Where appropriate make adequate shade provisions at recreation sites and facilities. (CALM, CM, CC, TK, MU) [Ongoing]**

32 - Park access and circulation

The objective is to provide safe, convenient and structured access to, and within, the Park that is consistent with the Park's values.

Given the location of the Park in a developing urban environment, access is a major issue. Whilst access for recreation and education purposes is a legitimate use, uncontrolled vehicle, pedestrian and horse access has severely degraded some areas of the Park.

The *City of Cockburn's Trails Master Plan (1999)* provides a guide for the development of recreation trails within its municipality area. Detailed planning for access needs to be undertaken with recreation planning for the Park and is a significant aspect of the Recreation Masterplan (Appendix B).

ROAD ACCESS

Vehicle access is an important consideration for the Park. Private vehicles access the Park by a comprehensive road network system with a number of major arterial roads adjoining or dissecting the Park.

Major roads which dissect the Park east-west include Leach Highway, South Street, Farrington Road, North Lake Road, Beeliar Drive and Russell Road. Thomas Road also adjoins The Spectacles to the south. The development and expansion of east-west transport corridors is considered a major threat to the integrity of the Park (Section 39).

Existing car parks are provided at a number of locations in the Park and these are indicated in Appendix B. The car park capacities, sizes and surfaces vary depending on visitor demand and the types of facilities provided at each particular site.

It will be necessary to develop additional parking areas to facilitate access to the Park where there is an existing visitor demand or where the provision for new access is planned. The provision of additional parking facilities is considered in the Recreation Masterplan (Appendix B) and will help address the undesirable effects of uncontrolled parking and access.

CYCLE AND PEDESTRIAN ACCESS

The many quiet neighbouring suburban streets provide local residents with a good opportunity to access the Park by cycling and walking. In addition to the visitors who access the Park by vehicles, four new railway stations which are proposed at locations between Cockburn Road and the Kwinana Freeway will also provide potential access for pedestrians and cyclists.

Generally, however, trails and pathways within the Park and between discrete Park areas are limited. The lack of formed pathways restricts circulation and connectivity throughout the Park. Pedestrians are currently using firebreaks and management tracks to walk throughout the Park. Cyclists are restricted to dual use paths and formed limestone tracks.

Increased visitor pressures on the Park and the lack of a structured pathway system mean that informal paths are being created by people seeking new experiences which result in greater disturbance to bushland areas and lake and wetland edges.

An effective path system should have minimal impact upon the values of the Park, whilst allowing visitors to experience the diverse recreation opportunities and zones within the Park.

Park access and circulation is shown in the Recreation Masterplan (Appendix B). Planning for access, walk trails and dual use paths will continue as urban development occurs in areas surrounding the Park.

ACCESS FOR ALL

Access for people with disabilities requires improvement in the Park. In many areas, access for people with mobility problems is restricted due to the undeveloped nature of the pathways, however, at the more intensive recreation areas, for example, Bibra Lake and Manning Lake, wheelchair access is better developed.

Appropriate pathways and ramps will need to be provided to allow those with disabilities to experience the diverse settings within the Park. In planning for future recreation facilities, the needs of disabled people will be considered.

HORSE RIDING

The managing agencies recognise that people enjoy riding horses in the Park's natural settings. This attraction, however, needs to be balanced when considering the following issues:

- the possible damage by horses to the Park's nature conservation values that include introducing or spreading dieback disease, eroding soil, trampling and browsing vegetation and introducing and spreading weeds through feed and droppings;
- the potential safety conflicts with other Park visitors; and
- conflicts with other visitor experiences.

The riding of horses currently occurs in the south-west portion of Lake Banganup (outside of the fenced area of the Harry Waring Marsupial Reserve), outside of the fenced area at Thomsons Lake, at Kogolup Lake and at Manning Lake.

Individual horse riders will be allowed to continue riding at the south-west portion of Banganup Lake and at the southern and western sides of Thomsons Lake for the foreseeable future. At Thomsons Lake, restrictions have been put in place given new urban development occurring in close proximity to the reserve and the potential for visitor conflicts. No floating areas will be provided at these locations and no other CALM-managed areas of the Park can be utilised for horse riding.

The above arrangements for horse riding at Banganup Lake and Thomsons Lake will be reviewed over the life of this Plan in light of environmental impacts, the demand for horse riding and potential conflicts of use with other visitors. In respect to Banganup Lake, the bushland condition of the area will be monitored to review changes to the woodland areas. If monitoring indicates that bushland condition is deteriorating and it can be demonstrated that horse riding is contributing to the degradation of the area, then horse riding will be further restricted or prohibited.

The riding of horses at Kogolup Lake is not permitted as the level of erosion and disturbance to bushland areas caused by equestrian activities is not considered acceptable. The potential conflict between horse riders and other Park visitors is also considered unacceptable and this is likely to increase as urban development intensifies in the area.

In recent times, two horse hire businesses have ceased operating in close proximity of Kogolup and Thomsons Lakes. As such, the need to consider provisions for them is no longer required.

The management of horse riding in the Park can be assisted with the provision of interpretive and education material for horse riders.

PRIVATE VEHICLES AND MOTORBIKE ACCESS

Private vehicles, trail bikes and motorbikes are restricted to designated parking areas and access roads. Access outside these areas may endanger other Park visitors, adversely affect wildlife and cause damage to the landscape.

BOAT AND CANOE ACCESS

The use of motorised and non-motorised recreational watercraft is considered inappropriate within the Park given the potential adverse impacts on native fauna and wetland vegetation.

Watercraft used for educational, research, monitoring or managerial purposes may be permitted for use within the Park.

ACCESS FOR MAINTENANCE VEHICLES

Boundary access for maintenance vehicles is provided at many points throughout the Park, including access for fire vehicles and those carrying out mosquito control works, midge monitoring, rehabilitation works, weed control and watering. As far as practicable these vehicles will use existing pathways and fire access tracks.

Strategies

1. **Implement the Recreation Masterplan that will:**
   - **coordinate access and circulation allowing safe and convenient access for visitors to and within the Park;**
   - **integrate with surrounding path networks;**
   - **provide appropriate recreation facilities and services that foster appreciation and enjoyment of the Park's natural values;**
   - **provide adequate parking facilities at proposed recreation sites; and**
   - **restrict private vehicles to designated car parks and access roads.**

   (CALM, CM, CC, TK, MU) [High]

2. **Continue to allow horse riding at the southwest portion of Banganup Lake and at the southern and western sides of Thomsons Lake for the foreseeable future. (CALM) [High]**

3. **Monitor the environmental impacts, demand for horse riding and conflicts of use with other visitors at Banganup Lake and Thomsons Lake. If necessary further restrict or prohibit horse riding in these locations. (CALM) [Ongoing]**

4. **Prohibit horse riding at Kogolup Lake. (CALM) [High]**

5. **Provide interpretive material that outlines appropriate behaviour for horse riders. (CALM) [Medium]**

6. **Provide for emergency response within the Park and ensure the path system allows for emergency vehicle access in appropriate areas . (CALM, CM, CC, TK, MU) [High]**

7. **Prohibit unauthorised watercraft from accessing the wetlands and water bodies of the Park. Watercraft used for educational, research, monitoring or managerial purposes may be permitted for use within the Park. (CALM, CM, CC, TK, MU) [Ongoing]**

8. **Consider the needs of disabled people when designing recreation facilities and pathways within the Park. (CALM, CM, CC, TK, MU) [Ongoing]**

9. **Where necessary close car parks at night to reduce vandalism. (CALM, CM, CC, TK, MU) [Ongoing]**

10. **Prohibit use of unauthorised off-road vehicles in the Park. (CALM, CM, CC, TK, MU) [Ongoing]**

33 - Signs

The objective is to provide a system of signs that communicates the location of the Park features, provides orientation assistance, identifies hazards, leads to appropriate use of the recreation areas and helps communicate information about the Park.

Signs play an important role in notifying visitors about access and use, and communicating information about the Park's identity and values. Signs need to be designed and located to provide messages in a consistent way and without compromising the quality of the area in which they are sited.

Sign System

CALM has prepared a sign system for Perth's regional parks and a sign plan for the Park to help ensure signs are designed and located appropriately.

The regional parks sign system includes detailed design specifications for all signs provided in the Park. It aims to introduce a suite of signs that are of a high standard, are robust and have a consistent and contemporary style. The signs system includes directional and orientation signs, management signs, risk warning signs and interpretive signs. It also includes a brand image or logo for each regional park. The Beeliar Regional Park brand image, which depicts a tortoise, will be used on a number of sign types to enhance public recognition of the Park.

The local governments of Melville, Cockburn and Kwinana as well as Murdoch University will be encouraged to adopt the regional parks signs system and brand image for signs in areas of the Park under their jurisdiction.

Sign Plan

The sign plan will direct the placement of signs within the Park. Informative, directional and interpretive signs will be placed at prescribed locations within the Park.

Strategies

1. **Implement the regional parks sign system and the sign plan for the Park. (CALM, CM, CC, TK, MU) [High]**

2. **Encourage the other managing agencies to adopt the regional parks sign system and Park logo to ensure consistency of signs within the Park. (CALM) [Ongoing]**

34 - Visitor safety

The objective is to take all reasonable and practicable steps to ensure the safety of visitors in the Park.

There is always an element of risk in outdoor recreation activities. Nevertheless, all reasonable and practical efforts will be taken to minimise risks to visitors.

Visitor safety will be promoted through information and education about potential problems and risks. Visitor safety will also be an integral component in undertaking works program and capital developments within the Park. Recreation facilities and amenities for visitors will be developed and maintained using relevant Australian Design Standards as a guide. Management actions to reduce safety hazards should, if possible, be consistent with the values of the Park and should not intrude unduly on the experience of visitors.

The coastal limestone cliffs at Henderson foreshore (M91 Coastal Reserve) have been recently assessed in light of cliff falls that have occurred elsewhere in Western Australia. Some remedial works have been undertaken in an attempt to reduce any perceived dangers of cliff collapse (Ecoscape and Coastwise, 1999). Further assessment of cliff stability should be undertaken as part of any proposals for that area.

In addition, sections of the Henderson foreshore and Mt Brown area are contaminated with unexploded ordnance. The area was used for live demonstration firing during World War II by the Commonwealth Department of Defence. The Fire and Emergency Services Authority of Western Australia (FESA) carried out a field validation study in 1995.

A further report was prepared by FESA in 2003 in light of the proposed improvement of the area as part of the *Jervoise Bay Conservation and Recreation Enhancement Plan*. The report confirmed that CALM had implemented appropriate and reasonable measures to reduce visitor risk through the clearance of designated tracks and the installation of warning signs and fences.

CALM has also liaised closely with the Commonwealth Department of Defence, and the Crown Solicitor's Office to ensure appropriate mitigation works had been completed to meet the Department of Defence Policy - *Management of Land Affected by unexploded Ordnance (1999)*.

When managing risk, CALM is guided by *Policy Statement No.53 - Visitor Risk Management (CALM, 1996)*.

Strategies

1. **Implement the Regional Park Visitor Risk Management Program to ensure procedures are developed to manage and monitor known risks. (CALM) [High]**

2. **Undertake an assessment of cliff stability as part of any development proposals for the Henderson foreshore area. (CALM) [Medium]**

3. **Investigate risk management and amelioration options when considering any public works within the Mt Brown and Henderson foreshore area given the potential public risk posed by unexploded ordnance in the area. (CALM) [Ongoing]**

4. **Ensure visitor safety and risk management are integral components of works programs and capital developments within the Park. (CALM, CM, CC, TK, MU) [High]**

5. **Provide information to visitors that highlight potentially hazardous areas and activities, as well as appropriate preventative actions and emergency procedures. (Section 42). (CALM, CM, CC, TK, MU) [Medium]**

F. MANAGING SUSTAINABLE RESOURCE USE

35 - Guiding principles for managing sustainable resource use

1. Preservation of the values of the land itself
Land use should not compromise the natural and cultural values of the Park. Future developments should be of a character and arrangement that do not detract from the natural settings and landscape amenity. Through tendering and development assessment processes, proponents of significant developments within the Park will be required to assess the environmental impacts of the proposed commercial use.

2. Consistency of land use with reserve purpose
Activities should be compatible with the assigned purpose of reserves within the Park and should be of service to Park visitors. Reserves within the Park will be afforded an appropriate purpose for the protection and enhancement of Park values under the *Land Administration Act 1997* (Table 1, page 11).

3. Equity
Land use within the Park should be of a nature that promotes multiple use by Park visitors. Uses that impair other forms of acceptable use or jeopardise safety of other visitors should be specifically managed, directed to more appropriate places or not permitted.

6. Open and competitive assignment process
State Supply Commission guidelines will be followed to ensure that opportunities for commercial concessions in the Park are assigned based on an open and competitive process.

4. Leased or owned by the managing agencies
Commercial use of areas within the Park should be through either a lease or licence arrangement. Alternatively, the managing agencies may own and operate the facility or development.

5. Financial viability
Through the tendering process proponents of significant developments within the Park will be required to document the financial viability of the proposed commercial use. Revenue generated by commercial concessions on land in the Park managed by CALM will be used to help meet the overall cost of managing regional parks.

6. Management compliance
Activities and facilities must comply with the managing authorities' requirements. If effective management of commercial facilities or activities cannot be provided they should be restricted to appropriate levels, relocated or removed from the Park.

Strategy

1. **Apply the above principles as required in managing commercial concessions in the Park. (CALM, CM, CC, TK, MU) [Ongoing]**

36 - Commercial concessions for visitor services - leases and licences

The objective is to ensure that commercial concessions are consistent with this Plan, enhance visitor satisfaction and help offset Park management costs.

Commercial concessions (leases and licences) may be granted on lands or waters managed by CALM to provide appropriate facilities and services for visitors. A lease allows the lessee to occupy a particular area of land or waters, whereas a licence allows the licensee to enter and use the land.

Leases and licences provide a mechanism to bring private capital and management expertise into visitor services in natural areas. Concessions need to be carefully designed and managed, or they may detract from the conservation and landscape values of the Park. Appropriate concessions can generate income to help offset Park management costs and can significantly enhance public access and enjoyment of the Park.

CALM and the local governments of Melville, Cockburn and Kwinana should assess proposed leases and commercial concessions according to the objectives as set out in this Plan. Concessions must be consistent with the purpose of the reserve and the protection of its values. Commercial concessions on land managed by CALM will be established and managed in accordance with *Policy Statement No 18 - Recreation Tourism and Visitor Services* (CALM, 1999).

According to the *Conservation and Land Management Act 1984*, the Executive Director of CALM may grant a lease on land vested in the Conservation Commission of Western Australia subject to consultation with the Commission and approval of the Minister for the Environment. The Executive Director may apply terms and conditions as appropriate and the term of the lease may not exceed 21 years, but may include an option or options to renew that lease for a further term or terms not exceeding, in the aggregate, 21 years. The lease must be tabled before each House of Parliament within 14 sitting days of its execution by all parties to the grant or renewal.

Under the same Act, the Executive Director of CALM may grant a licence in writing to any person to enter and use certain land.

Leases and licences pertaining to local government land require the approval of the relevant Council.

All development proposals on land reserved as "Parks and Recreation" in Perth's MRS require approval from the WAPC. The WAPC in association with CALM will use this Plan as a mechanism for guiding development proposals within the Park or which impact upon the Park. Additionally, any commercial development proposed in the Park should be advertised

appropriately to allow for consultation with the community.

A tendering process for potential commercial concessions in the Park will be publicly competitive and consistent with State and local government tendering processes. Leases for recreation clubs and community associations are not subject to the same tendering processes.

Advertising within the Park requires the approval of the relevant managing agency.

EXISTING CONCESSIONS IN THE PARK

Existing concessions (including community associations and recreation clubs) within the Park are as follows:

City of Melville

- Blue Gum Reserve Recreation Centre, Reserve 29571, Disney Street, Brentwood.
- Blue Gum Reserve Child Health Care Centre, Reserve 38557, Moolyeen Road, Brentwood;
- Piney Lakes Environmental Education Centre, Reserve 46648 Leach Highway, Booragoon.

City of Cockburn

- Spanish Club of Western Australia, JandAA Pt172 Baker Court, North Lake.
- Murdoch Pines Golf Range, JandAA Pt172 Baker Court, North Lake.
- Lakeside Recreation Centre and Leeming Lakeside Baptist Church (Inc.), CockBL 393 Bibra Drive, North Lake.
- Native ARC (Inc.), Pt of Lot 387 Hope Road, Bibra Lake.
- Bibra Lake Scouts, Pt of Lot 387 Hope Road, Bibra Lake.
- Education Department of Western Australia, Lot 387 Hope Road, Bibra Lake.
- Cockburn Wetlands Education Centre, Lot 387 Hope Road, Bibra Lake.
- Food Van, CockBL 2121, (Bibra Lake Reserve) Progress Drive, Bibra Lake.
- Azelia Ley Historic Homestead, Lot 9 Loc. 3727, (Manning Lake Reserve) Davilak Avenue, Hamilton Hill.
- Coastal Park Moto-Cross Track operated by the Coastal Motorcycle Club of Western Australia (Inc), Reserve 39455 Cockburn Road, Henderson.
- The Cockburn International Raceway operated by Tiger Kart Club (Inc), Reserve 37426 Gemma Road, Henderson.
- Western Australian Radio Modellers (Inc), Reserve 39584, Gemma Road, Henderson.
- Mater Christi Catholic Primary School, Lot 8 Yangebup Road, Yangebup;
- Adventure World Pty Ltd (car park) Reserve 26954, Corner Gwilliam and Progress Drives, Bibra Lake;
- Cockburn Volunteer Sea Search and Rescue, Reserve 39584 Gemma Road, Henderson; and
- Cockburn Holiday Village, Reserve 24308, Cockburn Road, Henderson.

OPPORTUNITIES FOR ADDITIONAL CONCESSIONS FOR VISITOR SERVICES

There are opportunities for commercial concessions that could provide Park visitors with the scope to learn about and explore the Park in new ways, for example, approved ecotourism activities. Commercial concessions in the Park are not precluded and provide the opportunity to offer services to the public and a way to raise revenue to assist in the management and provision of facilities in the Park.

Bicycle Hire

The provision of cycling facilities is consistent with the management objectives of the Park and should be encouraged. This may include a licence to operate a hire business issued to approved operators and which would be subject to license conditions.

Guided Tours

There is the possibility for tour operators to undertake guided tours within the Park. These tours could take a range of forms including:

- Aboriginal and non-Aboriginal cultural heritage tours and activities; and
- nature observation tours and activities.

Commercial guided tours would require the permission of the relevant management agencies under a licence arrangement.

Community and special events

From time to time there may be demand for use of areas of the Park for community and special events.

The appropriateness of community or special events within the Park will be assessed by the managing agency controlling the respective area. Gatherings requiring sole use of a site will require a booking. A concession arrangement may be required between the event-organiser and the managing agency for the right to use a site and to cover the operational and administrative costs incurred by the managing agency.

Management agencies should use the guiding principles established for managing sustainable resource use (Section 35) as a means of determining the appropriateness of proposed activities. Local government requirements must also be met.

CONCESSIONS FOR PURPOSES OTHER THAN VISITOR SERVICES

There is a presumption against proposals for new concessions which are not related to providing services for Park visitors. Concessions for purposes other than visitor services will generally not considered appropriate for the Park, unless there is a considerable benefit to the Park and/or the community.

It is likely that the managing agencies of the Park will be required to assess proposals for telecommunications facilities (such as mobile telephone towers) in the Park. When assessing such proposals, or managing telecommunications facilities, CALM is directed by *Radio/Tele Communications Facilities - Policy Statement 49* [review in preparation].

LICENCES

Harry Waring Marsupial Reserve (Banganup Lake)
The University of Western Australia (UWA) currently operates the Harry Waring Marsupial Reserve for research purposes under a licence arrangement with CALM. Consideration should be given to offering UWA a lease for the reserve.

Beekeeping
CALM may grant permits to beekeepers to use Crown land under the *Conservation and Land Management Act 1984*. Permits are granted on the provision that biodiversity and conservation objectives are not compromised, where the activity is compatible with other land uses. CALM's *Policy Statement No. 41 Beekeeping on Public Land* was under review at the time of writing this Plan, the draft policy indicates that current apiary site permits will be maintained and renewed, but no additional permits will be granted on land reserved or proposed to be reserved primarily for conservation purposes, unless allowed for under a completed management plan.

The introduced honeybee (*Apis mellifera)* can have detrimental effects on native insects, hollow-using animals and vegetation. Competition for flora resources between honeybees and other native pollinators may favour the more aggressive foraging of the introduced bee, which results in a decline of native insects. Other possible effects are inefficient pollination of some local plants, destruction of flowers and hybridisation of some native plant species by cross-pollination of different native species.

Given the high visitation to the Park, its proximity to residential areas no permits will be granted for beekeeping in the Park.

Strategies

1. **Establish and manage any commercial operations in the Park in accordance with CALM's *Policy Statement No 18 - Recreation Tourism and Visitor Services*. Concessions may be permitted if they are consistent with the purpose of the relevant reserve. (CALM) [Ongoing]**

2. **Ensure any commercial activities are consistent with the guiding principles for sustainable resource use, conditions are fulfilled by concession holders and an appropriate fee is paid that contributes an income to the management of regional parks. (CALM) [Ongoing]**

3. **Ensure proponents of commercial activities complete an appropriate expression of interest. (CALM, CM, CC, TK) [Ongoing]**

4. **Assess community and special events proposed in the park in accordance with objectives of the Plan as well as the guiding principles for sustainable resource use. A concession arrangement may be required between the event organiser and the managing agency for the right to use a site and to cover the operational and administrative costs incurred by the managing agency. (CALM, CM, CC, TK, MU) [Ongoing]**

5. **Where appropriate, allow provisions for community organisations and clubs that are consistent with the reserve purpose. (CALM, CM, CC, TK) [Ongoing]**

6. **Consider leasing Harry Waring Marsupial Reserve to the University of Western Australia. (CALM) [Low]**

7. **Exclude beekeeping activities from the Park. (CALM) [Ongoing]**

37 - Mining and the extraction of basic raw materials

The objective is to protect the Park's values from exploration, mining and the extraction of basic raw materials.

The Conservation Commission of Western Australia does not consider mining and the extraction of basic raw materials as an appropriate land use in the Park, hence there is a presumption against these activities.

EXTRACTION OF BASIC RAW MATERIALS

Depending on the land tenure involved there are different legislative requirements for extraction or mining of basic raw materials.

On freehold land basic raw materials (including sand, limestone, limesand, clay, gravel and hard rock) are not defined as "minerals" under the *Mining Act 1978* and commercial extraction is subject to extractive industry licences under the *Local Government Act 1995*. Any freehold property in the Park that is subject to an extractive industry licence will be processed under the *Local Government Act 1995*. Given the Park is reserved for Parks and Recreation in the MRS, the extractive industry licence will be determined by the WAPC.

Basic raw materials targeted on reserves vested with the Conservation Commission or other Crown land will be processed under the *Mining Act 1978*.

The mining of basic raw materials from within the Park is unlikely to be environmentally acceptable and such proposals will be referred to the Environmental Protection Authority (EPA) for assessment. The EPA may assess the proposal as "environmentally unacceptable".

MINING

Applications for mining within regional parks will be processed under the *Mining Act 1978*.

The State government's environment policy includes a prohibition on mineral and petroleum exploration and mining in national parks and nature reserves. It has determined that applications lodged prior to 10 February 2001 would not be affected and would be

processed in accordance with the policy that applied at that time.

In processing applications, regional parks are recognised by the Department of Industry and Resources (DOIR) under the *"Guidelines for Mineral Exploration and Mining within Conservation Reserves and Other Environmentally Sensitive Lands in Western Australia"* (DME, 1998). Applications affecting the Park will also be subject to *The Mineral Exploration and Development Memorandum of Understanding* (MOU) between the EPA and DOIR (DME, 1995). The MOU clarifies referral arrangements for mineral exploration and mining proposals to the EPA and CALM where these proposals occur within conservation reserves and other environmentally sensitive lands.

Mineral exploration in national parks, 'A' Class nature reserves, and 'A' Class conservation parks (in the southwest of Western Australia) is subject to the concurrence of the Minister for the Environment and the Minister for State Development. Approval for mining to occur in the Park is subject to EPA assessment. If mining is to occur in 'A' Class nature reserves and 'A' Class conservation parks it would require EPA assessment and Parliamentary consent.

Strategies

1. **Ensure any proposals for mining and extraction of basic raw materials affecting the Park are referred to the EPA. (CALM) [High]**
2. **Review proposals for mining and extraction of basic raw materials with the view to excluding them from the Park. (CALM, CM, CC, TK, MU) [Ongoing]**
3. **Should proposals for mining or the extraction of basic raw materials be approved, ensure adequate provisions are made to manage impacts and to protect the remaining Park areas. (CALM, CM, CC, TK, MU) [Ongoing]**

38 - Utilities and park services

The objective is to minimise the impact of public utilities in the Park and provide cost effective, efficient and safe park services.

STORMWATER FACILITIES AND DRAINAGE OUTLETS

There are many stormwater facilities and drainage outlets throughout the Park whose management is the responsibility of the Water Corporation or the relevant local government. Many of these drains divert stormwater and surface water runoff from the surrounding catchment areas into the wetland system. Nutrient enrichment and altered water regimes threaten the natural values of the wetlands.

The two main issues associated with drainage facilities are:

- ecological impacts (Section 16 - Water quality, Section 17 - Vegetation and Section 19 - Weeds); and
- aesthetic and visual impacts (Section 24 - Landscape Amenity).

The ecological impacts associated with stormwater drainage can be reduced and this requires cooperation and consultation between the managing agencies. The management of stormwater entering the Park's wetlands is a catchment wide issue, and controls need to be implemented at that level. As such, all new developments adjoining the Park will be required to dispose of stormwater appropriately within the development site. No additional direct drainage outfalls will be permitted in the Park. In the longer term, existing stormwater outfalls will be reviewed to assess the viability of improving water quality entering the Park..

Many outlets are unattractive and more attention to detail is necessary so that they blend with their natural surroundings. Consideration should be given to their appearance and function by battering back walls and planting the sides with local vegetation. This would have the effect of improving existing outlets and stripping nutrients from stormwater before it reaches the Beeliar Wetlands. These treatments together with modifications to outlet alignments should lead to utilities that remain functional and yet merge into their surroundings.

ROADS

Roads will only be constructed in the Park if they are for management purposes or are servicing a recreation facility. Where possible, facilities should be located near the boundaries to reduce the need to place roads within the Park.

Where new urban or industrial development occurs adjacent to the Park, the construction of a road between the development site and the Park will improve management and fire access, separates land uses, improve informal surveillance, reduce rubbish dumping and improve Park aesthetics.

PARKLAND SERVICING AND MAINTENANCE

Parkland and recreational areas will need regular maintenance that will predominantly be the responsibility of the City of Cockburn, City of Melville and the Town of Kwinana. Maintenance of parkland areas is the responsibility of the managing agency which controls that area. The collection of rubbish, maintenance and provision of toilet facilities and general maintenance operations within the Park will require regular vehicle access.

Existing and proposed toilets within the Park are to be connected to sewer outlets or other environmentally acceptable disposal systems. The use of septic tanks is to be avoided except in conjunction with alternative treatment units.

The provision of bins will be minimised and visitors encouraged to take their rubbish home. The dumping of rubbish has been a management issue in some areas of the Park. This will require the application of the *CALM Regulations 2002* or the relevant local laws relating to rubbish dumping.

Strategies

1. **Liaise with the Department for Planning and Infrastructure and Department of Environment to prevent additional direct storm water drainage outlets from being constructed in the Park. (CM, CC, TK, CALM) [Ongoing]**

2. **Liaise with the local governments and Water Corporation to review existing drainage facilities to improve water quality entering the Park and to improve the aesthetics of the outlets (Section 24). Allow for additional recharge basins to be constructed in the Park if they are beneficial to the wetlands. (CALM) [High]**

3. **Promote "take it home" rubbish education. (CALM, CM, CC, TK, MU) [Medium]**

39 - Development proposals within and adjacent to the Park

The objectives is to minimise the impact of developments on the Park.

Being located within a developing urban area and in close proximity to industrial areas at Kwinana, Henderson and Fremantle, the Park will continue to be subjected to infrastructure proposals that threaten its values.

Currently, underground sewerage and drainage lines cross the Park at various locations, while services associated with roads also traverse the Park. It is important that the land managing agencies liaise with infrastructure providers so that, where possible, future development is located outside the Park boundary.

Where service corridors are required within the Park, they should be rationalised by combining utility requirements. Additionally, proponents will be required to rehabilitate areas or provide appropriate facilities such as pathways on areas disturbed during the construction of infrastructure or service projects.

Ideally, there should be no environmental impacts, both during and post construction, to the lands or waters that comprise the Park from developments that adjoin the Park. Liaison with agencies responsible for town planning and environmental approvals will help ensure appropriate conditions are placed on the proponent of the development. If there are impacts to the Park, proponents will be required to mitigate them through appropriate works.

Strategies

1. **Liaise with the Department for Planning and Infrastructure and Department of Environment to ensure appropriate conditions (which help protect the values of the Park) are placed on the proponents of developments when they are seeking planning and environmental approvals for works affecting the Park. (CALM, CM, CC, TK, MU) [High]**

2. **Ensure proponents rehabilitate areas or provide appropriate facilities such as pathways on areas disturbed during the construction of infrastructure or service projects. (CALM, CM, CC, TK, MU) [Ongoing]**

G. WORKING WITH THE COMMUNITY

40 - Guiding principles for working with the community

1. Community participation
The community will be encouraged to have input into the management of the Park. Public participation processes will have a clearly stated purpose and clearly identified scope. Participation is to be based on a shared understanding (with stakeholders) of objectives, responsibilities, behaviour and expected outcomes. The participatory process is to be objective, open, fair and carried out in a responsible and accountable manner. Participation will provide opportunities for input, representation and joint learning from all relevant stakeholders.

2. Information exchange
Information regarding the planning and management of the Park will be exchanged between land managers and the community in an open and transparent manner. Data and information used in the decision making process will be available to stakeholders. Public participation processes will emphasise the sharing of information, joint learning and understanding.

3. Outcomes and decision-making
The outcomes of public participation will form part of the decision-making process. Participants should be informed as to how their involvement affected CALM's or the State government's decisions.

4. Management objectives
The community will be encouraged to contribute to nature conservation and land management objectives, including those outlined in this Plan. This will help to build community awareness, understanding and commitment to these objectives.

5. Education and interpretation
Education and interpretation will be aimed at giving visitors a 'take home' message that will create an awareness of issues affecting the Park and positively influence visitor behaviour. It will also provide information on the reasons behind management decisions and will convey the objectives of this Plan. Education and interpretation will encourage community involvement in and ownership of the Park.

Strategy

1. **Apply the above principles in working with the community to manage the Park. (CALM, CM, CC, TK, MU) [Ongoing]**

41 - Community involvement

To facilitate community involvement in the management of the Park.

THE BEELIAR REGIONAL PARK COMMUNITY ADVISORY COMMITTEE

The public is formally involved in implementing this Plan through the Beeliar Regional Park Community Advisory Committee.

The Committee provides a forum at which issues affecting the Park are discussed. It consists of community members and representatives from the City of Melville, City of Cockburn, Town of Kwinana, Murdoch University and CALM. The Committee commented on the draft management plan prior to its release for public comment and assisted in finalising the management plan. The committee's role is also to provide advice in regard to the ongoing management of the Park.

The existing Community Advisory Committee's role, composition and structure will be reviewed periodically.

INTERACTION WITH THE BROADER COMMUNITY

It is very important that the community is actively involved in implementing this management plan. This encourages a sense of ownership of the Park by the community and encourages interested people to become involved in the Park's future planning and management. To facilitate community involvement in the Park CALM has prepared a Regional Park Volunteer Information Package.

Residents bordering the Park can have a significant impact on the Park. It is important to seek the cooperation and involvement of adjacent landowners to protect the values of the Park. This can be done through educational programs, which promote responsible use and inform the community of management roles and responsibilities. Programs should outline the effects of inappropriate activities such as dumping rubbish and garden waste, and the disposing of fish and pool water into local stormwater drains which flow into the Park's wetlands and lakes.

There are a number of educational institutions within close proximity to the Park. These include Murdoch University, University of Western Australia (Harry Waring Marsupial Reserve), Challenger TAFE, Kwinana Senior High School and Mater Christi Catholic School. All educational institutions should be encouraged to use the Park for educational research purposes.

There are a number of different ways members of the community can be involved in assisting with the implementation of this Plan including:

- joining community volunteer groups;
- joining the Department of Conservation and Land Management's Bush Rangers Program;
- contacting members of the Beeliar Regional Park Community Advisory Committee;
- reporting problems and issues to the managing agencies;
- being involved in clean up days (e.g. Cleanup Australia Day); and
- using the community service program to assist in Park management.

When consulting with the community regarding the management of the Park, CALM is guided by *Policy Statement No.15 – Community Involvement (Public Participation and Volunteers)*.

Strategies

1. **Consult with the Beeliar Regional Park Community Advisory Committee in implementing this Plan. (CALM, CM, CC, TK, MU) [Ongoing]**

2. **Periodically review the role and composition of the Beeliar Regional Park Community Advisory Committee. (CALM) [Ongoing]**

3. **Maintain active liaison with community groups involved in the Park. (CALM, CM, CC, TK, MU) [High]**

4. **Promote community groups involved in implementing this management plan and subsidiary plans. (CALM, CM, CC, TK, MU) [Ongoing]**

5. **Encourage and support the activities of community groups, schools and other groups interested in the Park. (CALM, CM, CC, TK, MU) [Ongoing]**

6. **Continue to encourage, promote and support the local volunteers with essential resources to carry out their activities. (CALM, CM, CC, TK, MU) [Ongoing]**

7. **Facilitate community involvement in the Park by implementing the Regional Park Volunteer Information Package. (CALM) [Ongoing]**

8. **Promote responsible use of the Park and keep the community and other organisations informed of management actions, programs and developments within the Park. (CALM, CM, CC, TK, MU) [Ongoing]**

9. **Encourage educational institutions to use the Park. (CALM, CM, CC, TK) [Ongoing]**

Key performance indicators for community involvement
The success of these strategies will be measured by: 1. Change in volunteer hours contributed to the management of the Park. 2. Existence of an active community advisory committee.
Target: 1. No decrease in volunteer hours contributed to the management of the Park. 2. Maintain an active community advisory committee for the Park.
Reporting: 1. Every 3 years. 2. Every 3 years.

42 - Information, interpretation and education

The objectives are to increase the community's awareness, appreciation and understanding of the Park's values and management practices, and to involve a wide range of public participation in implementing this Plan.

An effective communication program is essential to achieve the objectives of this Plan. It informs the public of attractions, facilities and recreation opportunities available within the Park and provides an avenue to promote an appreciation, and greater understanding and enjoyment of the natural environment. Additionally, it fosters appropriate behaviour so that adverse impacts on the environment are minimised.

A communication plan and program for the regional parks in Perth has been completed by CALM. The communication plan has three parts:

1. information – providing an overview of opportunities and details of facilities, activities and regulations;
2. interpretation – exploring natural and cultural features; and
3. education – providing detailed materials and programs designed to facilitate learning, focusing on target groups (e.g. school groups, community groups).

The communication program will be implemented by way of signs, displays, publications (such as brochures and Park notes) and guided activities.

An interpretation plan will also be completed providing Park-specific information to visitors. Interpretive information will assist people plan their visit, enjoy and appreciate the Park and help them recall their experience when they depart. The Park offers many opportunities for developing an enriching body of interpretive material. Key areas for interpretation and education within the Park include:

- the lakes and wetland areas;
- recreational opportunities;
- flora and fauna;
- the Ramsar values of Thomsons Lake;
- cultural influences (both Aboriginal and non-Aboriginal);
- the relationship of the Beeliar Wetlands with others on the Swan Coastal Plain;
- the regional park entity, its management and evolution; and
- responsible use of the Park.

The development of interpretive material should be undertaken in a coordinated way to ensure the most effective use of available resources and to present a well-integrated, consistent body of information about the Park.

Involvement of the community in Park management, ongoing liaison with community groups and the provision of interpretive and educational materials will be important for maintaining the values of the Park and to maximise its use as an educational resource.

The Cockburn Wetlands Education Centre plays a particularly important role in environmental education and information within the Park. The efforts of the staff and volunteers involved in the Centre have assisted in raising the awareness and understanding in the local community of the Park's identity and values.

As another significant education resource, the City of Melville has developed an interpretation and community centre at Piney Lakes.

CALM will work through community environmental education centres such as Piney Lakes Environmental Education and the Cockburn Wetlands Education Centre to promote the values of the Park and to provide information to visitors about the Park.

School groups will continue to place demands for educational activities and talks about the Park. A number of local schools have been involved with activities such as planting and rehabilitating degraded areas. There is the opportunity to conduct these school activities in conjunction with CALM's existing schools education program and the Department's Bush Rangers Program.

Strategies

1. **Implement and periodically update the Regional Park Communication Plan. The plan provides direction on:**
   - **community education;**
   - **community involvement; and**
   - **interpretive strategies and techniques.**

   (CALM) [High]

2. **Prepare and implement an interpretation plan for Beeliar Regional Park. (CALM, CM, CC, TK, MU) [High]**

3. **Continue to liaise with all interest groups to ensure a coordinated approach to interpretation and education within the Park. (CALM, CM, CC, TK, MU) [Ongoing]**

H. IMPLEMENTING AND EVALUATING THE PLAN

43 - Priorities, funding and staff

The objective is to manage the Park according to the priorities developed for implementation.

PRIORITIES

The priorities for managing the Park have been established by the managing agencies of the Park and appear in brackets behind each strategy in the Plan. They represent the priorities at the time of writing. CALM, in consultation with the Conservation Commission of Western Australia, will review priorities in reference to changing circumstances during the term of the Plan. There are many strategies outlined in this Plan. While some are guidelines others are prescriptions for specific actions. The local governments of Melville, Cockburn and Kwinana as well as CALM will implement this Plan within the framework of available resources.

Subsidiary plans and implementation programs
In implementing this Plan, more detailed subsidiary plans will be required prior to operations taking place within the Park (see Figure 1, page 2).

Subsidiary plans to be (or have been) prepared as part of the Beeliar Regional Park planning process include:

- Fauna Management Program (Section 18);
- Weed Management Plan (Section 19);
- Fire Response Plan (Section 20);
- Pest Animal Control Plan (Section 22);
- Rehabilitation Plan (Section 23);
- Visitor Survey Program (Section 29);
- Recreation Masterplan (Section 30);
- Sign System and Sign Plan (Section 33);
- Visitor Risk Management Program (Section 34);
- Volunteer Information Package (Section 41).
- Communication Plan for regional parks (Section 42); and
- Interpretation Plan (Section 42).

Additionally, an annual projects list will be prepared to guide major works on CALM-managed lands within the Park. The City of Melville, City of Cockburn, Town of Kwinana, Murdoch University and the Beeliar Regional Park Community Advisory Committee will be consulted in the preparation of the annual projects list (Section 11).

STAFFING

The local governments involved in Beeliar Regional Park will use council staff and contractors for the implementation of this Plan. CALM services its management obligations with staff from the Regional Parks Unit and contractors.

FUNDING ARRANGEMENTS

The respective local governments and CALM will finance and manage their respective land areas (Figure 4, page 10). CALM has been allocated a recurrent budget for the maintenance of regional parks from State Treasury. Additionally, in 1997, a capital budget was provided by the Western Australian Planning Commission (WAPC) for the planning and development of facilities within regional parks. Some funding for local governments involved in regional parks is available through the Area Assistance Grants Schemes administered by the WAPC.

Responsibility for acquisition of private land proposed for inclusion in the Park remains with the WAPC.

Strategies

1. **Prepare and implement an annual projects list, taking into account the priorities identified in this plan. Consult with the Beeliar Regional Park Community Advisory Committee when preparing this list. (CALM, CM, CC, TK) [High]**
2. **Seek corporate sponsorship and other funding arrangements for the Park. (CALM, CM, CC, TK, MU) [Ongoing]**

44 - Term of this Plan

This Plan will guide management of the Park for a period of 10 years from the date it is gazetted. During this time, amendments to the final management plan are allowed under section 61 of the CALM Act. If a significant amendment is necessary, the proposed changes will be released for public comment.

At the end of the 10-year period, this Plan may be reviewed and a new management plan prepared. The new management planning process requires full public consultation and approval from the Minister for the Environment. If the plan is not reviewed and replaced by the end of the 10-year period, section 55(2) of the *Conservation and Land Management Act 1984* allows the plan to remain in force in its original form, unless it is either revoked by the Minister or until a new plan is approved.

45 - Performance assessment

The Conservation Commission will measure the success of this Plan in accord with its performance assessment function under section 19(1)(g)(iii) of the *Conservation and Land Management Act 1984* by using performance indicators and other mechanisms as appropriate.

It is not efficient to measure all aspects of management given resource and technical impediments –

consequently, indicators will target 'key' components of the plan. KPIs are identified in relevant sections throughout the plan and are also presented in a summary in Table 2. Each key performance indicator comprises evaluation of a measure, target and reporting requirements.

CALM is responsible for providing information to the Conservation Commission to allow it to assess the performance of the Department in carrying out and complying with this Plan.

The frequency of reporting will depend upon the requirements of each KPI, the establishment of baseline information against which to assess performance, and any unforeseen changes to the environmental conditions. Where a report identifies a target shortfall, a response to the Conservation Commission may be required. The response may identify factors that have led to the target shortfall, and propose alternative management where appropriate. The Conservation Commission will consider CALM's response on the target shortfall and evaluate the need for action. The Conservation Commission will make the results of performance assessments available to the public.

The adequacy of the range of selected KPIs and management strategies will be reviewed following each Conservation Commission performance assessment.

CALM will undertake a review of the management plan in preparing an annual projects list for the Park. The Beeliar Regional Park Community Advisory Committee will be involved in preparing the annual projects list.

Strategies

1. **Audit the overall effectiveness of the Park's management based on the key performance indicators (Table 2). (Conservation Commission of Western Australia) [Ongoing]**
2. **Review the implementation of this Plan annually in preparing an annual projects list. (CALM) [Ongoing]**

Table 2 - Performance Assessment

KEY VALUES	KEY OBJECTIVE	KEY PERFORMANCE INDICATORS		
		Performance Measure	**Target**	**Reporting Requirements**
The Park's conservation, recreation and landscape values.	8. Land tenure To ensure that the values of the Park are protected by security of tenure and reserve purpose.	1. Tenure actions for which the CALM and the Conservation Commission are responsible.	1. Complete all tenure actions for which CALM and the Conservation Commission are responsible.	1. Every 5 years.
The wetland ecosystems of the Park.	16. Lakes and wetlands To manage the Park in a manner that protects and enhances the wetland environments of the Park.	1. Changes in abundance, species diversity and structure of naturally-occurring aquatic macro-invertebrate populations. 2. Existence of integrated catchment management plans for selected catchments affecting the Park.	1. No decline in the abundance or diversity of naturally-occurring aquatic macro-invertebrate populations. 2. Approval of integrated catchment management plans.	1. Every 3 years. 2. Every 5 years.
Vegetation communities in the Park are representative of communities once widespread on the Swan Coastal Plain but now significantly cleared.	17. Flora and vegetation To protect, conserve and rehabilitate local flora species and vegetation communities in the Park.	1. Changes in the abundance of selected local wetland flora species. 2. Changes in the occurrence of *Phytophthora cinnamomi* infections at Thomsons Lake Nature Reserve. 3. Existence of a weed control and rehabilitation plan.	1. No decline in the abundance of selected local wetland flora species. 2. No new human-assisted occurrences of *Phytophthora cinnamomi* at Thomsons Lake Nature Reserve. 3. Approval of a weed control and rehabilitation plan.	1. Every 3 years. 2. Every 3 years. 3. Every 5 years.
The Park contains a diversity of wildlife and fauna habitats. It has significant bird breeding areas, acts as a summer refuge for transequatorial migratory waders and has an abundance and diversity of birdlife.	18. Fauna To conserve naturally-occurring fauna species in the Park, particularly threatened and priority species.	1. Changes in species diversity of selected groups of naturally-occurring fauna. 2. Changes in the abundance of selected groups of naturally-occurring fauna species. 3. Existence of a fauna management program.	1. No decline in species diversity of selected groups of naturally- occurring fauna. 2. No decline in the abundance of selected groups of naturally-occurring fauna species. 3. Approval of a fauna management program.	1. Every 3 years. 2. Every 3 years. 3. Every 5 years.

Continued over page…

Table 2 (continued) - Performance Assessment

KEY VALUES	KEY OBJECTIVE	KEY PERFORMANCE INDICATORS		
		Performance Measure	**Target**	**Reporting Requirements**
The diversity of flora species and vegetation communities and the presence of priority or other uncommon species.	19. Weeds To minimise the impact of environmental weeds on the local plant species and communities in the Park.	1. Changes in populations of high priority weeds as identified in the *Environmental Weeds Strategy for Western Australia.* 2. Changes in the abundance and distribution of priority environmental weeds (to be determined through a weed control and rehabilitation plan for the Park). 3. Existence of a weed control and rehabilitation plan.	1. No new populations of weed species rated high in the *Environmental Weeds Strategy for Western Australia.* 2. No increase in the abundance and distribution of priority environmental weeds. 3. Approval of a weed control and rehabilitation plan.	1. Every 3 years. 2. Every 3 years. 3. Every 5 years.
The Park provides opportunities for a wide range of passive and active recreation. Of particular significance is the opportunity to recreate in natural environments that are relatively undisturbed yet close to urban areas.	29. Visitor Use (and the Recreation Masterplan) To encourage visitor use whilst ensuring that the level and type of visitor use are sustainable and minimise conflict with other Park visitors and values.	1. Changes in visitor numbers and satisfaction levels. 2. Provision of formalised access in the Park (Appendix B – Recreation Masterplan). 3. Existence of a visitor survey program.	1. No decline in visitor satisfaction from 2006 levels. 2. Complete access and circulation components of the Recreation Masterplan within ten years of completion of this Plan. 3. Approval of a visitor survey program.	1. Every 3 years. 2. Every 5 years. 3. Every 5 years.
The Park is a community asset.	41. Community Involvement To facilitate community involvement in the management of the Park	1. Change in volunteer hours contributed to the management of the Park. 2. Existence of an active community advisory committee.	1. No decrease in volunteer hours contributed to the management of the Park. 2. Maintain an active community advisory committee for the Park.	1. Every 3 years. 2. Every 3 years.

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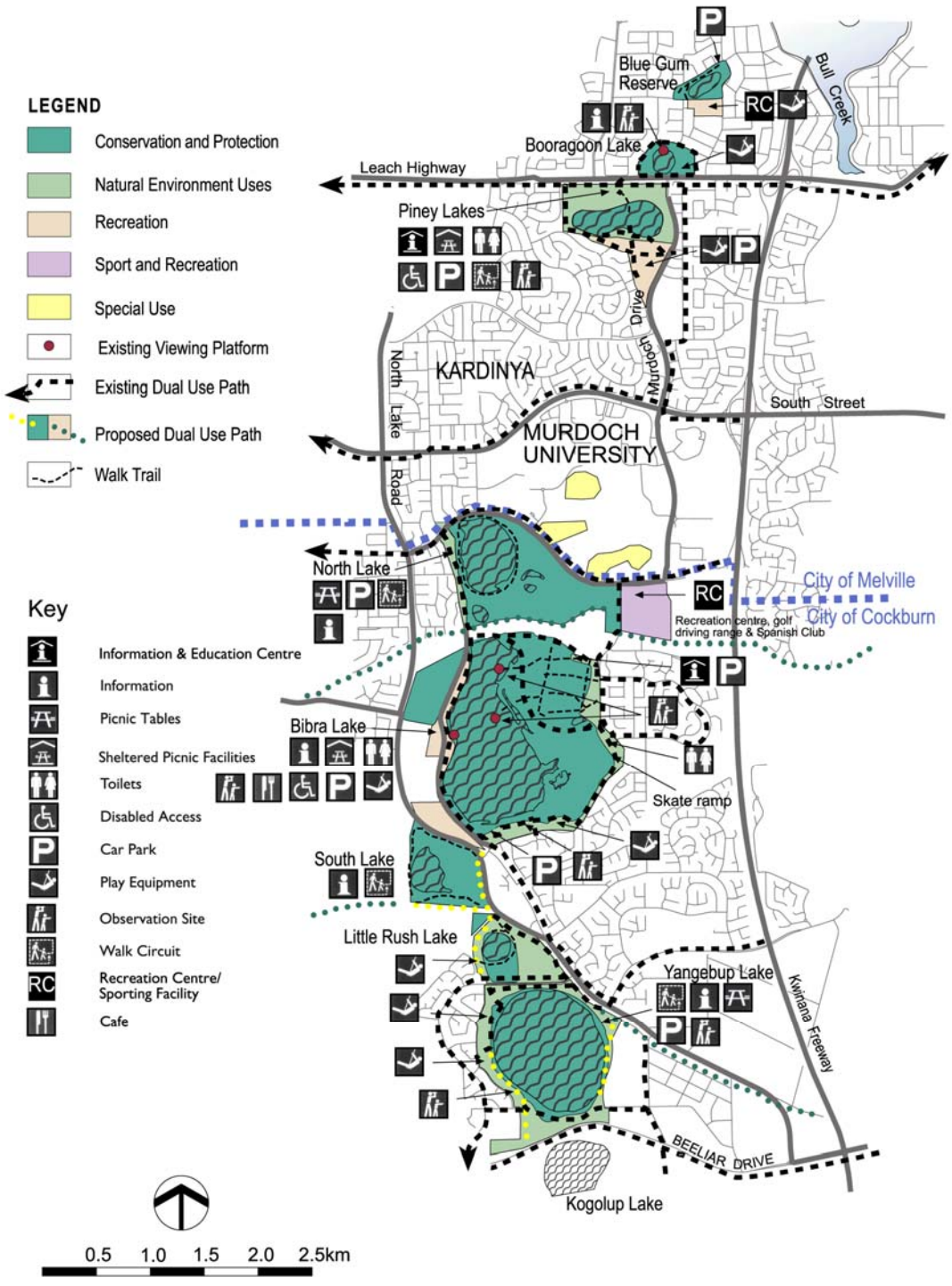
Appendix A - Abbreviations

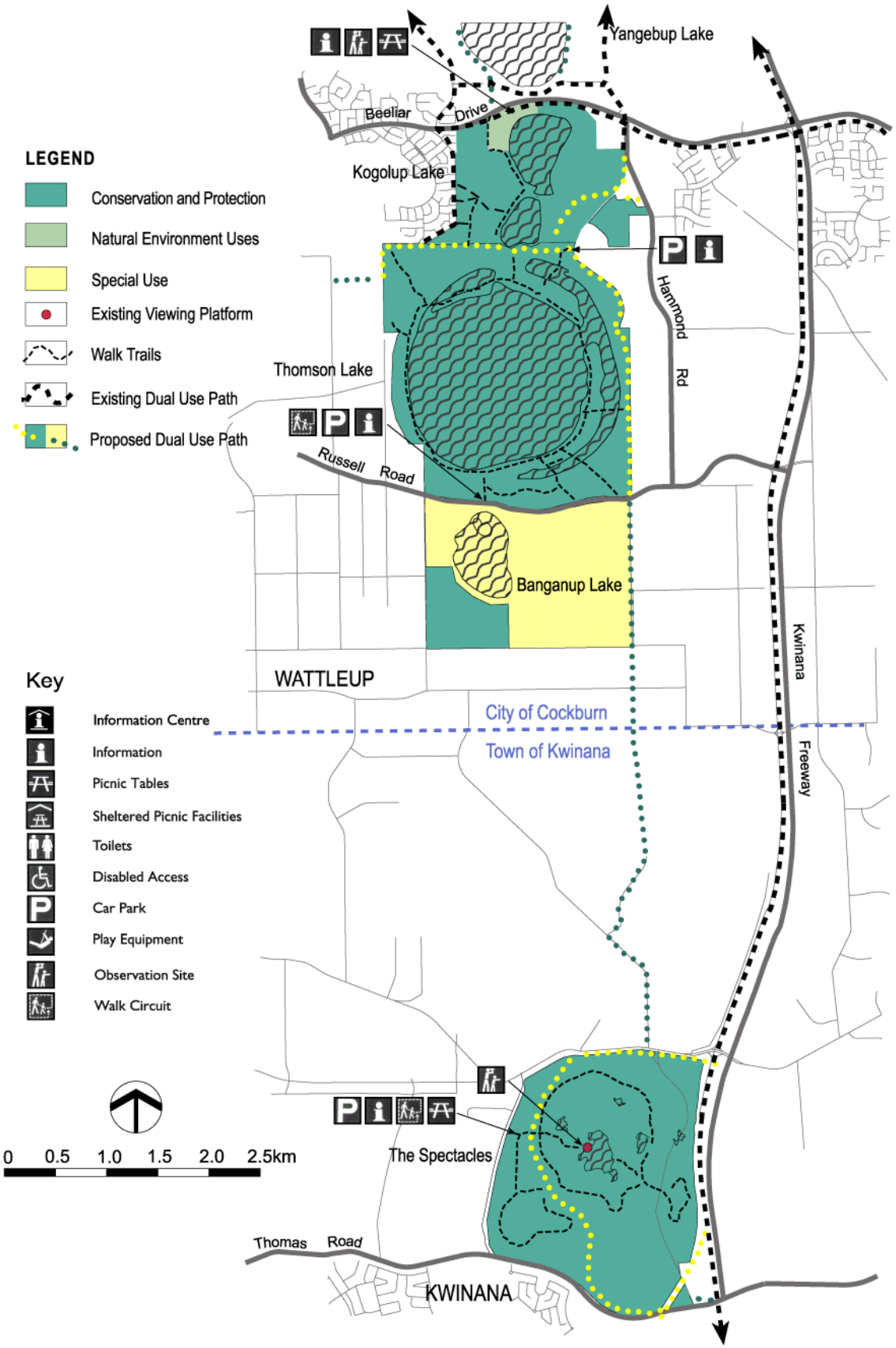
A list of abbreviations used in this plan:

AHD	Australian Height Datum - the height above mean sea level
CALM	Department of Conservation and Land Management
CAMBA	China Australia Migratory Birds Agreement
CBD	Central Business District
CC	City of Cockburn
CM	City of Melville
DOIR	Department of Industry and Resources
DoE	Department of Environment
DLI	Department of Land Information
DPI	Department for Planning and Infrastructure
FESA	Fire and Emergency Services Authority of Western Australia
JAMBA	Japan Australia Migratory Birds Agreement
MRWA	Main Roads Western Australia (now part of DPI)
MRS	Metropolitan Region Scheme
MU	Murdoch University
RAOU	Royal Australasian Ornithologists Union (now Birds Australia)
TK	Town of Kwinana
WAPC	Western Australian Planning Commission

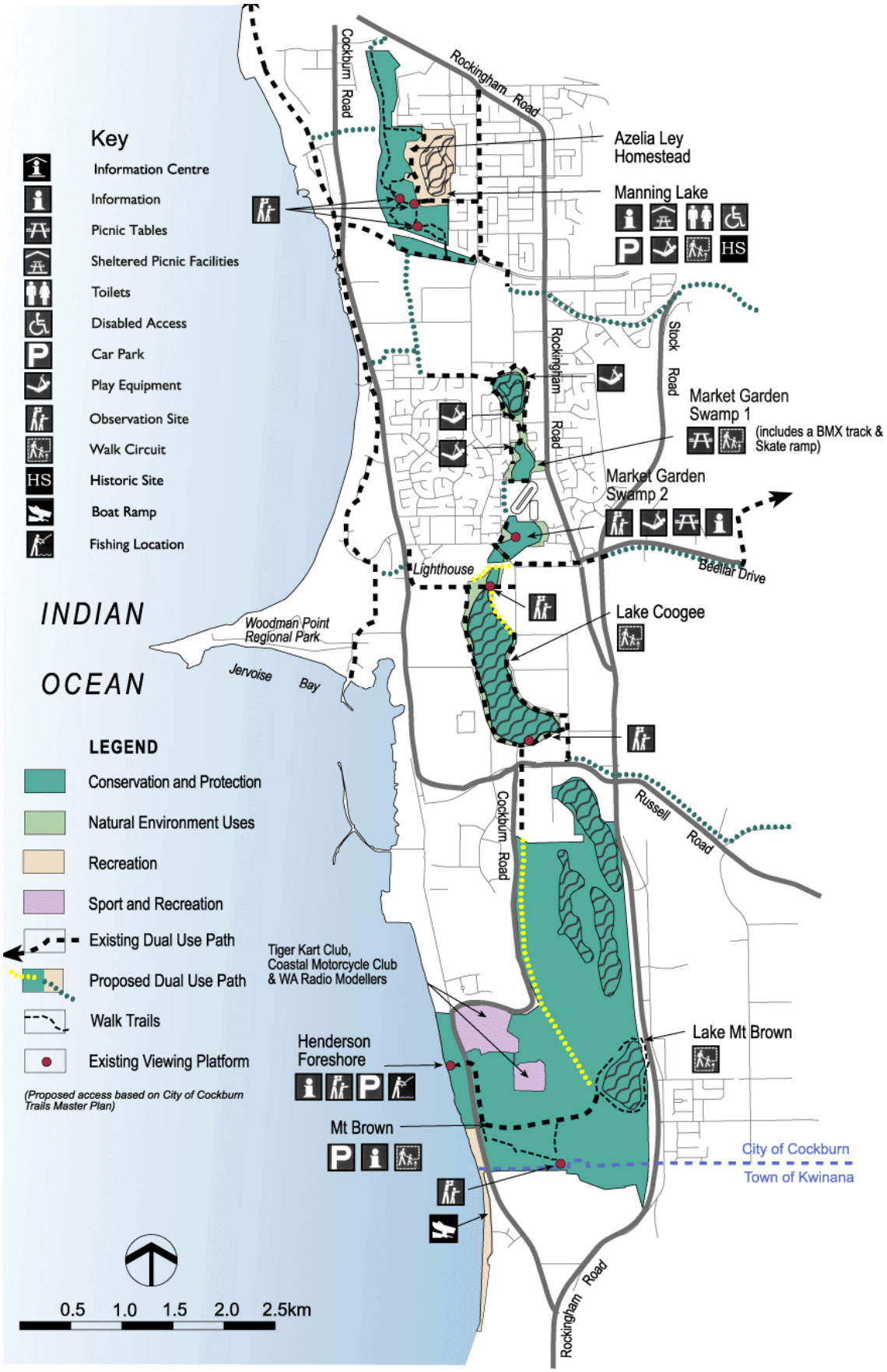
Appendix B - Recreation Masterplan



Recreation Masterplan – Part 1: Blue Gum Lake to Yangebup Lake



Recreation Masterplan – Part 2: Kogolup Lake to The Spectacles


Key
Information Centre
Information
Picnic Tables
Sheltered Picnic Facilities
Toilets
Disabled Access
Car Park
Play Equipment
Observation Site
Walk Circuit
Historic Site
Boat Ramp
Fishing Location
INDIAN
OCEAN
LEGEND
Conservation and Protection
Natural Environment Uses
Recreation
Sport and Recreation
Existing Dual Use Path
Proposed Dual Use Path
Walk Trails
Existing Viewing Platform
(Proposed access based on City of Cockburn Trails Master Plan)
0.5 1.0 1.5 2.0 2.5km
Cockburn Road
Rockingham Road
Azelia Ley Homestead
Manning Lake
Rockingham Road
Stock Road
Market Garden Swamp 1
(includes a BMX track & Skate ramp)
Market Garden Swamp 2
Bellair Drive
Lighthouse
Lake Coogee
Woodman Point Regional Park
Jervoise Bay
Cockburn Road
Russell Road
Tiger Kart Club, Coastal Motorcycle Club & WA Radio Modellers
Henderson Foreshore
Lake Mt Brown
Mt Brown
City of Cockburn
Town of Kwinana
Rockingham Road

Appendix C - CALM policies referred to in this Plan

Rehabilitation of disturbed land, Policy Statement No. 10

Community Involvement (Public Participation and Volunteers), Policy Statement No. 15

Recreation, Tourism and Visitor Services Policy Statement No. 18 [review in preparation]

Fire Management Policy, Policy Statement No. 19

Beekeeping on Public Land, Policy Statement No. 41 [review in preparation]

Radio/ Tele Communications Facilities, Policy Statement No. 49 [review in preparation]

Visitor Risk Management, Policy Statement No. 53

Proposed Environmental Weed Management Policy [subject to final consultation]

Proposed Management of Pest Animals on CALM-managed Lands [subject to final consultation]

Appendix D - Vegetation communities and assemblages within the Park

THE UPLAND VEGETATION COMMUNITIES AND ASSEMBLAGES

In the Park there are six types of upland plant communities or assemblages:

- **Low Woodland of Banksia Species**
  Characterised by the dominant species of *Banksia attenuata* and *B. menziesii* at Blue Gum Lake, Kogolup Lake, Thomsons Lake and Harry Waring Reserve and with the addition of *B. ilicifolia* and *B. grandis* at Brownman Swamps and Lake Mount Brown, in medium to good condition.

- **Low Woodland to Low Forest of Eucalypts and Banksia species**
  Present at North Lake, Yangebup Lake and Brownman Swamps in good condition with patches also remaining at Bibra Lake. The species include *Eucalyptus marginata, Banksia attenuata, B. menziesii, B. ilicifolia* and *B. grandis.*

- **Open Forest of Eucalypt and Banksia species**
  Occurs at Brownman Swamps which is the best representation both in terms of area extent and condition but is also present at Yangebup Reserve (in good condition), and at South Lake, Manning Lake and Market Garden Swamps (in altered condition). The dominant species comprise *Eucalyptus marginata, E. gomphocephala, Banksia attenuata, B. menziesii, B. ilicifolia,* and *B. grandis.*

- **Low Woodland to Low Forest of Eucalypts, Casuarina and Banksia**
  Present at Thomsons Lake and The Spectacles in good condition and at Kogolup Lake in moderate condition, comprising the following dominant species*: Eucalyptus marginata, Corymbia calophylla, Banksia attenuata, B. menziesii* and *Allocasuarina fraseriana.*

- **Very Low Open Woodland Eucalypt species**
  Occurs around Thomsons Lake with the dominant species being *Eucalyptus todtiana*.

- **Scrub of Acacia**
  Present at Thomsons Lake with the dominant species being *Acacia saligna*.

THE WETLAND VEGETATION COMMUNITIES AND ASSEMBLAGES

There are twelve types of wetland communities or assemblages present in the Park:

- **Low Forest of *Melaleuca rhaphiophylla***
  Occurs at Booragoon Lake, North Lake, Kogolup Lake and at The Spectacles in good condition.

- **Low Woodland to Low Forest of *Eucalyptus rudis***
  Occurs in patches or in combination with other assemblages at Booragoon Lake, Kogolup Lake, Thomsons Lake, Banganup Lake (Harry Waring Reserve), and The Spectacles in good condition and in poor to medium condition at North, Bibra and Little Rush Lakes.

- **Low Forest of *Melaleuca preissiana***
  Fairly widespread occurring in ten Park locations, being best represented at Piney Lakes Reserve, Kogolup, Thomsons, Banganup, North and South Lakes and at The Spectacles.

- **Low Open Forest of Melaleuca**
  Occurs at Piney Lakes and at Banganup Lake and comprises *Melaleuca preissiana* as the dominant species over an understorey heath of *M. teretifolia* and *M, lateritia.* Its best example is at Piney Lakes. This was once a widespread community typifying the Bassendean wetland assemblages.

- **Low Open Woodland of Marri and Paperbark**
  Occurs at Piney Lakes in good condition and comprising *Corymbia calophylla* and *Melaleuca preissiana.*

- **Low Open Woodland of Banksia and Melaleuca**
  Occurs at five Park locations being best represented at Thomsons, North and Piney Lakes and the eastern shore of Bibra Lake.

- **Shrubland of *Melaleuca teretifolia***
  Is widespread throughout the Park both in patches and as dense thickets, being best represented at Booragoon, Bibra and South Lakes and at The Spectacles but also occurring at Little Rush, Banganup and Kogolup Lakes.

- ***Banksia spp. and Agonis linearifolia* Scrub**
  Has only been cited at only North Lake where it is in good condition.

- **Heath of *Astartea fasticularis***
  Once widespread through the adjacent Jandakot region but very little of it remains, cited only at Piney Lakes, where it is in good condition. This species also occurs, again at Piney Lakes, as a heath in combination with *Viminaria*.

- **Sedge communities**
  Occur at a number of the wetlands:
  Baumea articulata occurs in minor areas at both Thomsons and Banganup Lakes. *Schoenoplectus validus* occurs as a minor community at Little Rush Lake. It is uncommon and is worthy of protection. There is a community of *Isolepis species,* which is also uncommon in the southern wetland at The Spectacles.

- **Low Woodland to Low Open Forest of *Melaleuca rhaphiophylla* with an understorey of sedgeland and open shrubland**
  Occurs in all of the reserves of the eastern chain but is best exemplified at Brownman Swamps.

- **Low Forest of *Melaleuca cuticularis* along with shrubland of *M. cuticularis* and *M. rhaphiophylla* and Low Samphire Heath, comprised of *Sueda australis, Atriplex pseudosum* and *Sarcocornia spp.,***
  Occur at both Lake Coogee and Market Garden Swamps, but are disturbed in both locations and in need of rehabilitation and protection.

THE COASTAL VEGETATION COMMUNITIES AND ASSEMBLAGES

There are four types of coastal communities or assemblages In the Park:

- **Low Open Woodland Eucalypt species**
  Occurs in minor patches at Manning Reserve and the M 91 Henderson Reserve, being *Eucalyptus decipiens*, which, whilst having been disturbed, is an important representative.

- **Scrub of Acacia**
  Present as *Acacia rostellifera* along with *Melaleuca hugelii* at Manning Reserve, the Henderson foreshore area (M91) and the Brownman Swamps. All in juxtaposition with Low Heath Communities as described below.

- **Low Heath Communities**
  Present at Manning Reserve, the Henderson foreshore area and the Brownman Swamps incorporating, amongst others, *Melaleuca hugelii, M. acerosa, Grevillea thelemanniana* and *Hibbertia hypericoides,* with the highest diversity heath community being at the Henderson foreshore. A further Low Heath community also occurs in restricted areas at the Henderson foreshore and that comprises a dominance of *Acanthocarpus preissii* and *Frankenia pauciflora,* in fair to good condition.

- **Scrub of Parrot Bush**
  Occurs in patches at Manning Reserve, the Henderson foreshore and Brownman Swamps being *Dryandra sessilis* in association with *Hakea prostrata*.

Appendix E - Swan Coastal Plain Landscape Character Type

SCENIC QUALITY	LANDFORM	VEGETATION	WATERFORM
HIGH	• Rounded foothills with steep slopes. • Dunal formations of distinctive height, configuration or combination which provide obvious contrast to the landform patterns common in the character type (e.g. Spearwood dunes). • Dissected calcareous dunes featuring rugged limestone cliffs, caves and outcrops (e.g. Blackwall Reach). - Gently inclined or level areas with distinctive drainage patterns (e.g. Pinjarra Plain). • Large stretches of coastal landscape free of disturbance (coastal heath). Coastal dunes which display areas of active weathering, steep and irregular slopes and ridges (e.g. Lancelin). - Prominent limestone cliffs and headlands (e.g. Cape Peron). - Offshore estuarine sandbars and reefs.	• Scattered remnant vegetation forming an open parkland. • Remnant or other areas of native vegetation exhibiting an unusual diversity of colour, height or species. • Distinctive displays of seasonal colour. • Wind-shaped, gnarled or dwarfed vegetation unusual in form, colour or texture. • Strongly defined patterns of woodland, dune and wetland vegetation.	• All estuaries, wetlands and swamps. • Watercourse of permanent or intermittent flow with continually changing flow character. • Reservoirs with dominant natural characteristics.
MODERATE	• Expanses of beach with uniform width and colour. • Regular coastal edges without bays, inlets or cliffs. • Areas of plains with common patterns of dissection evident but not distinctive. • Areas of uniform undulation with less distinct drainage. • Dunal formations and uniform height and configuration.	• Less diversity in vegetation with regular patterns in height, colour and texture evident. • Vegetation patterns found commonly in the surrounding landscape (coastal heath).	• Intermittent watercourses with long stretches of unchanging flow characteristics. • Reservoirs with some natural characteristics.
LOW	• Areas of uniform indistinctly dissected plains with few features of visual interest. • Coastal landscapes which are of special visual significance and therefore rate no lower than moderate scenic quality.	• Extensive areas of vegetation with repetitive patterns or showing little variation or diversity (coastal heath).	• Waterbodies with little evident natural characteristics. • Irrigation and drainage.

Appendix F - Glossary of terms

Aeolian	soil massing formed through deposition by wind blow.
Avian	of or pertaining to birds.
Avifauna	the birds of a given region.
Biota	The sum of all species occurring in a defined area – it includes flora and fauna, invertebrates, fungi, bacteria and viruses.
Calcareous Silt	fine particles of lime/calcium sediment.
Consanguineous	as in 'related by birth'. In the case of Beeliar Regional Park it refers to each of the chain of wetlands having formed from the same or similar event or cause.
Dolomite	common mineral, calcium magnesium carbonate.
Eutrophication	the process of which occurs in waters high in nutrients encouraging the growth of algae.
Geomorphic/ Geomorphology	resembling the earth in form/ the study of the characteristics, origin and development of landforms.
Hydroperiod	the time taken for the drier-wetter-drier cycle to occur seasonally. In this instance a cyclical pattern has been noted whereby some seasons have shorter hydroperiods than others, over a twenty two year span.
Ramsar	Convention on the Conservation of Wetlands of International Importance: Especially as Waterfowl Habitat. Known as the Ramsar Convention
Stratigraphy	in this context: '…..complex underlying (layering) of impervious and porous layers….'
Tamala Limestone	formerly known as coastal limestone, consisting of coarse to medium grained calcarenite, composed of skeletal fragments etc it is of the Pleistocene age.
Taxa	(singular, taxon) refers to a taxonomic entity such as species, subspecies, variety.

Appendix G - Contacts

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