

Proposed Port Kennedy and Rockingham Parks Management Framework

Includes the Port Kennedy Scientific Park,
Lake Richmond, Anstey Swamp, Paganoni Swamp,
Tamworth Hill Swamp, Lake Coo loongup
and Lake Walyungup

Prepared for



CITY OF ROCKINGHAM



WESTERN AUSTRALIAN
PLANNING COMMISSION



DEPARTMENT OF CONSERVATION
AND LAND MANAGEMENT

PORT KENNEDY
BOARD OF
MANAGEMENT

By

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Foreword

The State Government is committed to the protection and preservation of our natural parks which form an essential part of our heritage.

The Rockingham Lakes, Lake Coo loongup and Lake Walyungup, have been set aside as a Regional Park for many years and now, with the addition of Port Kennedy, Lake Richmond, Tamworth Hill, and Anstey and Paganoni Swamps, the opportunity for the creation of an integrated Parks System in the Rockingham district has become a reality.

The parks provide opportunities for interactive community learning about the natural environment. This proposed management framework emphasises conservation of the environmental values and research, learning, interaction, discovery and opportunities for low-impact recreation compatible with those values.

The Rockingham area is experiencing rapid urban growth and development, and the creation of this park will assist in providing a substantial recreation and conservation resource for its existing and future population.

I would like to thank the members of the Steering Committee, the consultants and members of the public who assisted in the preparation of this management framework.

Although this document has been prepared on behalf of the Western Australian Planning Commission, the Department of Conservation and Land Management will soon assume management responsibility for the parks. This management framework will therefore form the basis for CALM's future management plan.

Public comment is now sought on the ideas presented in this report. I urge you to make your views known by sending a submission to the following address by 7 November 1997:

***Port Kennedy and Rockingham Parks
Management Framework***

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Graham Kierath MLA
Minister for Planning

Introduction

The Port Kennedy Scientific Park and the Rockingham Lakes Regional Park – Lake Richmond, Anstey Swamp, Paganoni Swamp, Tamworth Hill Swamp, Lake Cooloongup and Lake Walyungup – form a vast network of environmentally significant land across a broad expanse of the City of Rockingham.

It is an area with a geology, geomorphology, hydrology and vegetation that is continuous from west to east. It has considerable importance in terms of research into the evaluation of wetlands, coastal history, biological succession and palaeoclimate for the past 7000 years. The educational value of these parks is not restricted to scientific study – there is also great potential for the general community, and young students in particular, to learn much from the diverse ecology and geomorphology of the parks.

The parks also contain endangered fauna and threatened plant communities, and there are important links with other ecosystems – including the Shoalwater Islands Marine Park and regional wetlands at Leda, Beeliar, Stakehill and in the Peel region.

With the State, national and international importance of this extensive Parks System in mind, the Western Australian Planning Commission, the Port Kennedy Board of Management, the Department of Conservation and Land Management and the City of Rockingham joined forces in a bid to determine how the total Parks System could best be managed to protect its environmental values, while allowing for a range of appropriate public uses.

These four bodies commissioned a comprehensive report to develop a Management Framework for the Rockingham Parks – one which could protect the environmental value of the parks while allowing for the widest possible range of appropriate use by the public.

During the undertaking to develop this Management Framework, there has been an intensive information gathering process, through consultation with experts and interested parties, and through detailed reference to a range of

literature which relates to other Australian and overseas parks with major scientific, educational and interpretational roles.

A Steering Committee was appointed to act on behalf of the four authorities. This committee sought comments, input and ideas from a range of community groups, organisations, agencies and interested individuals, through discussions, meetings and a community workshop. Much of the Management Framework's direction is based on the views of the many people and organisations who were consulted.

A Scientific Advisory Committee was also established, to advise and assist the team of consultants preparing this Management Framework. This committee provided specific and general information on the Rockingham Parks' biological, environmental and geomorphic values, participated in the community workshop, made recommendations to the Steering Committee and reviewed the Management Framework document.

The Management Framework was developed with a number of objectives in mind, and it looked at the different needs and requirements for the area known as the Port Kennedy Scientific Park and the various lakes, swamps and wetlands that comprise the Rockingham Lakes Regional Park. The similarities and links that exist between these two parks were also examined.

The individuals involved were asked to consider and clearly define the concept of a "Scientific Park" at Port Kennedy, and to develop a scheme that would encourage scientific research into the natural features of all the parks – and interpret that research for the public and students.

They were also asked to identify the biophysical resources of both parks, and consider how those resources could be most effectively managed.

Another objective was to identify the potential for ecotourism, recreation and leisure activities within the Parks System, and allow for enhanced public use of the parks.

With all that information gathered, the team was to prepare the Management Framework for the

parks, bearing in mind the legislation, policies, development plans and management plans already in place in relation to the parks. The intention was to establish a basis for the future development of more detailed management plans for each of the parks and the total Parks System – after public review and assessment by Government agencies and other interested parties.

A Vision for the Rockingham Parks

The result of this extensive consultation and research process is a positive vision for the future of these important natural resources – to ensure that these areas are preserved so that their unique qualities can continue to be appreciated by new generations of Western Australians, and to ensure that the valuable information acquired during study of the Parks System can help us towards a greater understanding of our fragile environment.

As a result of the environmental significance of the Port Kennedy Scientific Park and the Rockingham Lakes Regional Park, it is recognised that the primary aim of the Port Kennedy and Rockingham Parks Management Framework must be conservation of the natural environment. But that does not mean that the Parks System cannot be enjoyed and appreciated for the potential recreational, scientific and educational activities it offers. These activities must simply be conducted in a manner that has minimal impact on the environment, for its long-term benefit.

The Management Framework proposes a wide variety of potential uses for the Parks System, some of which are already well established uses. These potential uses have been illustrated in a comprehensive Master Plan, which is included within this report.

The Master Plan is a starting point for a range of opportunities within the Rockingham Parks. It represents a basis for discussion and further deliberation. The Master Plan outlines options for appropriate development which could be used as suggested, refined through further research or simply ruled out, according to the choices of the decision-making authorities. The important factor, though, is to create a vital yet flexible park

capable of fulfilling the range of complementary demands placed upon it – specifically conservation, education and recreation.

The Master Plan – an important part of the overall Management Framework – includes a system of scenic walk trails which would link the various areas of the Parks System, with shorter loops for visitors entering the areas from major roads or adjoining residential areas. The walk trails would be aimed at people with a range of fitness levels, and provide opportunities for interaction with the natural environment. Educational information would be provided at strategic locations along each trail – in the form of tokens, signs or information shelters to create self-guided tours – and supplemented by publications about each area.

While the trails would be aimed primarily at pedestrians, the scale of the region suggests the possibility of cyclists having access to some areas, and regulated bicycle hire could be introduced. Access by motor vehicles would be strictly controlled and confined to specific, predetermined recreational areas. There would be some regulated vehicle access for management, scientific and educational purposes within the Port Kennedy Scientific Park.

The Master Plan also clearly defines areas for equestrian pursuits. A marathon ride adjacent to Paganoni Swamp and the exercising of horses on the southern 800m of the Port Kennedy Scientific Park beach are provided for within the framework.

General access to the Port Kennedy Scientific Park will be restricted by a proposed vermin-proof fence, but pedestrian access would be provided at strategic locations.

The potential for ecotourism is shown through infrastructure that includes the walk trails, car parks, picnic areas, observation platforms, toilets and lookouts.

Effective promotion of the Parks System could focus on an educational, research and interpretation centre, with displays, a lecture theatre, laboratories and viewing platforms. The Master Plan includes suggested locations for such a centre.

Of course, the role of the local community is vital to the success of this vision for the Rockingham Parks. This means more than just public awareness, and includes direct involvement in the management of the parks. The Management Framework has three options for the management of the Parks System, each of which is detailed within this report. Common factors in each of these management options include the establishment of a regional foundation, to raise funds for scientific and educational projects; a Scientific Advisory Committee, to identify and coordinate research within the region and assist the exchange of knowledge; and, an Education Council to promote networking and science through education.

The Rockingham Parks provide an opportunity for interactive community learning and sharing of knowledge about the natural environment. To realise this opportunity, the Management Framework puts the emphasis on conservation of environmental values and research, learning, interaction and discovery – and low-impact recreational activities that preserve those values.

A bright future for the Rockingham Parks is possible – a future that encourages cooperation and community involvement to protect and enhance the important features of the Parks System, while allowing careful and considerate public access and enjoyment.

Attributes of the Rockingham Parks

As part of the research process in preparing a Management Framework for the Rockingham Parks, the participants and consultants closely examined the many attributes of the Port Kennedy Scientific Park and the Rockingham Lakes Regional Park. These attributes were examined in terms of:

- The regional context;
- Surface geology;
- Geomorphology;
- Coastal processes, sea level and coastal history;
- Wetlands;
- Thrombolites;
- Flora and vegetation; and
- Fauna.

Their findings can be summarised as follows.

The Regional Context

The scientific and conservation values of the area are increased by the location of the Rockingham Parks within the region, and their potential for linkages with other ecosystems. These other ecosystems include the Shoalwater Islands Marine Park and nearby wetlands at Stakehill, Leda, Beeliar and the Peel Region. The parks feature a diverse range of geology, geomorphology, wetland type (fresh, saline, permanent water, ephemeral, large and small), flora, fauna, habitat and land-use practices. This diversity also considerably increases the scientific value of the parks.

Surface Geology

The surface geology of the Rockingham Parks is of considerable interest. It comprises various sediments of marine and estuarine origin which were deposited during the Pleistocene and Holocene periods, from 1.8 million years ago to the present.

Safety Bay Sand, which covers the Port Kennedy Scientific Park and is dominant around Lakes Richmond, Cooloongup and Walyungup, is the most extensive of these sediments. Other geological units in the area include Becher Sand, Tamala Limestone, Leschenault Formation and Cooloongup Sand. Summary descriptions of each geological unit are included in the appendices.

Geomorphology

The Rockingham Parks are located on two major geomorphic landforms known as the Quindalup Dune System and the Spearwood Dune System.

The Quindalup Dune System is a relatively recent (Holocene) landform which lies along and inland from the coast between Dongara and Geographe Bay. Within the study area the Quindalup system is made up of Safety Bay Sand and has formed a distinct geomorphic area known as the Rockingham-Becher Plain. The Port Kennedy Scientific Park and Lakes Richmond, Cooloongup and Walyungup are located within this plain, which is mostly made up of parallel sand ridges with intervening poorly developed swales. The ridges vary from 2m to more than 20m in height and may be partially or fully stabilised by vegetation. They were deposited along former shorelines over the past 7000 years in a continuing process. This record of relatively recent formation provides perhaps the most important scientific interest and value of the Port Kennedy Scientific Park.

The interaction of swells and waves approaching the coast through the offshore islands and submerged sandbanks has influenced the deposit of sand and created Point Peron to the north and Point Becher to the south. These "cusped forelands" are also of considerable scientific interest.

The Spearwood Dune System comprises a series of shore-parallel ridges and depressions of the Pleistocene Tamala Limestone. The system is a major landform in the Swan Coastal Plain and in the Rockingham area it comprises roughly shore-parallel submarine and emergent ridges and associated depressions. The depressions have been partially in-filled by Holocene sediments.

The Spearwood system occurs east of Lakes Coo loongup and Walyungup. Tamworth Hill Swamp is wholly contained within the system, as are Anstey and Paganoni Swamps, which occupy low-lying areas between dune ridges.

Coastal Processes, Sea Level and Coastal History

The Rockingham-Becher Plain provides a record of changes in sea levels during the Holocene period, and a large component of the value of Port Kennedy Scientific Park lies in its geomorphology and this record of coastal change. It may be used as a model to illustrate a stratigraphic approach to analysing and understanding the evolution of coastal geomorphic systems. The area also provides an example of modern sedimentation and coastal geomorphology, and it exhibits a range of significant features in terms of calcrete, climate history and sea level history. The proximity of the Shoalwater Islands Marine Park increases the opportunities for promoting research into the coastal processes.

Wetlands

The Rockingham Parks include wetlands that show variety in size, salinity, permanence and depth, and this diversity increases the opportunities for scientific research. The wetlands

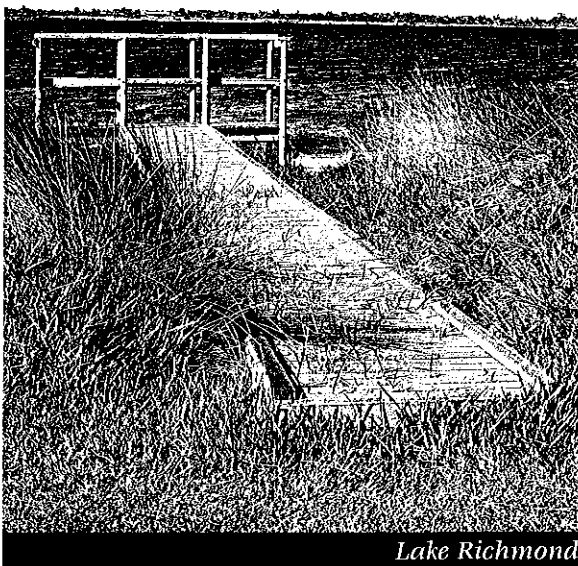
are recognised for their conservation values and defined as a significant group in the Australian Nature Conservation Agency's Directory of Important Wetlands in Australia (1996).

Lake Richmond was formerly part of a southern extension of Cockburn Sound which was filled in about 4000 years ago. It is fresh and its 15m depth is unusually deep for a lake on the Swan Coastal Plain.

Lakes Coo loongup and Walyungup were also part of Cockburn Sound but were isolated from the sea at an earlier time. Both are shallow and saline, and increasing in salinity each year. The presence of freshwater wetlands and seepage adjacent to the saline lakes is an interesting feature.



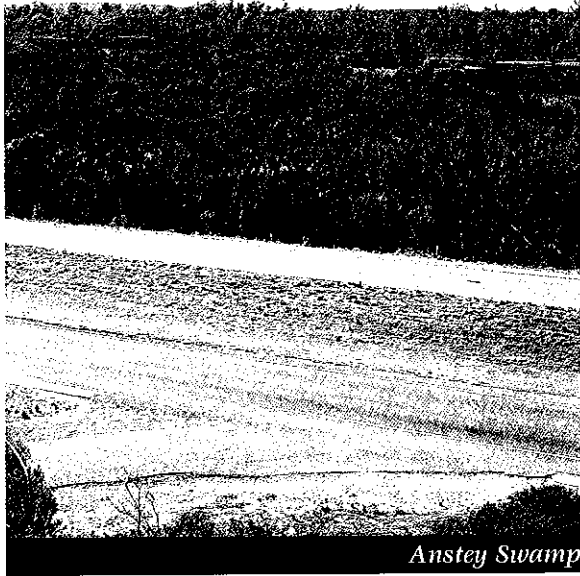
Lake Walyungup



Lake Richmond

Tamworth Hill Swamp, in the Spearwood Dune System and part of the Stakehill Suite of wetlands, is a freshwater mesoscale sumpland (an area seasonally inundated) with a *Melaleuca Rhaphiophylla* perimeter and sedgeland covering the remainder. The substrate is black humic mud, traditionally a source of peat.

Anstey and Paganoni Swamps are also in the Stakehill Suite, and considerably larger than Tamworth Hill Swamp. The water levels fluctuate extensively and salinity levels are comparatively low. Anstey Swamp was recently damaged by an intense bush fire, but the wetland vegetation is slowly regenerating.

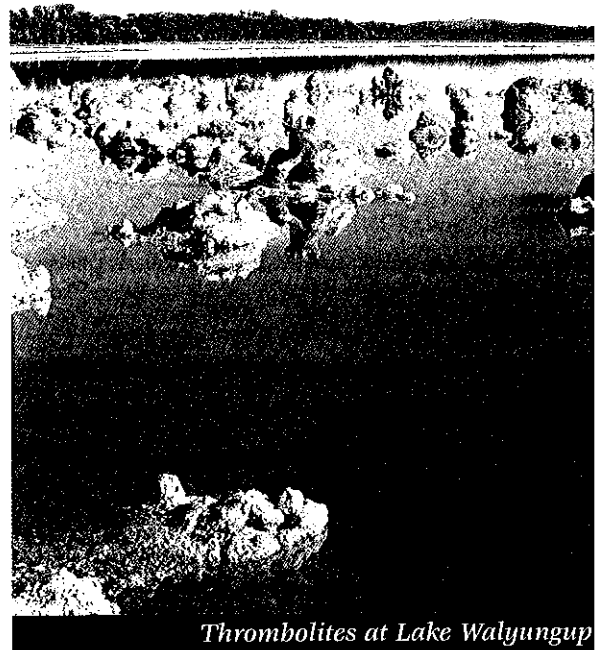


Anstey Swamp

In contrast to all of these wetlands, the wetlands at Port Kennedy are microscale. They form part of the Becher Suite and comprise seasonal sunplands and damplands roughly parallel to the coast in depressions between the sand ridges. Each of these wetlands is part of an evolutionary time sequence and supports examples of threatened plant communities. The relative youth of the wetlands, the geomorphic history and the range in age represented within the area provides excellent opportunities for research on wetland evolution.

Thrombolites

Lakes Richmond, Walyungup and Coo loongup contain examples of microbialites, the collective name for organosedimentary structures formed by micro-organisms, which include stromatolites and thrombolites. These structures were common in the Pre-Cambrian and Cambrian ages (3.5 billion to 570 million years ago) and are the oldest life-form on earth. Their study can aid the interpretation of past environments and allow the reconstruction of the Earth's earliest biosphere. Accordingly, the thrombolites at Lake Richmond, Coo loongup and Walyungup have considerable scientific value. These populations are at risk from physical disturbance through trampling and removal, increased water levels and changes in water quality.



Thrombolites at Lake Walyungup

Flora and Vegetation

The vegetation of the Rockingham-Becher Plain is diverse and reflects the geomorphic units and depth to groundwater, as well as disturbances such as fire.

The Port Kennedy Scientific Park includes threatened plant communities which are classified as critically endangered. Weed invasion is generally restricted to tracks and firebreaks, although some of the wetlands have been invaded by bulrush. There is more weed invasion and greater disturbance within the vegetation to the east, at Lark Hill West, and recent fires have affected the northern part of the park. The vegetation is expected to regenerate in the long term if the area does not suffer continuing disturbances.

Vegetation at Lake Richmond has been extensively disturbed by introduced species and fire, and at Tamworth Swamp the vegetation has been degraded in the past by fire and overgrazing. Lakes Coo loongup and Walyungup support at least 13 different vegetation associations, and mixed associations of algae, with stonewort, a major food source for Black Swans, the most important and extensive. The eastern side of Lake Coo loongup has been invaded by several weed species, most likely as a result of rubbish dumping. Weeds in other areas are generally restricted to access paths and firebreaks.



Vegetation at Lark Hill West



Paganoni Swamp

Vegetation at Anstey and Paganoni Swamps has been disturbed by fire and weed invasion. The wetland vegetation at Anstey Swamp is recovering from an intensive bush fire, and although Paganoni Swamp has been grazed in the past, the condition of the vegetation is generally good, with weed invasion restricted to a buffer zone and firebreaks.

Fauna











The vegetation and wetlands of the Rockingham Parks system support a wide range of native fauna, but the introduction of feral animals,

especially foxes and cats, frequent fires and weed invasion are likely to have reduced the number and populations of species within the region.

Despite its degraded condition, Lake Richmond supports a wide variety of fauna, including the long-necked tortoise, an unnamed species of mollusc, several species of fish, five species of frogs and several other species of reptile. More than 100 bird species have been sighted in the reserve. Feral fauna at Lake Richmond includes foxes, cats and rabbits.

The diversity of habitats at Lakes Cooloongup and Walyungup reflects the variety of fauna

LAKE RICHMOND
THE JANE MUELLER ENVIRONMENTAL WALK
 LAKE RICHMOND, A PERENNIAL FRESHWATER LAKE 1000m LONG & 600m ACROSS, IS UP TO 15m DEEP.

 AUSTRALIAN PELICAN Pelicans moult on Lake Richmond each spring when they concentrate to observed feeding on Sea Kelp.	 AUSTRALIAN SHEELUCK A large duck visiting from the edge of the lake.
 BLACK SWAN One pair nests here every year.	 PACIFIC BLACK DUCK A common duck on local waters.
 WHITE-FACED HERON Heron feed on the many tadpoles and frogs in the lake.	 MUSK DUCK The musk has a large like frogging beak. This is a diving duck.
 EURASIAN COOT Coots feed in open water, diving for vegetation.	 BLACK-WINGED STILT The stilt is a wading bird. It feeds in shallow water.
 PURPLE SWAMPHEN Swampheens graze around the edge of the lake eating on plants on the bank.	 COMMON GREENSHANK A wading bird. It feeds in shallow water.

STROMATOLITES
These stone structures are the oldest known life form on earth. In both there are large green structures and smaller yellow structures.

LONG-NECKED TORTOISE
The tortoise lays eggs in surrounding swamps. It can be seen feeding in the lake.

MOTORBKE FROG
This is common all year but only heard of calling in the summer and spring.

TIGER SNAKE
Keep to the track. The tiger snake is a land snake.

ACACIA CYCLOPS
A spring and swamp. It has large, curly seedpods.

HARDENBERGIA
A beautiful creeper with purple and yellow flowers in winter and spring.

JACKSONIA
A small, loose shrub found in dry areas, having orange-yellow pea flowers.

CONOSTYLIS
Relates to kangaroo. It has yellow flowers.

MELALEUCA HUGGELI
Known as Olive. It is a small, scraggy tree - 6-8m.

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Existing interpretive information at Lake Richmond

recorded there. This includes 73 species of birds, plus fish, the long-necked tortoise, frogs, snakes, lizards, skinks and koonacs. The tall open Tuart forest at Lake Cooloongup and Tamworth Hill Swamp and the Marri-Jarrah-Tuart forest at Tamworth Hill support grey kangaroos, and the black-gloved wallaby has been recorded in the area.

Fauna surveys in the Port Kennedy area have concentrated on mammals. The western grey kangaroo, black-gloved wallaby, wallaroo, echidna, dunnart, the bush rat and the rare and endangered southern brown bandicoot have all been recorded on the site. The wallaroo is believed to have been introduced, because its natural range does not include the Perth Metropolitan Region. The populations of smaller animals are at risk of predation by foxes and cats.

Anstey and Paganoni Swamps provide excellent habitats for a range of less common waterbirds. The swamp harrier, egrets, herons, ibis and cormorants use the wetlands for nesting.

Issues for Consideration

A number of management issues had to be considered as part of the process to develop a Management Framework for the Rockingham Parks. These included the impact of increasing urbanisation in the region.

- Nutrients and contaminated water introduced into the region through surface flow and groundwater seepage could result in changes to the parks' hydrology, alteration to the water balance and quality, and saltwater intrusion, all of which could have a significant impact on the wetlands.
- Increased use of areas by humans has been associated with rubbish dumping, the spread of weeds, fire and an eventual decline in native vegetation.
- Off-road vehicles and horses can cause erosion, disturb fauna and spread weeds, and feral and domestic animals – including foxes, rabbits, cats and dogs – have an impact on native fauna.
- Conservation may not be the primary objective of the private owners of sections of Lake Richmond and Tamworth Hill, Anstey and Paganoni Swamps.
- Future developments, including construction of major roads and a proposed railway line to Mandurah, also have potential to have an impact on the region's natural attributes.

Appropriate planning and management of the area is therefore vital, to limit and reduce these pressures, and to maintain and enhance the region's environmental values.

Key principles for managing the Rockingham Parks echo the issues highlighted by the Steering Committee and Scientific Advisory Committee and raised at the community workshop.

- Planning for the area should be based on a holistic approach, taking into account existing management practices and land uses including urban development, the Port Kennedy resort development, CALM's activities in the area and the marine environment.

- Conservation, scientific research, education, science promotion and interpretation should be the primary management objectives.
- The region should be seen as a resource for community education and the sharing of knowledge, with a focus on research, learning, interaction and discovery – and community involvement in day-to-day management.
- Existing and future recreational needs should be recognised and assessed.
- Only activities that can be supported in each specific area should be permitted.

A sense of identity is also considered vital, and there is a need for the Rockingham Parks to be readily recognised under a single, evocative name – and one that ideally would reflect the scientific values of the region. The Scientific Advisory Committee suggested a number of names (as included with its recommendations in the appendices), but a public competition is another option for choosing a name and would also increase public awareness of the parks and encourage community involvement in their management.

Complementary design should also feature throughout the Parks System, to establish continuity and reaffirm the links between each component area. Signs and information shelters should follow a consistent design that is easily recognisable as representing the Rockingham Parks.

Additions to the Parks System

There is a recognised need to extend the area of the Rockingham Parks system to include adjacent areas of significance:

- The southern boundary of the Port Kennedy Scientific Park should be brought into line with the southern boundary of the Shoalwater Islands Marine Park.
- Point Peron, another important geomorphic feature and the twin cusped formation with Becher Point, should be included within the Rockingham Lakes Regional Park.

- The foreshore south of Becher Point, adjoining the Port Kennedy Scientific Park, is a narrow strip 25m wide from the high water mark to the first line of permanent vegetation. It is currently Vacant Crown Land, and should be incorporated into the Scientific Park.

Community Involvement

As previously stated, local community involvement in the Rockingham Parks is considered vital to the success of the Management Framework. This should mean more than just community awareness – it should involve opportunities for direct public input and participation in management. It is felt such involvement would help achieve the Framework's conservation objectives and promote a sense of responsibility for the parks.

Some individuals and community groups are already involved in areas of the Parks System – the local branch of the WA Naturalists Club manages Lake Richmond for the City of Rockingham, and the Port Kennedy Land Conservation District Committee has managed an area of the Port Kennedy Scientific Park for several years. The continued involvement of community groups in the ongoing management structure should be encouraged.

A Rockingham Parks Foundation and a Science Education Council should be established, with members drawn from the community. The foundation would attract donations for research projects and work with the education council. The education council would involve local schools, community groups, education authorities, universities and environmental education associations. Its role would be as a network on science education and an advisory body to promote this branch of education.

Management Structure

Management of the Rockingham Parks is currently the responsibility of several organisations, including the Cities of Rockingham and Mandurah, the Western Australian Planning Commission, the Department of Conservation and Land Management (on behalf of the National Parks and Nature Conservation Authority), Port Kennedy Board of Management, and the WA Naturalists Club. Portions of Anstey, Tamworth Hill and Paganoni Swamps are in private ownership, as is part of Lake Richmond.

This existing management structure does not readily allow for a holistic approach to the region, or facilitate the exchange of information between land managers, scientists and community groups. Three alternatives for the management of the Rockingham Parks have been suggested.

Option One

This model proposes that a Community Advisory Committee be set up to liaise with and advise management agencies. It should be a committee with high public visibility and strong mission and role statements – and structured in a way that ensures it is seen as more than just a token group. Members could include representatives from the City of Rockingham, community groups, the Ministry for Planning, Port Kennedy Board of Management, the Water and Rivers Commission and the Department of Environmental Protection.

In turn, advisory bodies should be set up to liaise with the Community Advisory Committee: a Port Kennedy and Rockingham Lakes Foundation should be set up, with membership from the community, to raise funds for scientific research and education; a Scientific Advisory Committee should be established to identify priorities for research; and, a Science Education Council formed to promote science through education and form networks to share knowledge. These bodies would have members represented on the Community Advisory Committee.

The Community Advisory Committee would report to the community, the City of

Rockingham, State Government agencies and the National Parks and Nature Conservation Authority through CALM.

Option Two

This model recommends a Regional Board be set up to manage the Park System. A board would have greater regional authority and identity than a Community Advisory Committee, but would require statutory support. The Board would receive direction from the NPNCA and provide direction to CALM.

Option Three

This model contains elements of the first two proposals, and is preferred by the Steering Committee. It recommends establishing a Community Advisory Committee, as well as giving consideration to the formation of a Regional Board at some time in the future.

Regardless of which model is adopted, it is recommended that an Executive Officer be engaged to liaise with the stakeholders in the region and ensure the objectives of the Management Framework are achieved. This Executive Officer may have park management, scientific and/or science education skills, and should be supported by on-ground staff – including a full-time ranger.

Resources

There are a number of potential sources for funding to implement the Management Framework. These include funds raised by the proposed Foundation, for scientific and education projects; the Lotteries Commission; State Agency and Local Government operating budgets; and Commonwealth, State and Corporate grants programs, including Save The Bush, One Billion Trees, Gordon Reid Foundation, Trees and Seeds for Diversity and Water Watch. Corporate sponsorship, from companies keen to be associated with environmental and scientific excellence – particularly those located in the City of Rockingham – is another possibility.

Programs such as those incorporated within New Work Opportunities could provide labour, and community groups could provide labour, knowledge and other support services.

Consideration should also be given to obtaining international support for the Rockingham Parks, possibly from science organisations and research institutions.

Asset and Risk Management

Appropriately comprehensive Asset and Risk Management plans should be developed for the Rockingham Parks, and all associated infrastructure. This should include plans to ensure management and funding for the replacement of assets when needed, including the vermin-proof fence, for the next 20 years. Risk management should cover potential risks to the natural environment, minimising the risk of shortfalls in funding and resources, ensuring and encouraging support for the parks, as well as minimising the risks and liabilities associated with public use.

Evaluation and Review

A regular review and evaluation process is recommended for the Management Framework and any associated Management Plans. Factors for consideration include the success of management strategies, advances in scientific knowledge and changes in community attitudes.

The Management Framework

This Management Framework, developed for the future protection and enhancement of the Rockingham Lakes, is divided into four parts. These consider the management of the lakes system specifically in relation to:

- Conservation;
- Scientific Research;
- Information, Interpretation and Education; and
- Recreation.

Management for Conservation

The Port Kennedy Scientific Park and Rockingham Lakes Regional Park are subject to environmental changes and other factors that need to be considered.

Regional Hydrology

Changes to the hydrology of the Rockingham region caused by urbanisation, rural land uses and waste disposal have the potential to affect the status of the wetlands within the Rockingham Parks.

Changes to the hydrology of Lake Richmond since 1968 have reduced salinity levels and created a freshwater lake. Heavy metals and nutrient levels are low, and high bacterial counts have been attributed to excretions from birds and decaying vegetation. It is recommended that water quality continue to be monitored, and a retention basin be constructed on incoming drains to improve the quality of stormwater entering the lake.

The hydrology of Lakes Cooloongup and Walyungup is complex and each is quite different – Cooloongup has a saline groundwater outflow towards the sea, and Walyungup is a closed system with discharge only by evapotranspiration. Both lakes are in an area

designated for possible groundwater extraction, but it is assumed that any large-scale proposal to extract groundwater in the area would be assessed to ensure the lakes' hydrology was not significantly altered.

A plume of ammonium sulphate in the groundwater aquifer is the result of leakage from the Kwinana Nickel Refinery's Baldivis storage facility. An Environmental Protection Authority-approved recovery program is under way, and the plume's impact on groundwater is being assessed.

Water quality at Anstey Swamp might potentially be affected by nutrient-enriched run-off or groundwater flows from market gardens and vineyards to the east. A series of surface and groundwater bores should be established and monitored to guard against this potential. Appropriate action should be taken in response to any change in level or quality.

Seasonal fluctuation of water levels in the wetlands within the Port Kennedy Scientific Park is generally less than 0.5m. The water table in the area has risen over the last 10 years, with no corresponding rise in annual rainfall. It is thought to be the result of increasing urbanisation to the north and east of Port Kennedy, and is expected to rise further as urbanisation increases. The rising water table may alter the hydrology of the wetlands and modify the ecology of the Holocene dune community. This may be countered by groundwater extraction, but careful monitoring and management strategies are needed.

Fire

Fire is a problem throughout the Rockingham Parks. More than 43 fires have occurred in the Port Kennedy area since 1960 – deliberately lit or from camp fires lit by squatters or campers on the beach. Lake Richmond has been subject to arson and Anstey Swamp is recovering from a recent intense wildfire. While some native plant species benefit from periodic burning, frequent burning can destroy indigenous vegetation.

A fire management plan has been prepared for Stage II of the Port Kennedy area, with planned burn (habitat management) and no planned burn

areas. This plan was considered by the Scientific Advisory Committee, whose members concluded that a fire management plan based on the likelihood of frequent fires within Port Kennedy Scientific Park is inadvisable.

The committee agrees with the establishment of no planned burn areas, but is concerned about the size of proposed habitat management areas and believes these do not take into account landform variations. It believes installation of substantial fire tracks as proposed would be detrimental to the Scientific Park, and recommends fire “breaks” or “lines” be formed in a carefully considered network. These could be maintained by regular slashing to provide necessary access.

The committee also said that any proposed fire management plan should include an experimental framework of small controlled burns (5-10ha) planned in relation to the landforms. The aim would be to produce a mosaic of plant communities of different age since fire, to determine the distribution of and need for fire lines or breaks.

The Scientific Advisory Committee recognised that fire management, frequency of fires and types of firebreaks were contentious issues, and that there were risks in any decision to retain areas of unburnt vegetation and reduce the frequency of planned fires and number of firebreaks. It believes these risks can be reduced to acceptable levels through appropriate management.

A similar approach is recommended for the Rockingham Lakes Regional Park. Appropriate management following fire can augment natural regeneration, and ease of access to recently burnt areas allows for improved control of weeds and rabbits. Regeneration after fire may also present further opportunities for research.

Control of Weeds

There is significant weed invasion in parts of Port Kennedy Scientific Park, Lake Richmond, Lake Cooloongup and Paganoni Swamp. Weed species compete with native flora, reduce habitats and often increase fire potential. Weed invasion is

usually the result of previous land uses, and it occurs along access tracks and firebreaks or where rubbish has been dumped.

Methods of control depend on the weed species, the habitat, potential for erosion and the resources available. Chemical methods need to be used with care near wetlands, and mechanical methods require greater human resources.

It is recommended that the distribution and severity of weed invasion in the Rockingham Parks be mapped and priorities for control be determined.

Rehabilitation

Degraded areas require rehabilitation to prevent further degradation and erosion. The Port Kennedy Scientific Park foreshore area shows evidence of erosion from storms and human activity, and this area should be rehabilitated through fencing and brushing. Badly degraded bushland within the Rockingham Parks may require replanting of native vegetation, but the bushland should be initially given the time and opportunity to regenerate naturally. Replanting may be achieved by direct seeding or hand-planting of seedlings, with care taken to ensure genetic integrity is maintained by collecting seeds or seedlings from the site to be replanted or close by.

Feral Animals

Feral and domestic animals – including foxes, rabbits, cats and dogs – affect populations of native fauna and, in the case of rabbits, limit natural growth of vegetation. Feral animals are of concern in all the areas of the Rockingham Parks, though there has been little research to determine the extent of the problem.

Brush wallabies and the rare and endangered southern brown bandicoot are known to occur within the Port Kennedy Scientific Park and are subject to predation by dogs and foxes respectively. While the bandicoot population may survive in its denser habitats, the wallabies will be at increased risk of predation by dogs because

of the growth of urban areas nearby – unless they can be protected by a vermin-proof fence.

Such a fence would help control or eliminate feral animals within its boundaries, but would limit genetic mixing of populations through migration from adjoining areas and natural recolonisation after fire or disease. These fences normally look unattractive and limit human access.

The Scientific Advisory Committee looked at alternatives for protecting native fauna, and recommended that the fence be constructed to “vermin-proof” criteria on the terrestrial sides of the park, but to lesser specifications on the ocean side because of the high probability of storm damage and expense of replacement. The Committee recommended that other control methods, such as trapping and baiting, be used to control populations of feral animals within the enclosure.

A research program should be conducted to assess the effectiveness of the fencing, and determine the range, habitat requirements and population dynamics of populations within the park, including any need for genetic mixing. Results of this program should be incorporated into the parks’ management.

There is also a need to control feral animals in the Rockingham Lakes Regional Park. Foxes are eating long-necked tortoises and eggs at Lake Richmond, and probably at Lakes Coo loongup and Walyungup and Anstey and Paganoni Swamps. Rabbits are a recognised problem throughout the area. Control methods within the Rockingham Lakes Regional Park should be restricted to trapping and baiting.

A public education campaign should be set up to explain the need to keep dogs on leads in these areas, and consideration should be given to a “cat curfew” to limit cat movement in areas close to the park at night. Monitoring each of these methods of control should be part of the research program, and management techniques should be modified when necessary.

Private Land

A portion of Lake Richmond, Anstey Swamp and Tamworth Hill Swamp are in private ownership, and part of Paganoni Swamp, which extends beyond the study area into the City of Mandurah, is also privately owned. The owners of land in these wetland areas should be encouraged to manage the relevant parts of their properties with conservation in mind, and efforts should be made to have the areas placed in public ownership.

Management for Scientific Research

A multi-disciplinary Scientific Advisory Committee should be established to identify priorities for research activities within the Park System. It should report to the Board of Management and liaise with the Foundation and Science Education Committee.

While there has been considerable scientific study within the parks to date, this has concentrated on geomorphology and other aspects of the physical environment, with little systematic research into the biological features and basic information on fauna habitats. Priority should be given to a research program that would systematically document the environmental features of the parks, to provide information needed to create comprehensive management strategies. Other research topics likely to help with management of the Parks System should be encouraged – including studies into the impact of fire on flora and fauna, control and elimination of weed species, recreation and tourism opportunities, and human use of the areas.

The concept of community science should be embraced by any research projects – to allow for the involvement of local residents as well as professional scientists.

Sharing any information gained through research is also considered to be crucial to the success of the Scientific Park. This might include a requirement that a copy of research results and publications be lodged with the Scientific Advisory Committee; the establishment of a library within the Education Centre for research

results and publications; public presentations by scientists; and the involvement of local media.

Management for Information, Interpretation and Education

Effective information, interpretation and education programs will ensure that visitors to the area become aware of the unique natural heritage values of the parks and discover some of the activities they can enjoy within this environment. Visitors will learn to appreciate and understand the natural environment of the region, and they will be encouraged to behave in a way that will not have an adverse impact on the areas. Such programs for the Port Kennedy Scientific Park and Rockingham Lakes Regional Park should also encompass the adjacent Shoalwater Islands Marine Park, with signs, displays, publications and activities designed to relate to all three.

Information and interpretation programs should be developed in conjunction with an education program. Access routes, facilities, restrictions and the reasons for these restrictions could be covered in information about the region. Interpretative displays and publications should encourage discovery of the Parks System's important features and enhance understanding of their values – on a local basis as well as within the regional context. Scientists and/or volunteers could conduct guided tours of particular areas, but there should be scope for self-guided exploration. Interactive exhibits, which have proven particularly popular with children, could also be incorporated. There is potential to cover a vast range of relevant topics, including coastal processes, geomorphology, evolution of landscapes, wetlands, vegetation and fauna, thrombolites and land-use patterns. The importance of minimising human impact on the environment and care for the future could also be highlighted.

The Parks System has a great deal of potential as an educational resource for schools and interest groups. With some additional facilities and resources, this potential will be able to be realised.

A local network of schools and other groups interested in environmental and scientific issues should be established – in the form of an Educational Council. Warnbro Community High School, which already has an environmental focus, has shown strong support for this concept. The Education Department, Catholic Education Office, local groups such as the WA Naturalists Club, and non-government agencies such as Scitech should be invited to become involved.

A network coordinator should be appointed, to liaise with schools and assist in scientific interpretation.

Curricula material based on local examples should be developed.

Consideration should be given to establishing a multi-purpose interpretation, education and research centre to provide information about the region and service educational and community groups. Possible locations for such a centre include the Warnbro Community High School, the planned environmental education centre at Lake Richmond, the Mersey Point Tourist and Interpretative Centre, Murdoch University's Rockingham campus or within the Port Kennedy Scientific Park. Funding for on-going management, staffing and community ownership of the building would be an important factor in determining its location.

Management for Recreation

A diverse range of active and passive recreation activities are currently enjoyed within the parks system, and there is potential for these activities to continue, provided they can be managed in a way that ensures minimal adverse impact on the unique environment.

Ecotourism

There is considerable scope for passive recreation and ecotourism, with day visitors in mind. Ecotourism could focus on creating a sense of discovery and making use of effective information, interpretation and educational

programs. A network of walk trails, observation platforms, bird hides, lookouts and information shelters could combine with publications, guided tours and presentations by scientists working in the area. Picnic facilities could be established, but barbecues should be gas – to limit the potential for fire.

Land Sailing

The Sandgroper Land Sailing Club regularly has about 40 boats at weekend competitions at Lake Walyungup during summer. The club's few requirements include a temporary clubhouse at the lake and use of the existing parking facilities. A portable toilet is transported to the site for weekend competitions.

While little or no research has been conducted into the impact of land sailing on the salt lakes, the activity does not break the salt surface and impact is likely to be minimal. There is potential that visitors associated with the sport may adversely affect the environment, by trampling vegetation and disturbing wildlife, and a specific appraisal is recommended so that management measures may be implemented if necessary.

Model Aircraft Club

Lake Walyungup has been used during summer months in the past by a model aircraft club, but the club is thought to be in decline. The lake is only occasionally used to fly model aircraft by one or two members at a time, and the environmental impact of such activity is believed to be limited to some disturbance of the dried lake surface and to bird life. Due to the low number of people involved, this activity is not likely to require specific management strategies, and it should be permitted to continue in its present form. Future review may be necessary if more people become involved.

Ultralight Aircraft

Ultralight aircraft and gyrocopters are no longer permitted by aviation authorities to use the airspace around Lake Walyungup.

Off-Road Vehicles

On still summer nights, an estimated 2000 four-wheel-drive vehicles have been on the coastal strip adjoining Port Kennedy Scientific Park and the area north of Becher Point. Some vehicles have also been seen within the Scientific Park, but numbers have decreased as a result of active management by the Ministry for Planning.

Off-road vehicle access should be restricted in all parts of the Rockingham Parks system. Bollards should be positioned along the beach on the southern boundary of the Scientific Park, to limit vehicular access while permitting pedestrian access.

Equestrian Activities

Parts of the Parks System are used for horse riding. Horses are exercised on the sand and in the water of the beach adjoining the southern boundary of the Scientific Park, and marathon riders use a firebreak through the buffer zone at Paganoni Swamp.

Horses can adversely affect bushland by causing erosion, especially in sandy soils, and by spreading weeds, so it is recommended that equestrian activities within the area be controlled.

Use of the horse beach adjoining the Scientific Park should be formalised by providing access along a restricted-vehicle road on the southern boundary, and outside the vermin-proof fence. This road should terminate in a horsefloat park near the Department of Family and Children's Services Youth Camp. A well-constructed, mulched horse access path should be constructed, to limit erosion. The exercise area should be limited to the southern 800m of the Scientific Park beach, and its use should be restricted to 5am-10am. It is also recommended that this area of beach be vested in the City of Rockingham.

At Paganoni Swamp, horse riding should be restricted to a trail in the buffer zone adjoining the swamp, with the reasons for this restriction outlined on signs in the area. An education program could be developed with the marathon riders.

Horse riding at other locations within the Rockingham Lakes Regional Park may be allowed by providing fencing setbacks at the reserve boundaries, allowing enough space for riders to pass safely. The spread of weeds by horses should be assessed, and the continued use of the area reviewed.

An Explanation of the Management Plans

Port Kennedy Scientific Park

The Port Kennedy Scientific Park has considerable scientific and conservation values, and the Management Plan for this area (illustrated in Figure 12) focuses on protecting these values through conservation, scientific research, science education and low-impact recreation.

- A vermin-proof fence is proposed on three sides, bounded by Port Kennedy Drive, Warnbro Sound Avenue and Secret Harbour. To the west, adjoining the coast, a fence will be built to lesser specifications because of the probability of storm damage and the high cost of replacement. The fence will be designed to minimise visual intrusion.
- The fence will limit access to the park to a large degree, and four-wheel-drive access from the beach will be limited by the strategic placement of bollards on the southern boundary. Pedestrian and bicycle access will be allowed at specific points. Access will be restricted to the network of fire trails and firebreaks, and signs and interpretation shelters will be in place to emphasise the significance of the natural features. Optional locations for an interpretation centre are set out in the Management Plan, but there is no provision for overnight accommodation facilities.
- Areas for permitted equestrian activity are clearly defined, with exercising of horses to be permitted on the southern 800m of the park's beach. Access to this exercise area is proposed via a restricted-vehicle track on the southern boundary and a horsefloat carpark near the Department of Family and Children's Services Youth Camp. Vesting of the foreshore reserve should be formalised – the southern 800m in the City of Rockingham and the remainder in the NPNCA.

These options maximise scientific and conservation values of the area while providing a basis for interactive community learning, research and the sharing of knowledge.

Lake Richmond

The management plan for Lake Richmond (shown in Figure 13) builds upon the considerable work already undertaken by the local branch of the WA Naturalists Club and the City of Rockingham. It provides for a walk trail around the lake, with lookouts, observation platforms and interpretation signs, and a picnic/barbecue area to encourage family visits.

Retention basins on the drains entering the lake are also recommended, to help reduce nutrient, sediment and pollutant levels in stormwater inflows.

Lake Cooloongup

Lake Cooloongup is bordered by urban areas to the west, and an entry node from these areas is proposed at the termination of Elanora Drive (see Figure 14), to connect with the trail network. Another entry, picnic facilities and a viewing platform are shown near a Tuart forest at the north end of the lake which is in excellent condition and has high aesthetic appeal. Cycling may be permitted on the longer trails.

Lake Walyungup

This area has potential for a range of recreational activities because the lake dries out in summer and its flat bed is suitable for land sailing and other pursuits. The Management Plan (Figure 15) gives access from the north, with carparks in the north-east and north-west corners. Possible connections to the urban areas to the west via footbridges are included, to encourage use of the area for cycling and walking, and promote community ownership. A station on the proposed Rapid Transit Railway may be constructed in the north-west, to increase use of the area. There is potential in the north-east corner for a sheltered picnic area and amphitheatre next to the fresh water wetland. Access to the lake in summer is

provided in the north-west for land sailing and flying model aircraft.

Tamworth Hill and Tamworth Hill Swamp

Tamworth Hill offers an excellent vantage point to view the Rockingham-Becher Plain to the west, and the Management Plan (Figure 16) provides for a path from the carpark off Fifty Road up to a proposed lookout. The swamp is treated as a conservation area and its vegetation is protected by fencing. Measures should be implemented to ensure any run-off into the swamp is of acceptable quality.

Anstey Swamp

It is proposed to protect this area principally as a wildlife reserve (Figure 17). Existing fencing should be maintained, but a walk trail is provided with a possible boardwalk into the swamp terminating in a bird hide. The dense vegetation and lack of open water restrict the potential for other access and uses.

Paganoni Swamp

This area has similar qualities to Anstey Swamp, with dense vegetation and small areas of open water only after heavy winter rains. Proposed activities are limited and the reserve would primarily be a wildlife refuge (Figure 18). Walk trails are provided, and horse-riding permitted on dedicated firebreaks. The proposed recreational infrastructure increases to the south, within the City of Mandurah and outside the study area, where adjacent residential development is proposed.

Background Information

The process of developing this Management Framework involved efforts to discover the primary values and appropriate uses for the Port Kennedy Scientific Park and Rockingham Lakes Regional Park, and to suggest ways to manage these areas as components of one Parks System for the future.

The two parks were included in the study because of their complementary values – and because this provided an opportunity to establish an integrated management program to enhance the conservation, scientific, educational and recreational importance of the Parks System as a whole.

The Steering Committee which directed the preparation of the Management Framework included representatives of the four statutory bodies involved – the Western Australian Planning Commission, the Port Kennedy Board of Management, the Department of Conservation and Land Management and the City of Rockingham. A representative of the Scientific Advisory Committee also sat on the Steering Committee.

The Steering Committee's role included providing guidance to a team of consultants and others directly involved in the study, and reviewing the team's progress in preparing the Management Framework. It also assessed the draft Management Framework and sought comments from all the stakeholders before endorsing the draft. It will recommend adoption of the Management Framework report by the relevant agencies. These include the Western Australian Planning Commission, the National Parks and Nature Conservation Authority, the Port Kennedy Board of Management, the City of Rockingham and the Department of Conservation and Land Management.

Members of the Scientific Advisory Committee looked into the role of the scientific park, created a model for each of the individual parks, and provided specific and general information on the biological, environmental and geomorphic values of the parks. They also participated in the community workshop and advised the Steering Committee on the proposed Management Framework.

A wide range of community groups, organisations, agencies and interested individuals had the opportunity to provide comments, input and ideas during the preparation of the Management Framework, and their input had a direct influence on the composition of the framework.

The half-day community workshop was attended by 45 people, representing the primary, secondary and tertiary education sectors, researchers, community representatives, State agencies and the City of Rockingham. Workshop participants were given an outline of the attributes of the Parks System, before separating into small groups to talk about potential acceptable activities, facilities, management treatments and funding priorities.

The recommendations of the Scientific Advisory Committee and the issues raised during the community workshop are detailed in the appendices to this report. A select bibliography, which refers to some of the wealth of literature examined in preparing this document, is also included.

Defining a Scientific Park

During the development of the Management Framework, the overall concept of a Scientific Park at Port Kennedy was also thoroughly discussed and considered.

The development of a Scientific Park at Port Kennedy is an exciting proposal on many levels. It provides an opportunity to increase awareness and understanding of scientific principles and the management of natural resources; there are potential educational benefits at primary, secondary and tertiary level, and within the general community; and there are significant research opportunities for scientists. Its establishment must take into account a number of issues:

- The strong desire for community participation, identification and ownership of the park – a desire clearly revealed during last year's community workshop and another in

1993, and echoed by members of the Steering Committee and Scientific Advisory Committee.

- The evidence of past and continuing human influence and impact on the area.
- The potential links with the Rockingham Lakes Regional Park and Shoalwater Islands Marine Park.

Australian and international models are in place for Scientific Parks as a management category for protected land, but these show some variation in terms of the extent of human influence and levels of participation allowed within each area. As part of the process of creating a specific model for the Port Kennedy Scientific Park, the committees and consultants have taken into account the definitions of "Scientific Reserves", from the International Union for the Conservation for Nature (IUCN) and "International Biosphere Reserves", from the United Nations Education, Scientific and Cultural Organisation (UNESCO). They also examined the management of land for scientific purposes within Australia by State and Commonwealth agencies, and looked at the concept of "community science" in relation to the Port Kennedy Scientific Park.

It was found that a Scientific Reserve under the IUCN's guidelines is an area primarily for reference, with strict protection and minimal human activity. This was considered inappropriate in relation to the Port Kennedy area.

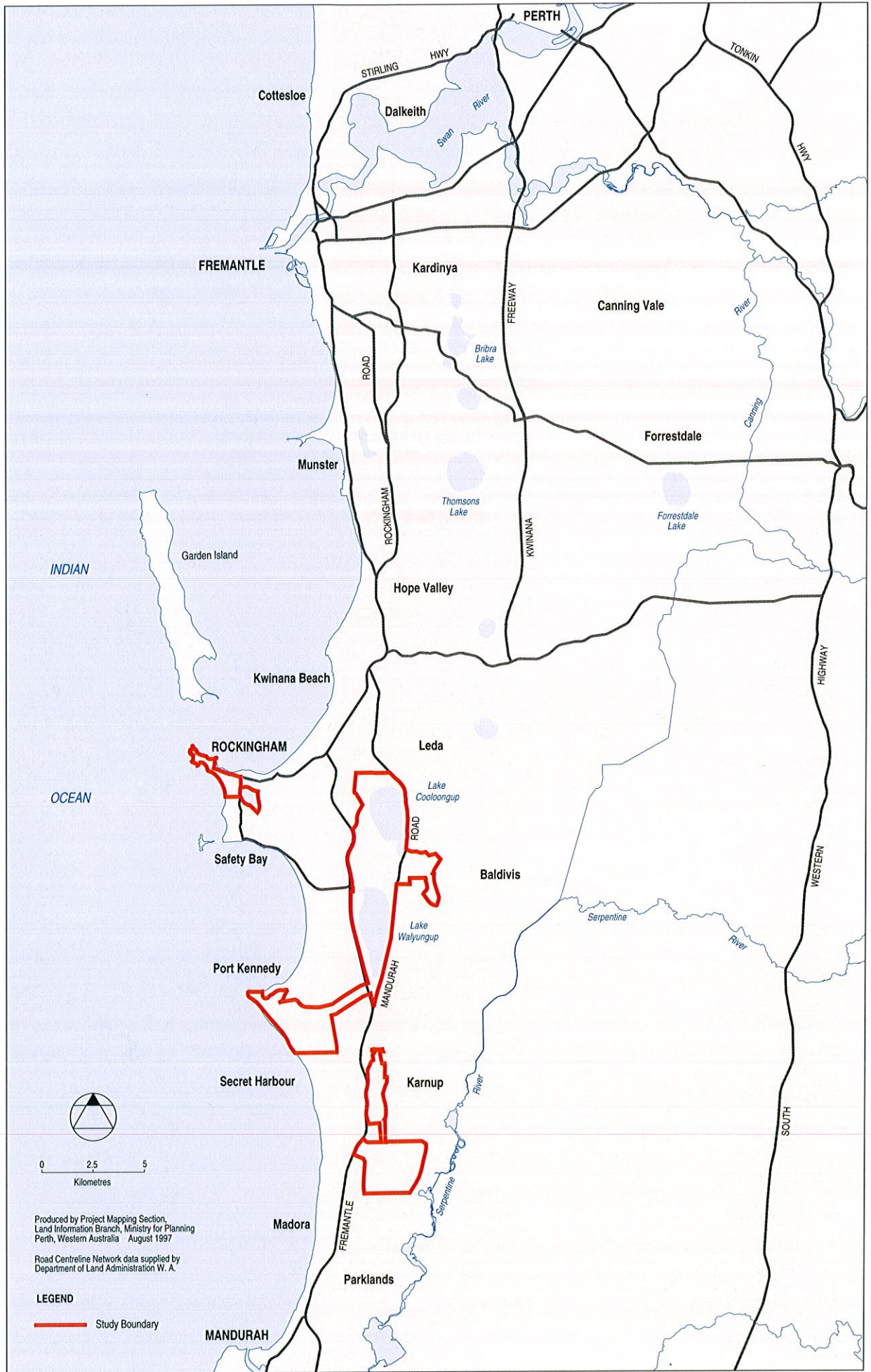
The UNESCO guidelines, under the Man and the Biosphere Program, are more relevant for Port Kennedy. Man in the Biosphere is a program of international scientific cooperation dealing with interaction between people and the environment. The program involves establishment of "biosphere reserves" which typically include a large undisturbed area, known as a "core area", plus adjoining "buffer zones" where more human influence is felt through multiple use. Biosphere reserves also include "transition zones" or "zones of cooperation" further out from the core area. Each UNESCO Biosphere Reserve is a valued benchmark for monitoring long-term changes to the biosphere and for biological conservation.

In contrast to the Scientific Reserves of the IUCN, UNESCO Biosphere Reserves incorporate people as an essential component of the landscape, with their activities fundamental to long-term conservation. UNESCO's program also places a strong emphasis on developing educational and training programs, particularly academic and professional training, environmental education, demonstration and extension, and training and employment opportunities for local people.

Within Australia, scientific interest is taken into account in most States and Territories. Terms used to define significant areas include national parks, nature reserves, conservation areas, scientific purpose reserves, wildlife reserves and conservation parks. There is variation in definition from State to State, and some areas have strictly controlled human access or have been reserved in perpetuity to ensure ecosystems remain relatively undisturbed.

Figures

Fig 1. Rockingham Parks Regional Location of Study Area



Produced by Project Mapping Section,
Land Information Branch, Ministry for Planning
Perth, Western Australia August 1997

Road Centreline Network data supplied by
Department of Land Administration W. A.

LEGEND

— Study Boundary

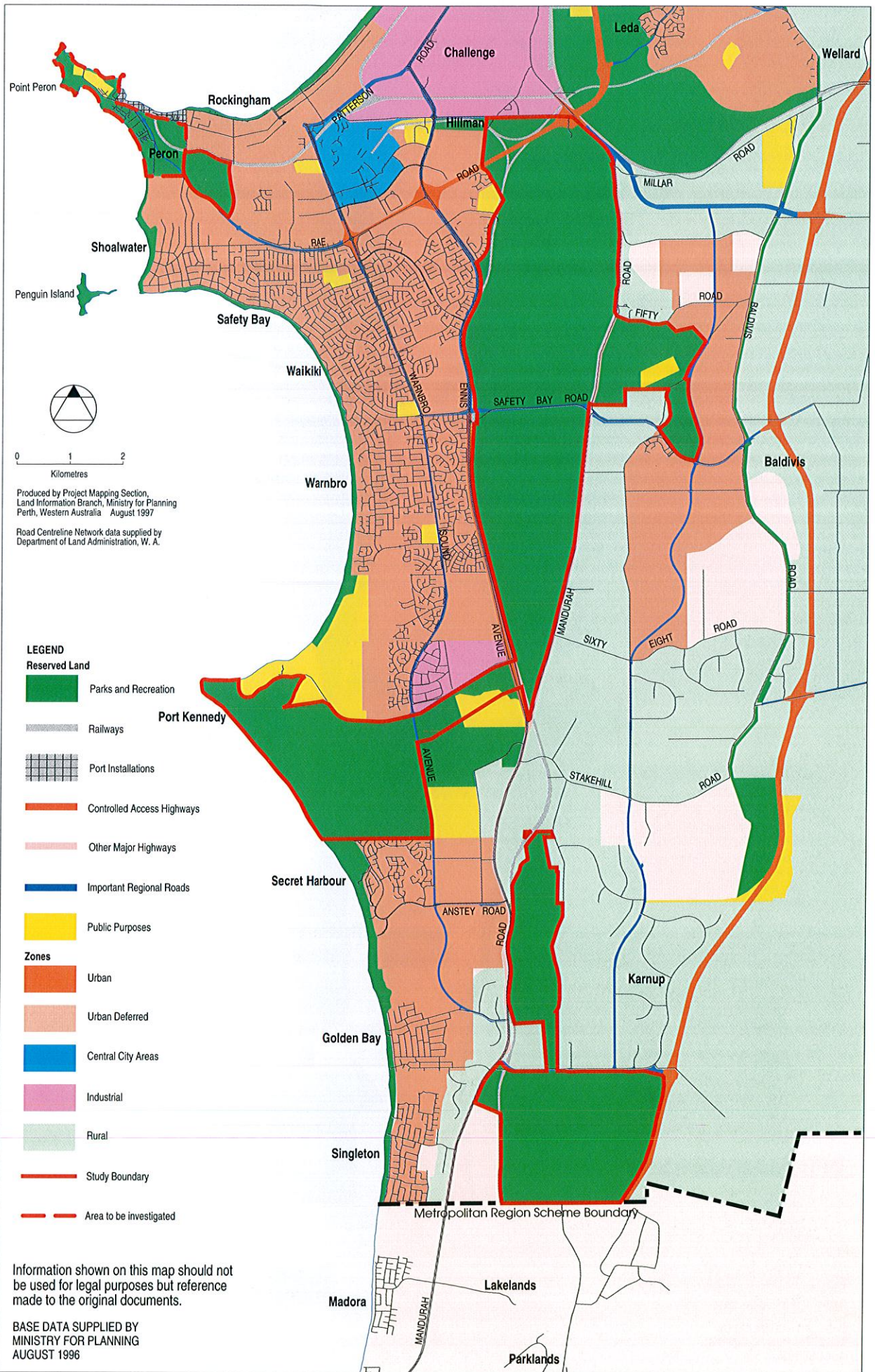


Fig 3. Rockingham Parks Regional Context



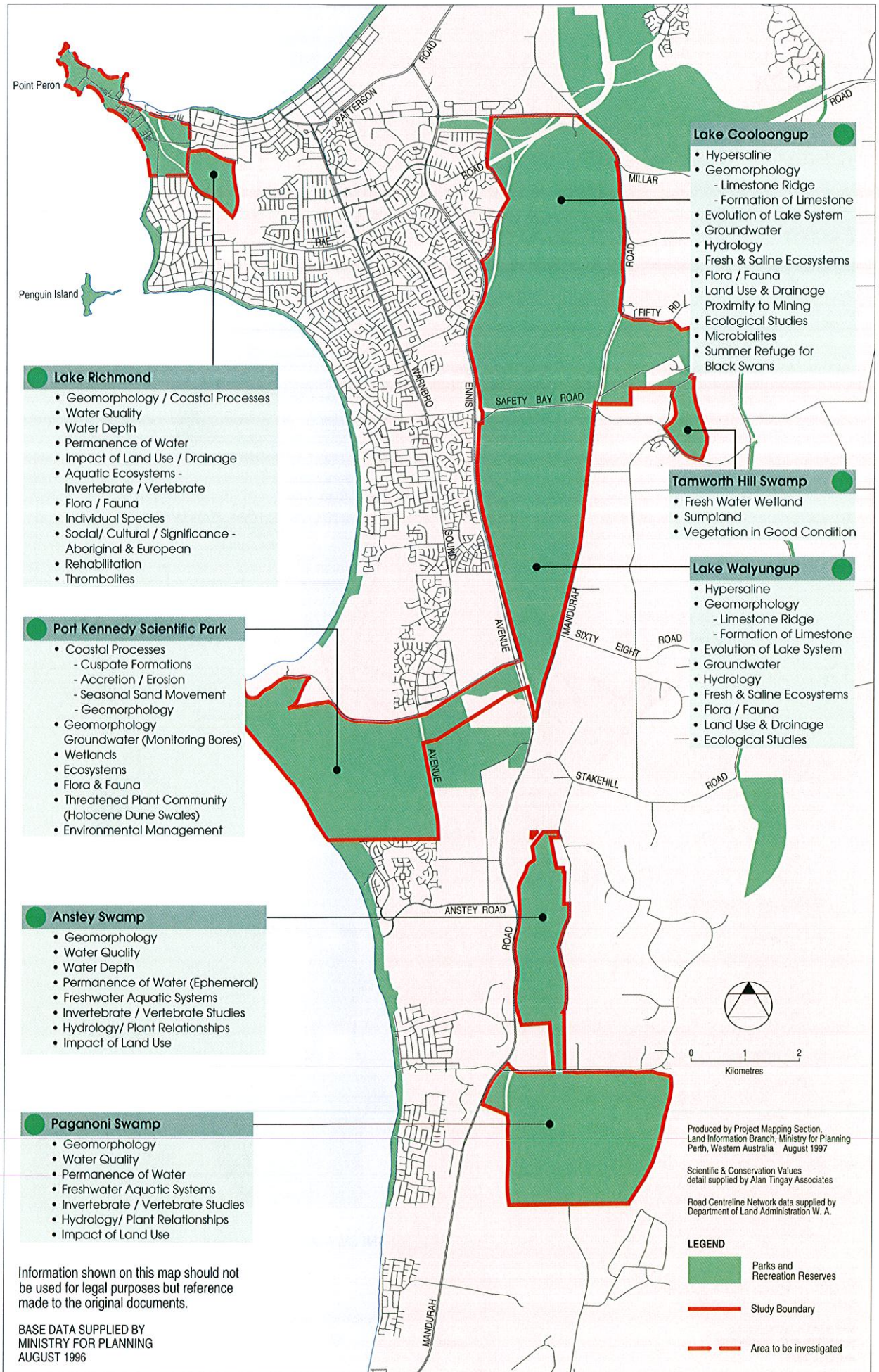
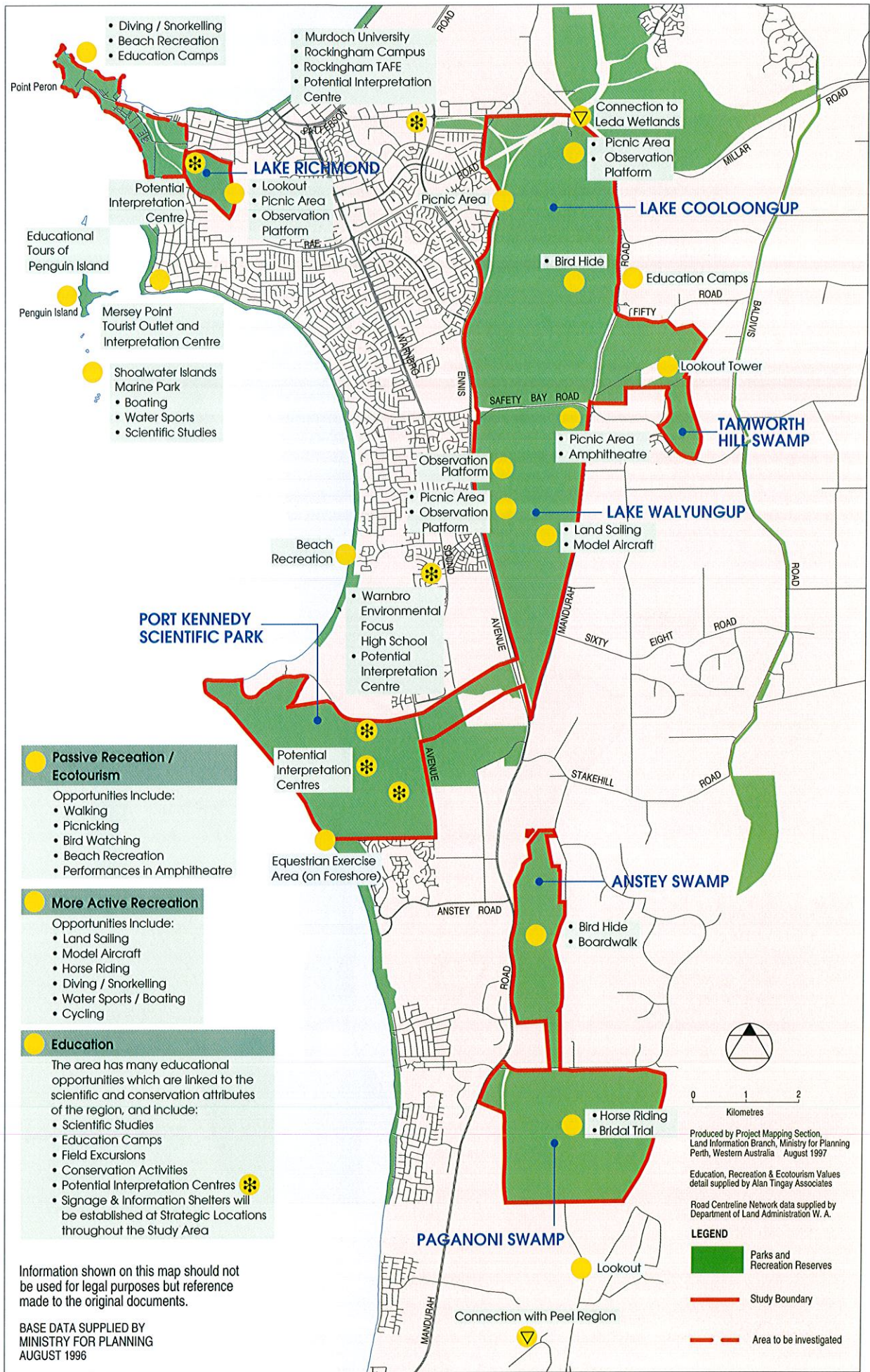
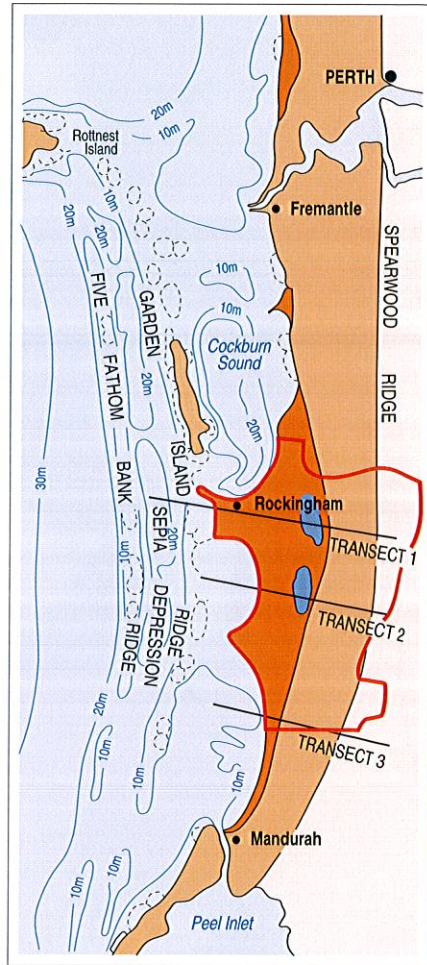


Fig 5. Rockingham Parks Education, Recreation & Ecotourism Values





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Produced by Project Mapping Section,
Land Information Branch, Ministry for Planning
Perth, Western Australia August 1997

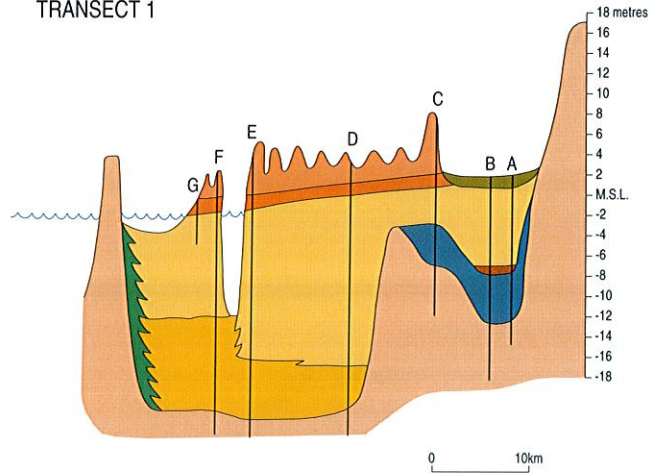
Source: Adapted from Searle et al, 1988

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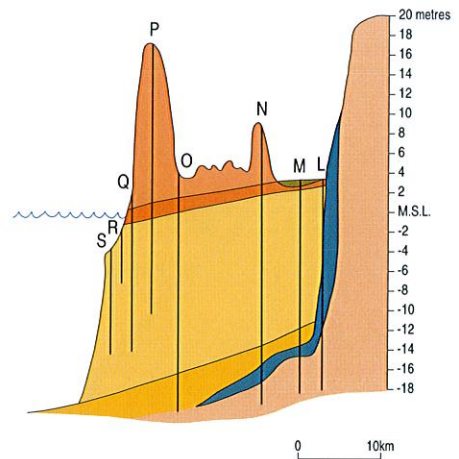
- Rocky Submarine to Intertidal Prominence
- 10m Water Depth (metres)
- Saline Lake or Salt Pan
- Quindalup Dune System (Safety Bay Sand)
- Spearwood Dune System (Tamala Limestone)
- Bassendean Dune System
- City of Rockingham Boundary

Information shown on this map should not be used for legal purposes but reference made to the original documents.

TRANSECT 1



TRANSECT 2



LEGEND

- Lacustrine Deposit
- Safety Bay Sand-Aeolian Facies
- Safety Bay Sand-Littoral Facies
- Becher Sand
- Bridport Calcilutite
- Ridge Apron deposit
- Leschenault Formation
- Coo loongup Sand
- Tamala Limestone
- ? Plio-Pleistocene Mud



Drill Site

TRANSECT 3

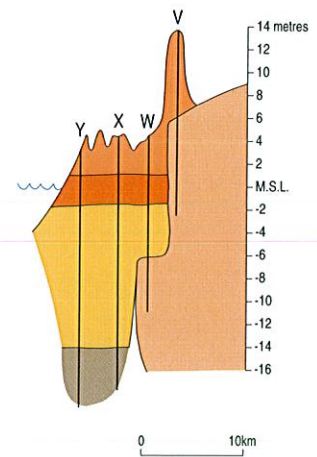
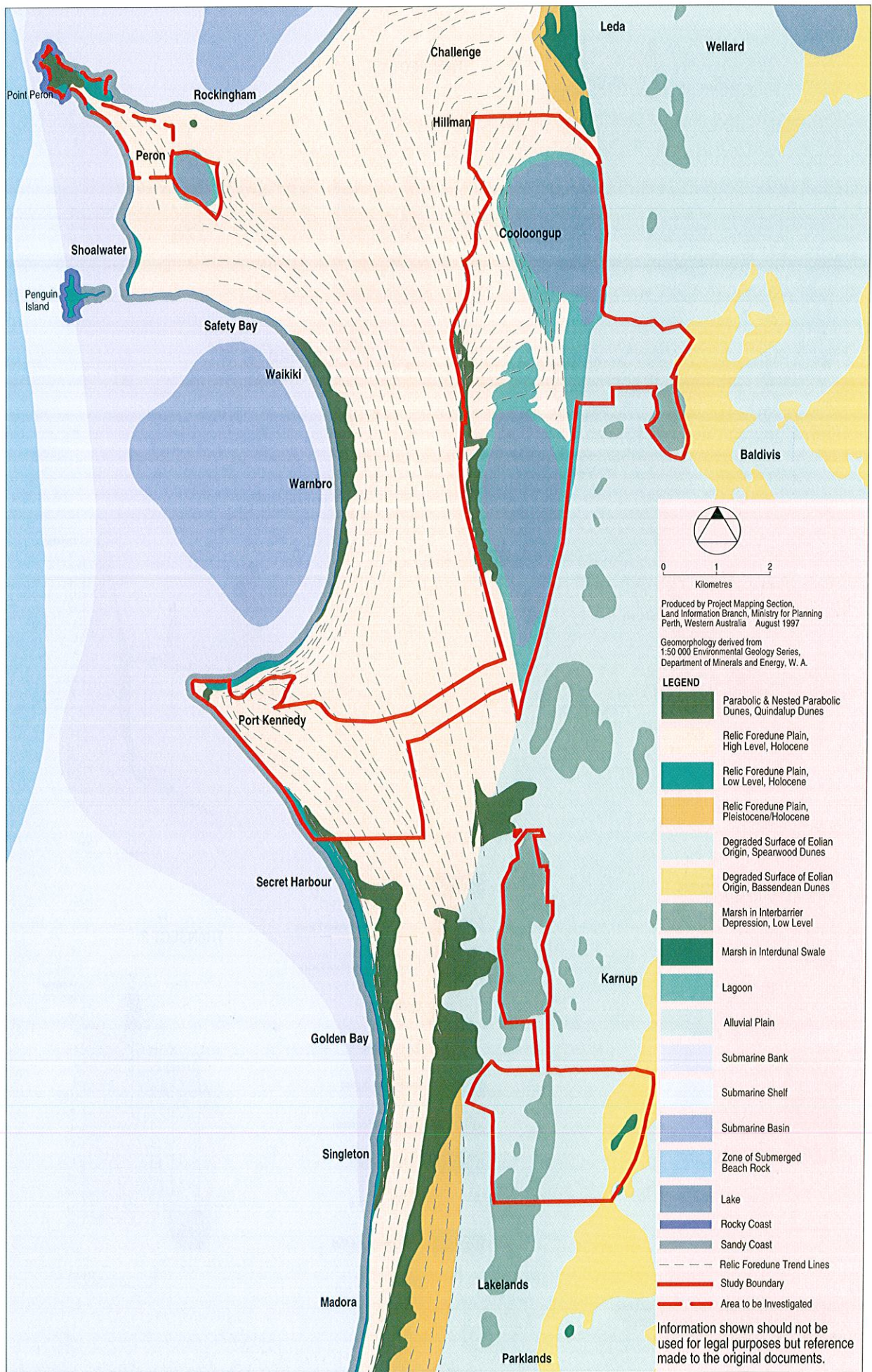


Fig 7. Rockingham Parks Geomorphology



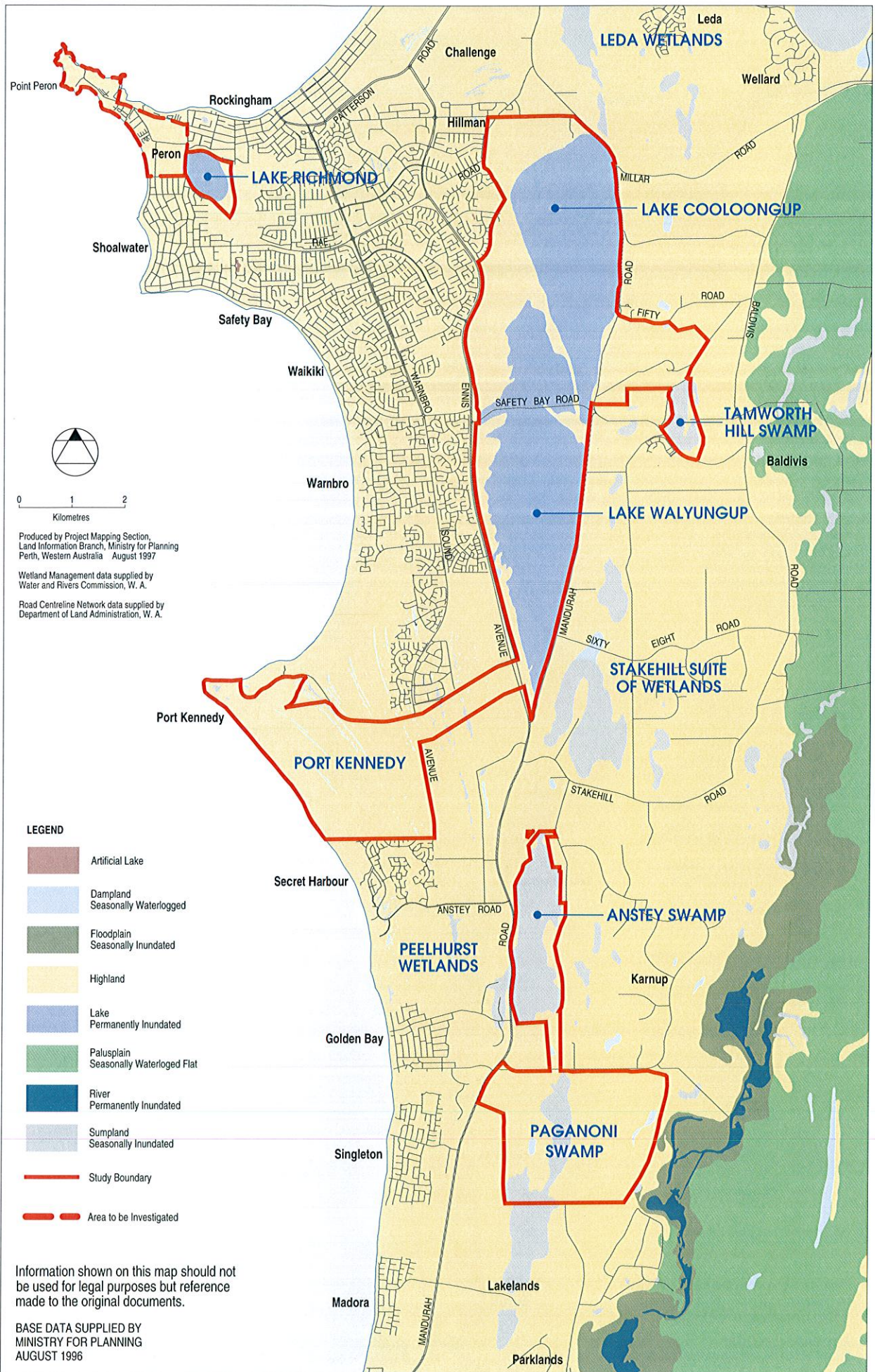
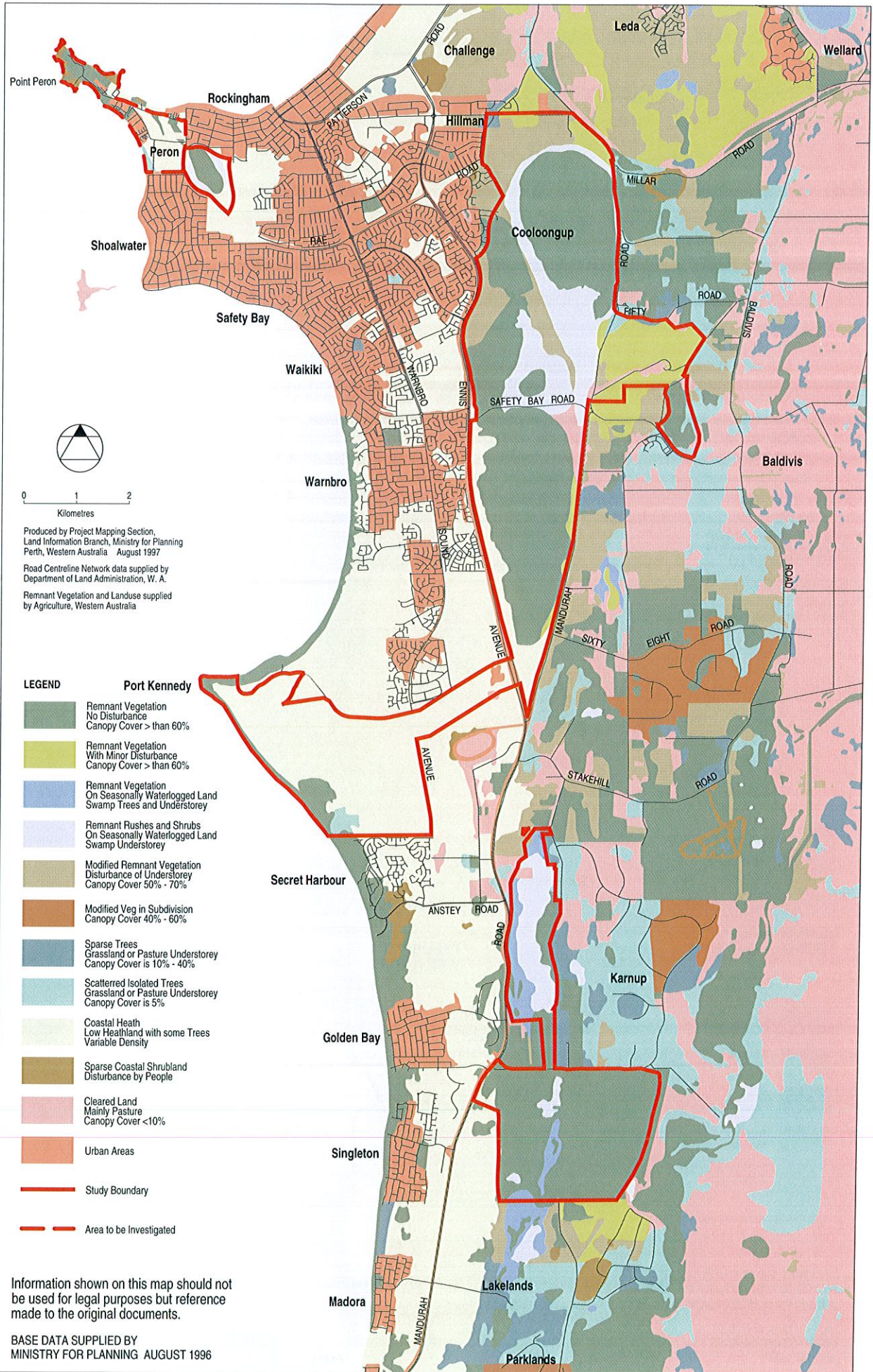


Fig 9. Rockingham Parks Vegetation Condition



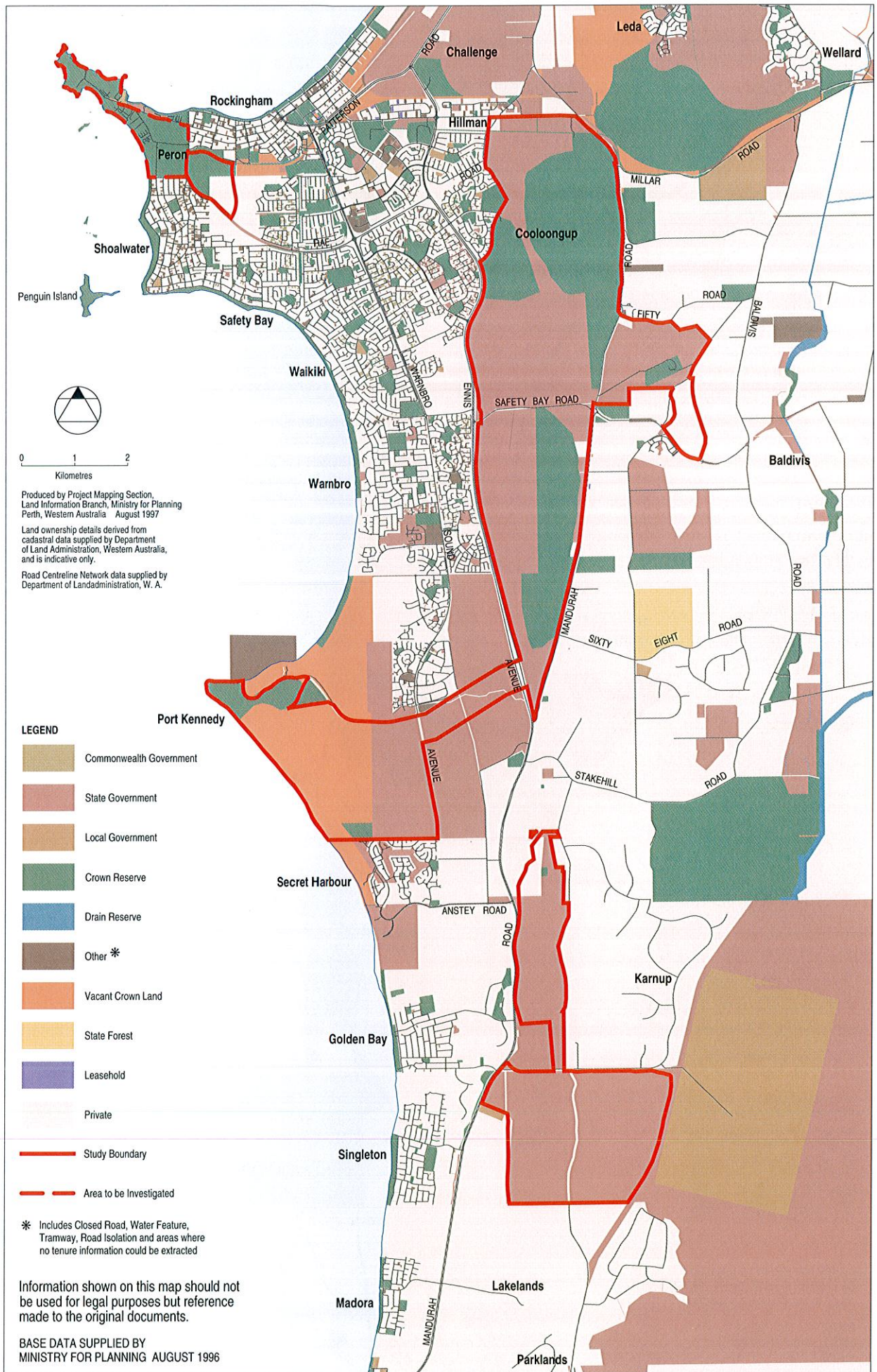
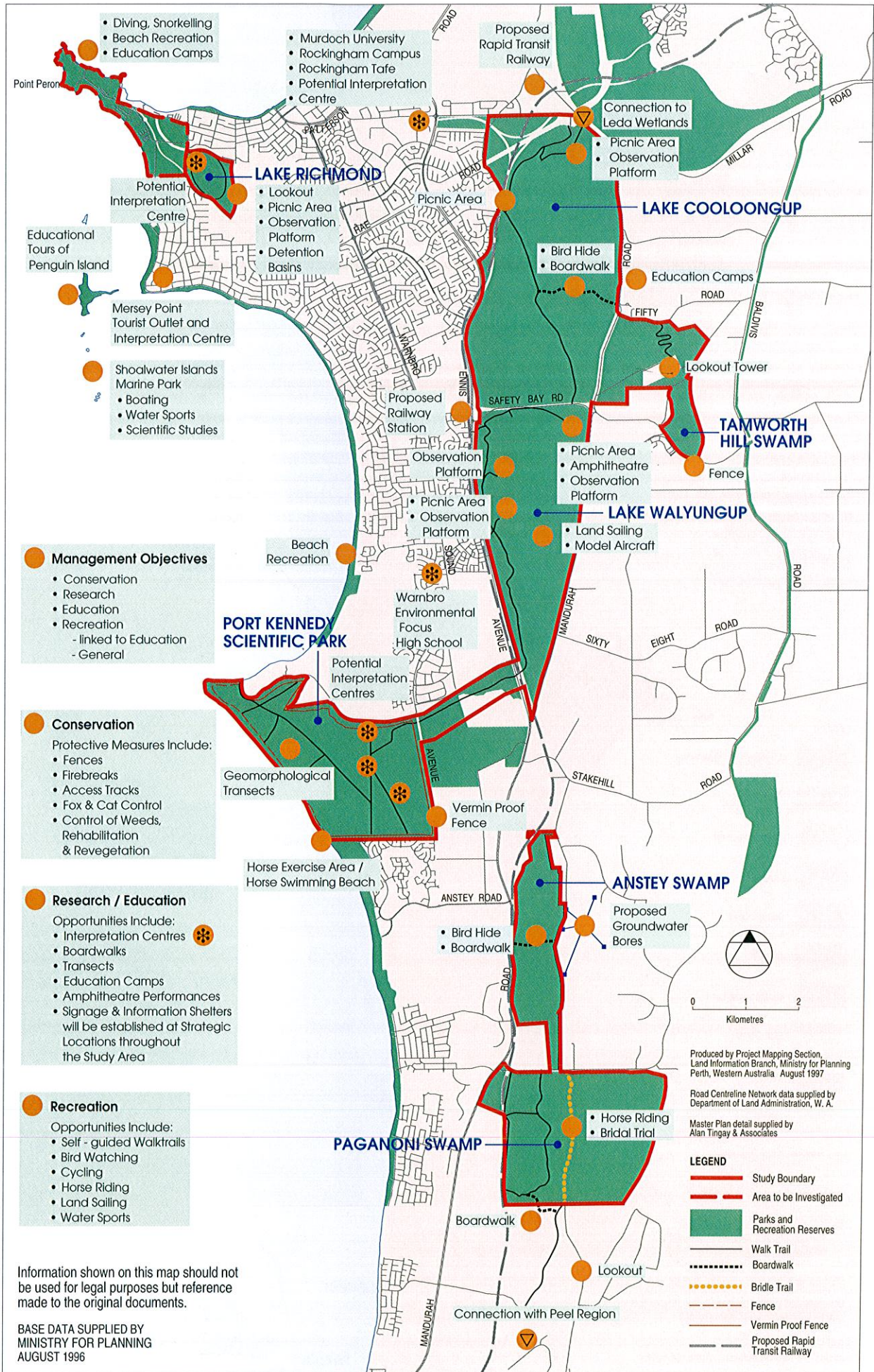


Fig 11. Rockingham Parks Master Plan



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AUGUST 1996

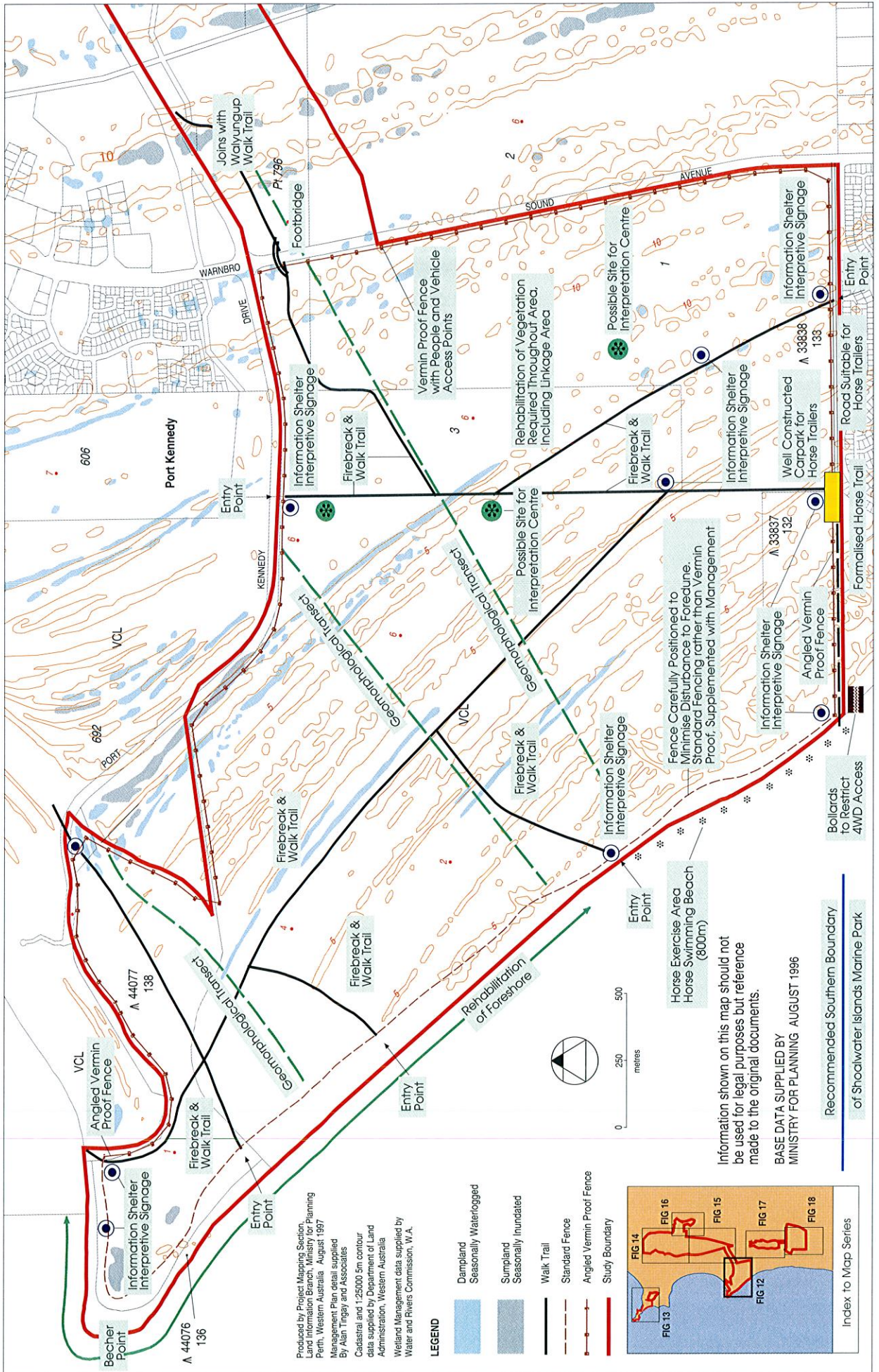
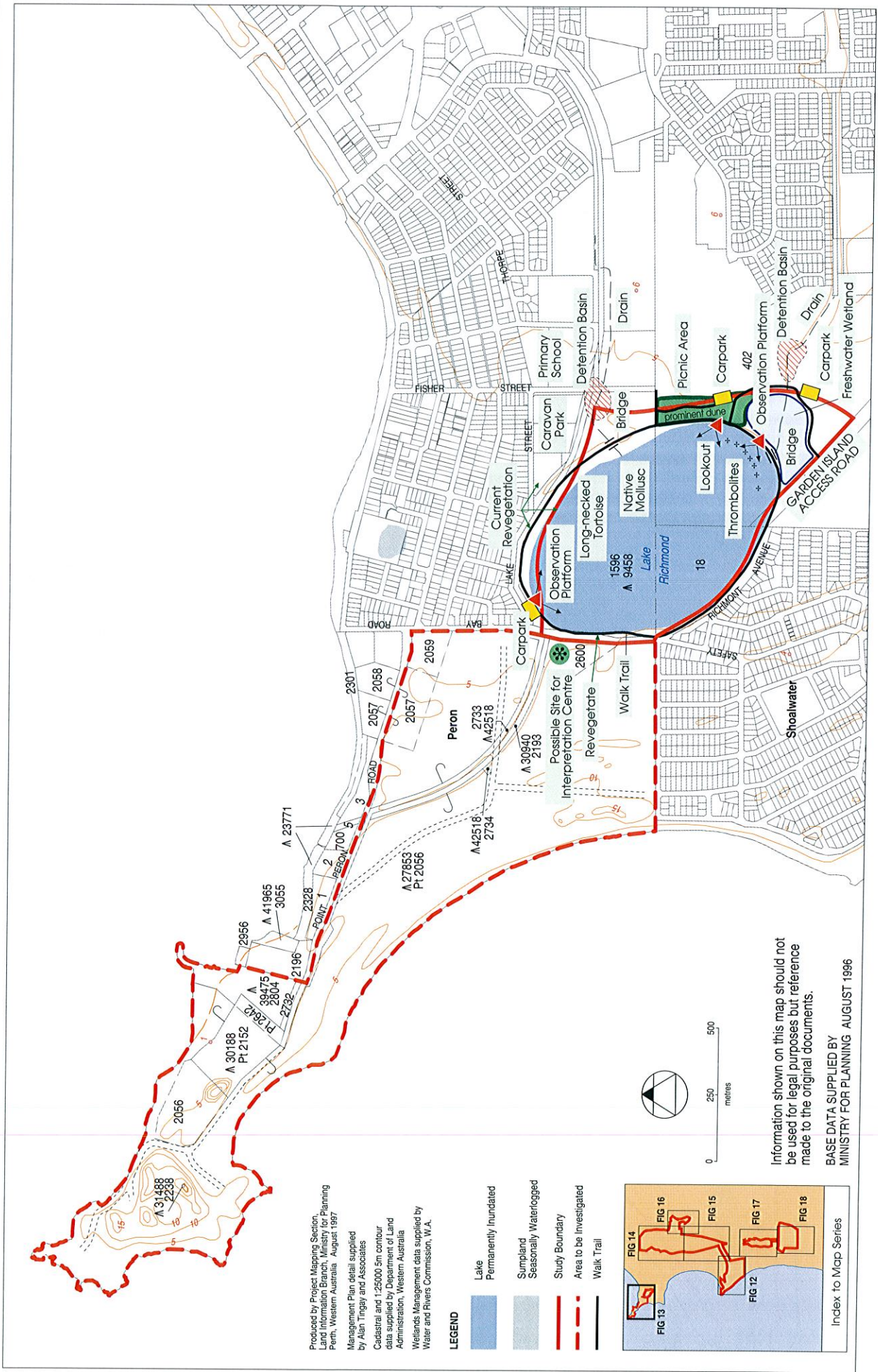
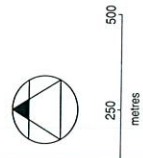
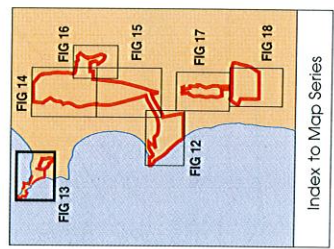


Fig 13. Rockingham Parks Lake Richmond Management Plan



Produced by Project Mapping Section,
Land Information Branch, Ministry for Planning
Perth, Western Australia August 1997
Management Plan detail supplied
by Alan Tingay and Associates
Cadastral and 1:25000 5m contour
data supplied by Department of Land
Administration, Western Australia
Wetlands Management data supplied by
Water and Rivers Commission, W.A.

- LEGEND**
- Lake
 - Permanently Inundated
 - Sunpland
 - Seasonally Waterlogged
 - Study Boundary
 - Area to be Investigated
 - Walk Trail



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be used for legal purposes but reference
made to the original documents.

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Index to Map Series

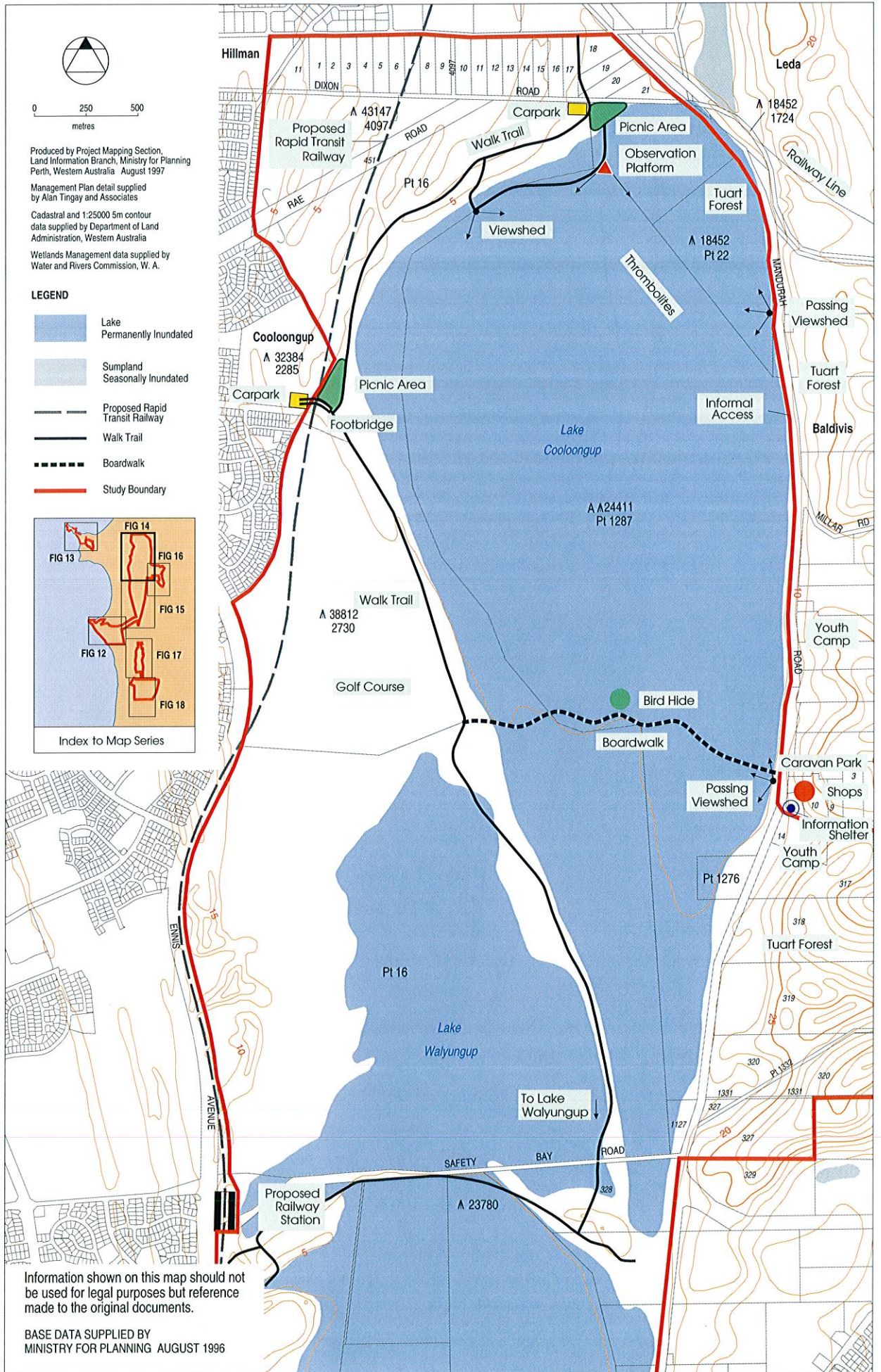
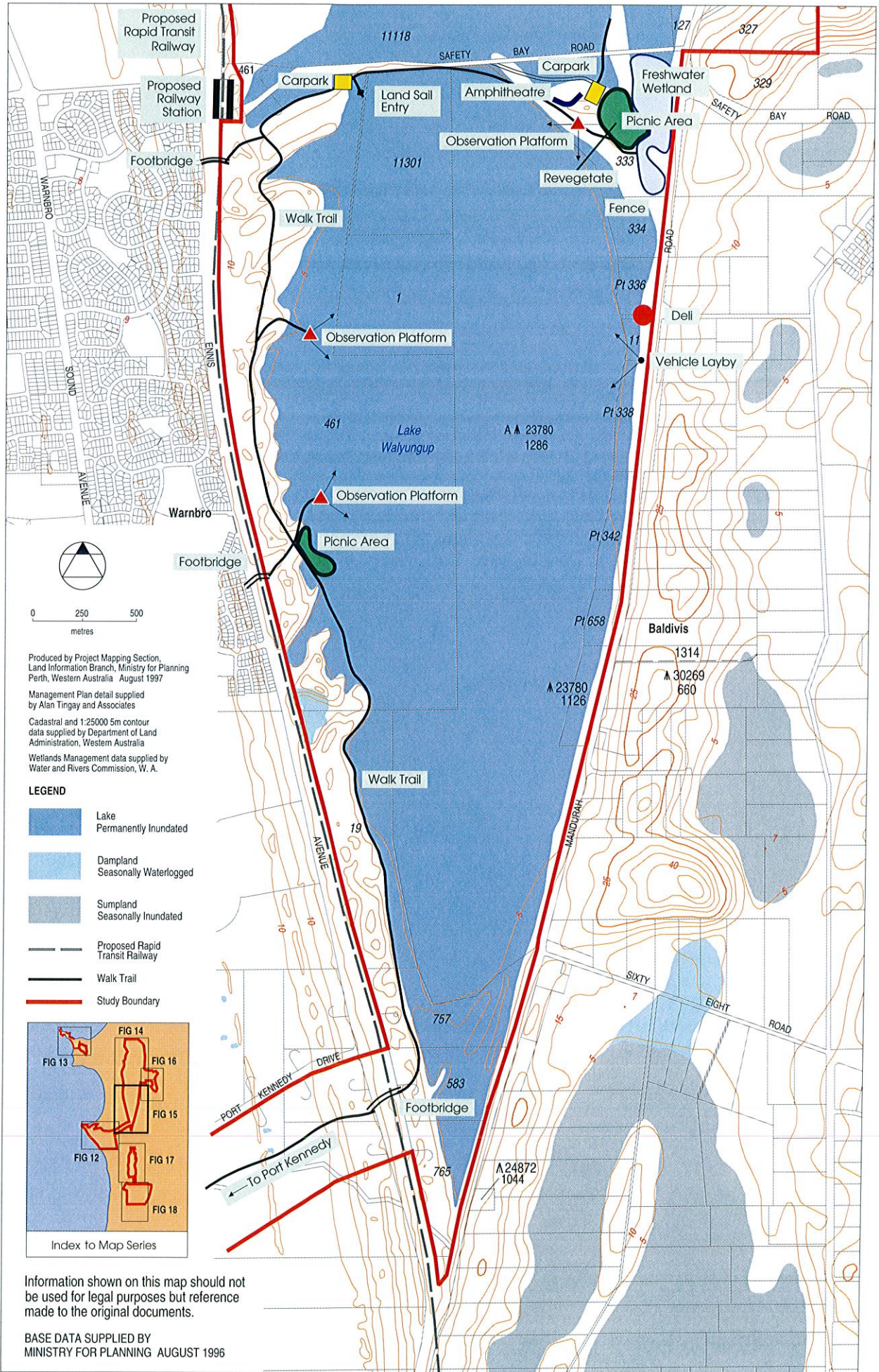


Fig 15. Rockingham Parks Lake Walyungup Management Plan



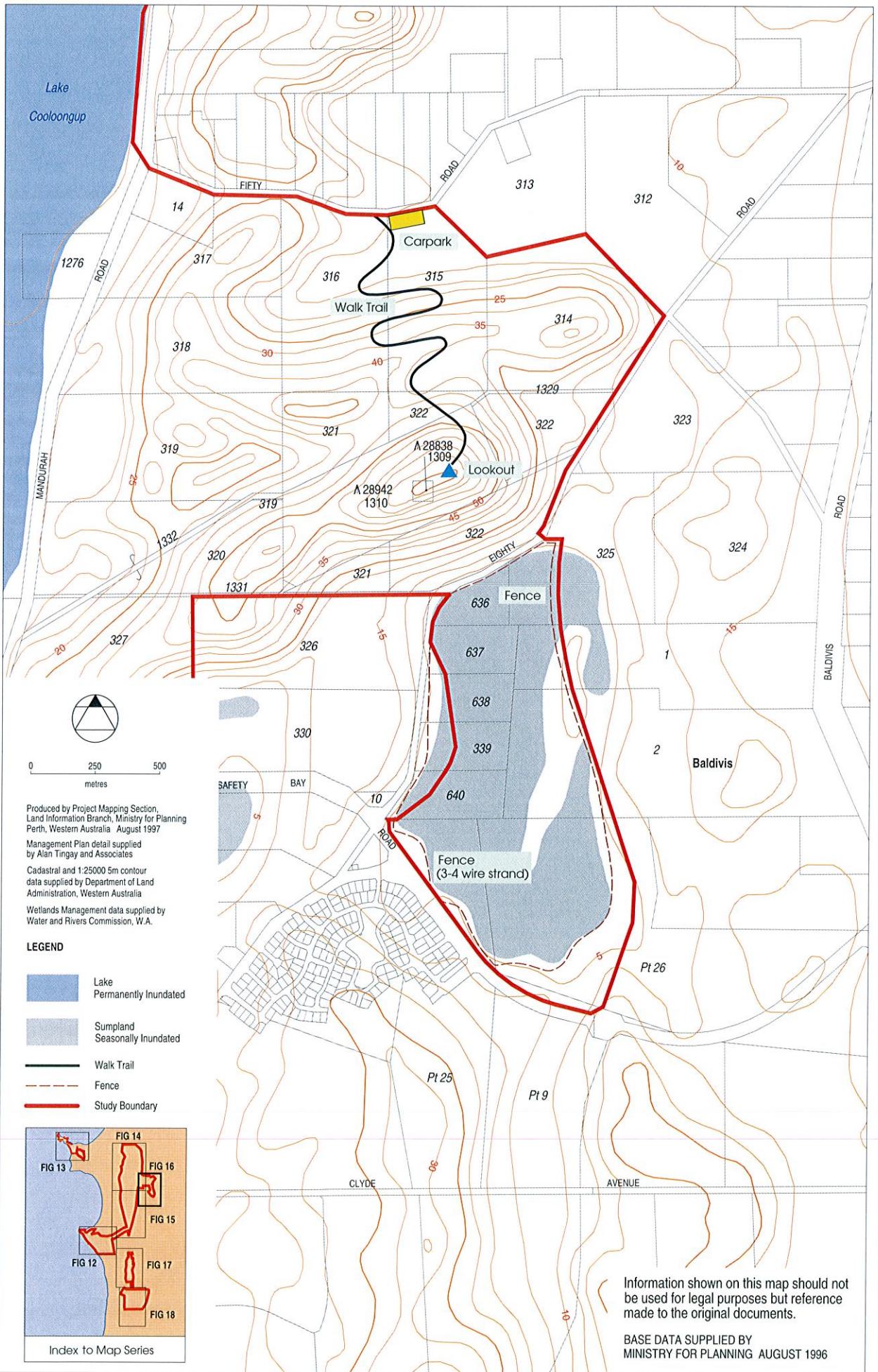
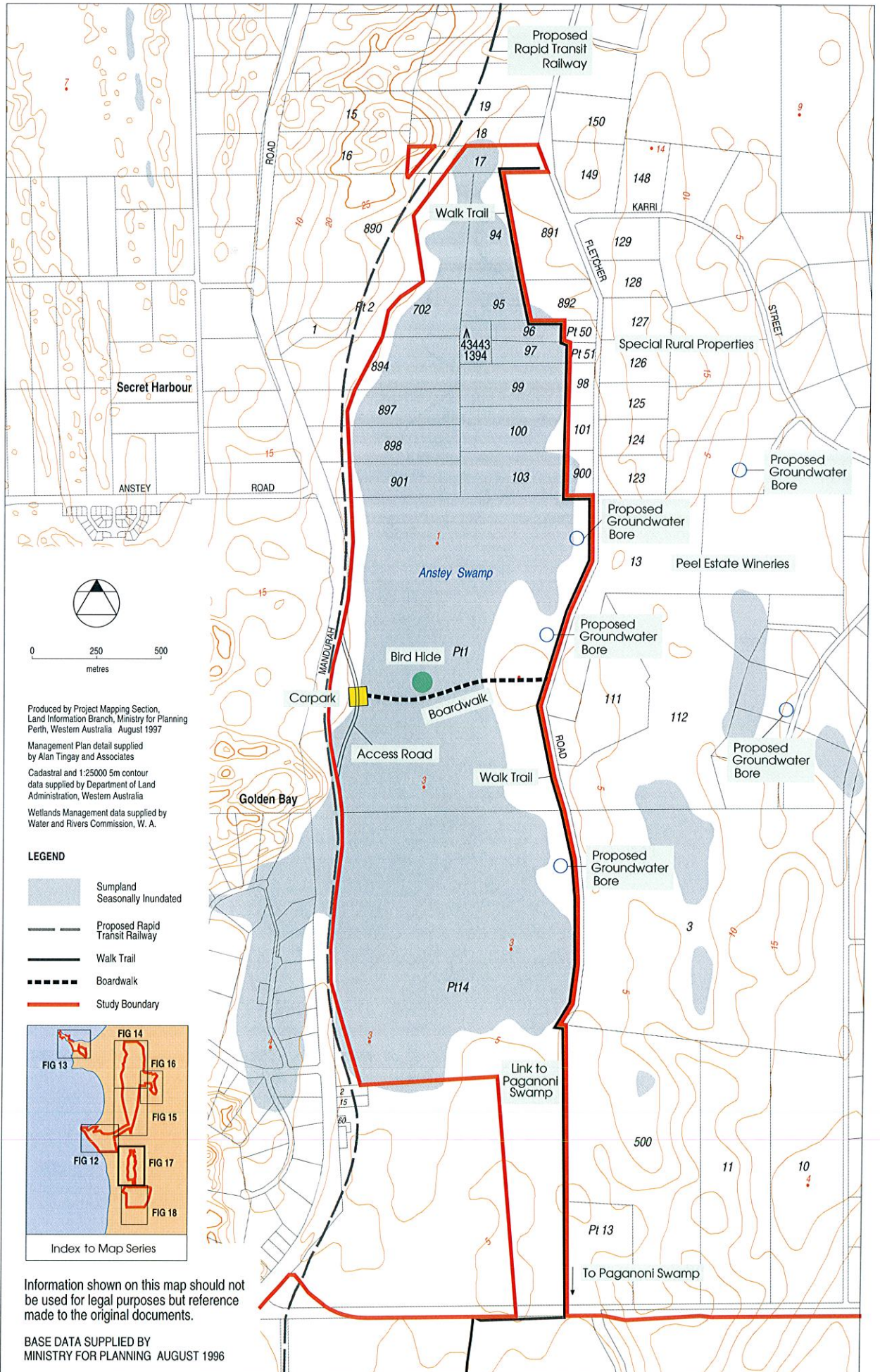
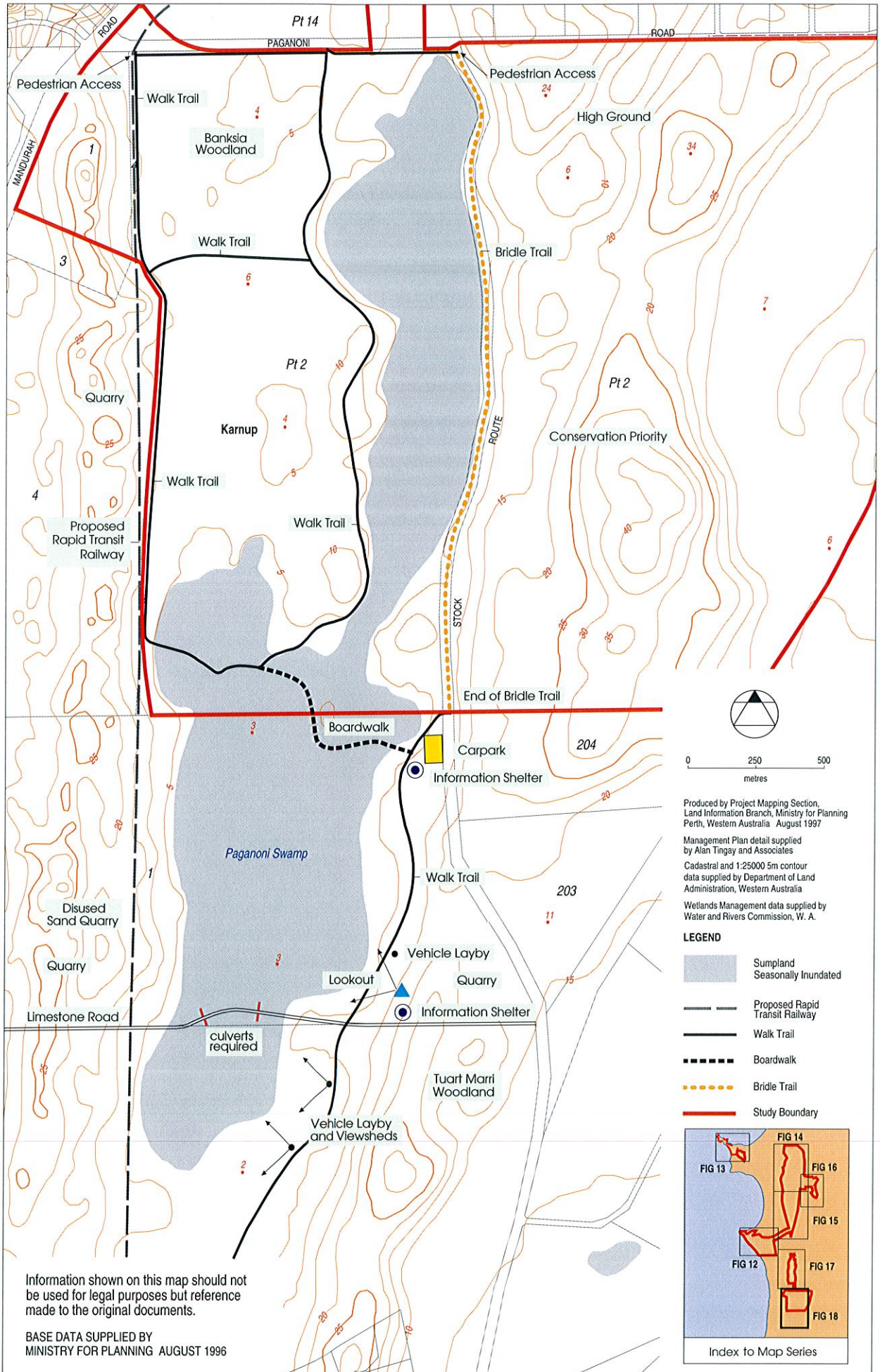


Fig 17. Rockingham Parks Anstey Swamp Management Plan





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Appendix 1

Recommendations of the Port Kennedy Scientific Advisory Committee to the Port Kennedy Steering Committee

Recommendation 1

The Scientific Advisory Committee resolved to advise the Port Kennedy Steering Committee that a distinctive overall name is required to generate community ownership in Port Kennedy Scientific Park and the Rockingham Lakes Regional Park.

Recommendation 2

The Scientific Advisory Committee resolved to advise the Port Kennedy Steering Committee that a non-government, multi disciplinary, multi-organisational foundation be established to raise public awareness of the park and to secure additional funding for education and scientific research.

Recommendation 3

The Scientific Advisory Committee resolved to advise the Port Kennedy Steering Committee that it supports the establishment of a feral-proof fence to protect Port Kennedy Scientific Park, bounded by Port Kennedy Drive, Warnbro Sound Drive and Secret Harbour. However, the western coastal boundary should be fenced with a structure of a lower standard, preferably constructed of 3-4 plain wire strand (not ring lock). The fence's effectiveness on the coast should be monitored on an experimental basis and be subject to review. The primary function of the coastal fence is to be prevent unauthorised vehicle access. The entire fence is to be set back from the surrounding roads and foredunes to reduce its visual intrusion into the landscape and the intimidating nature of the structure should be minimised through best design. It should be noted that the fence has further management implications such as fire management, monitoring and baiting.

Recommendation 4

The Scientific Advisory Committee resolved to advise the Port Kennedy Steering Committee that research within the first 12 months should be directed at those studies which have direct application for the future management of the park (eg feral fauna control).

Recommendation 5

The Scientific Advisory Committee resolved to advise the Port Kennedy Steering Committee that the interpretation centre be established as a priority to provide a focus for research and the activities of the proposed Foundation.

Recommendation 6

The Scientific Advisory Committee resolved to advise the Port Kennedy Steering Committee that basing a fire management plan on the premise that fires within Port Kennedy Scientific Park are likely to be frequent, is inadvisable. The Committee is in agreement with the establishment of 'no-planned burn' areas (NPB) but expresses concern regarding the planned 'habitat management' (HM) burns. The Committee considers that the HM areas are too large and are not designed to account for variation in the landform (eg dune and swale). The NPB areas may need to be regional park-designed depending on the outcome of decisions regarding the location of the HM areas.

Recommendation 7

The Scientific Advisory Committee resolved to advise the Port Kennedy Steering Committee that the installation of substantial (eg limestone, gravel) firebreak tracks in the pattern proposed (ie NW-SE track plus other SW-NE tracks) will be detrimental to a number of the park's most important values. For example, the Committee is conceded that such tracks will promote the spread of weeds and increase the risk of erosion. The Committee believes that instead of substantial fire tracks, fire 'breaks' or fire 'lines' be formed which might be maintained by regular slashing to

provide the necessary access. The belief is based on the unanimous agreement within the Committee that substantial fires will 'leap' whatever type of fire break is installed and that fire breaks serve to increase the amount of time available for the most appropriate fire fighting response rather than actually protecting vegetation or property. The design of fire breaks should be the subject of discussion between researchers and the management agency.

Recommendation 8

The Scientific Advisory Committee resolved to advise the Port Kennedy Steering Committee that any proposed fire management plan be contingent upon the early establishment of an experimental framework which examines the impact of controlled burns on small areas over a mosaic of plant communities of different age since fire. The designed mosaic will determine the distribution and need of fire breaks.

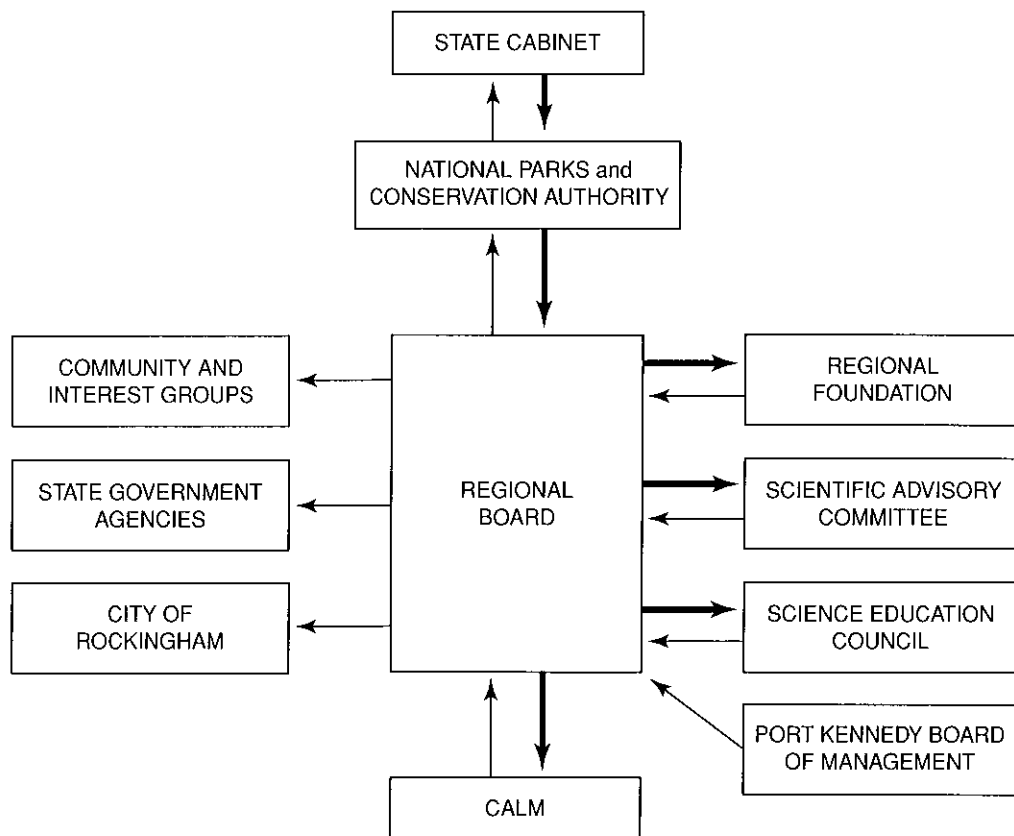
Recommendation 9

The Scientific Advisory Committee resolved to advise the Port Kennedy Steering Committee that the Ministry for Planning be encouraged to maintain an active management role and implement the management framework until the park is vested in the National Parks and Nature Conservation Authority.

Recommendation 10

The Scientific Advisory Committee resolved to advise the Port Kennedy Steering Committee that it recommends the following management structure for the Port Kennedy Scientific Park and the Rockingham Lakes Regional Park, to foster community participation and empowerment in the administrative process.

Proposed Management Structure



Appendix 2

Rockingham Parks Community Workshops Participants and Output

Community Workshop Participants

Dr Mark Adams	Natural Resource Management, University of WA	present
Jenny Alford	Dept of CALM, nominee for Lyndon Mutter	present
Jeff Anderton	Community representative	present
Mike Barnett	MLA	
Rod Beresford	Science Consult, Ministry for Educ., nominee Brett Herron	
Steve Blackburn	Councillor City of Rockingham	present
Dr John Blythe	Threatened Communities, Dept of CALM	present
Odna Borlag	Baldivis Community Association	present
Alan Briggs	District Manager, CALM, Pt Kennedy Board	present
Dr Alan Burbidge	Dept of CALM, nominee for Dr Neil Gibson	present
Laurie Caporn	Fisheries Dept, Pt Kennedy Board of Management	
Jim Chesterman	Project Manager, Ministry for Planning	present
Juliette Cole	Dept Environmental Protection	
Bruce Cunningham	Chair, Steering Ctee, Ministry for Planning	present
Dr Jenny Davis	School of Env'tal Sciences, Murdoch University	present
Mike Doab	Friends of Warnbro Beach	present
Wendy Durrant	Conservation of Rockingham Env't (CORKE)	present
Dr Ian Elliot	Geography Dept, University of Western Australia	
Clive Emby	Primary Science Consultant, Peel District Office	present
Mike Erith	Warnbro Community High School	present
Ralph Fardon	(Chair) Pt Kennedy Board of Management	present
Julie Farrant	Geography Teachers Association	
Henty Farrar	Dept of Land Administration, Pt Kennedy Board	
Bill Fitzsimmons	Pt Kennedy Fishing Association	present
Ian Gale	Department of CALM	present
Fred Gardiner	Mayor, City of Rockingham, Pt Kennedy Board	
Dr Neil Gibson	Dept of CALM, nominee Dr Alan Burbidge	
Bob Goodale	WA Naturalists Group, nominee Don Shephard	
Graham Harvey	Safety Bay High School	present
Brett Herron	Ministry for Education, nominee for Rod Beresford	present
Bridgette Hyder-Griffiths	Dept Env'tl Protection, nominee for Gray Whisson	present
Allan Hill	Councillor City of Rockingham	present
Tim Hillyard	Ministry for Planning	present
Alex James	Geography Consultant, Ministry for Education	present
Keryn James	ERM Mitchell McCotter, Facilitator for workshop	present
Phil Jennings	Conservation Council, Pt Kennedy Board of Mgmt	present
Richard Lukin	Kennedy Bay Resorts, Pt Kennedy Board of Mgmt	
Bill McAtee	Kwinana High School	
Sonja McAuliffe	Secondary Science, Catholic Education Office	present
Mal McFetridge	Councillor City of Rockingham	present
Mark McGowan	Councillor City of Rockingham	
Greg Mitchell	Primary Science, Catholic Education Office	present
Peter Monks	Senior Planning Officer	present
Dr Linda Moore	Friends of Lake Richmond	
Lyndon Mutter	Department of CALM, nominee Jenny Alford	

Frank Nannup	Winjan Aboriginal Corporation	
Ric Palmer	Community representative, Pt Kennedy Board	present
Joan Payne	Conservation Council	present
Mike Pepperday	Friends of Port Kennedy	present
Neil Robinson	Ministry for Planning	
Martine Scheltema	Alan Tingay & Associates	present
Prof George Seddon	(Chair) Scientific Advisory Committee	present
Dr Vic Semeniuk	Semeniuk Research Group	
Dr Chris Semeniuk	Semeniuk Research Group	
Gary Sheehan	Kennedy Bay Resorts, Pt Kennedy Board	present
Don Shephard	WA Naturalists, nominee for Bob Goodale	present
Bob Slight	Coastal Alliance; Sport & Rec Fishing Council	present
Matt Stafford	Ranger, Ministry for Planning	present
Peter St Clair Baker	Aust. Assoc. of Environmental Education	present
Rod Thiele	Science Teachers Association, nominee Grey Mitchell	
Rob Towers	Dept of CALM	
John Tucker	Manager Parks and Recreation	present
Cherie Vasiliauskas	Warnboro Primary School	present
Joe Wally	Winjan Aboriginal Corporation	
Bev Walker	Consultant for Kennedy Bay Resorts	present
Gary Whisson	Dept Env Protection, nominee Bridgette Hyder- Griffiths	
Scott Woodcock	Alan Tingay & Associates	present
Peter Woods	Peter Woods & Associates, Scientists	present

Output from the small group discussions

Questions 1: Acceptable Activities for the Rockingham Parks

i) Lake Richmond

- Conservation (especially of thrombolites)
- Research
- Recreation (walking, bike riding, jogging, picnics)
- Bird watching, viewing platform
- Formal and self guided education
- Pollution control, water monitoring
- No water sports, vehicles, horses.

ii) Port Kennedy

- Conservation
- Research
- Education/observation/recreation (guided and self guided tours)
- Interpretation shelters/centre
- Toilets parking outside critical areas
- Bridle path on periphery
- Public access to beach (not through scientific area)
- Passive/active recreation (walking, bike riding, jogging, bird watching)
- Controlled vehicles
- Aquatic recreation

No four-wheel drives, horses (limited to beach), trail bikes, development in Scientific Park, kiosk and boundary.

iii) Lakes Coo loongup and Walyungup

- Conservation
- Scientific
- Recreation, passive and active (landsailing - identify impact of first), cycling hire
- Toilets/kiosk
- Interpretation shelter/centre

- Lookout trail to Tamworth Hill
 - No four-wheel drives, trail bikes
- iv) Anstey and Paganoni Swamps
- Fence boundaries (conservation)
 - Scientific study/education
 - Passive recreation - walk trails
 - Bird watching
 - No horses (compare with some groups said controlled horse riding)
 - Interpretation centre/shelters
 - Limited vehicle access
 - Four-wheel drive/motor bike access to quarry.

Several groups also identified the need for a management structure for Port Kennedy Scientific Park and Rockingham Lakes Regional Park to be combined.

Also identified the need for a coordinator/administrator to be responsible to a Board of Management.

Question 2:
**Facilities and Management Treatments
Required for Highest Ranged Activities**

i) Lake Richmond

- Control of drainage
- Control of carparks (no carparks)
- Total acquisition of lake into public ownership
- Walkways/boardwalks - thrombolite viewing platform
- Bird hide
- Signage
- Weed control
- Control/limit public toilets and picnic areas
- Careful location of proposed highway
- No extensive grassing, vehicle access or playgrounds.

ii) Port Kennedy

- Maintenance of fire breaks/trails (= walk trails)
- Control feral animals and weeds
- Fencing (vermin proof)
- Rehabilitation of degraded areas
- Interpretation centre
- Limited public facilities (1 group only mentioned accommodation)
- Signage (directional and interpretive?)
- Groundwater control
- Acknowledge community boating needs (beach access)
- Restricted horse access
- Strong community presence
- Develop alternative beach access away from bird rockery at Point Becher.
- No four-wheel drives, motor cycles or jet skis.

iii) Lakes Cooloongup and Walyungup

- Identify specific conservation areas and control access
- Provide access for active pursuits
- Picnic/barbecue areas, toilets, carpark
- Formalise landsailing
- Aboriginal interpretation system
- Walk trail system with signage
- Fire management
- Community involvement in management

iv) Anstey and Paganoni Swamp

- Fence boundaries
- Control weeds
- Control access
- Parking only on road reserves
- Signage
- Fire breaks
- Community involvement in management

Question 3:
Priorities for Funding

- i) Lake Richmond
 - Stormwater drainage control
 - Signage/interpretative material
 - Dual use path
 - Carpark control
- ii) Port Kennedy
 - Fencing
 - Fire fighting - fire breaks and equipment, presence
 - Significant ranger/education officer presence
7 days/24 hours
 - Walking paths (limited/staged)
 - Interpretation centre
 - Control weeds
- iii) Lakes Cooloongup and Walyungup
 - Identify conservation areas/control public access
 - Rehabilitation of bushland
 - Control active recreation
- iv) Anstey and Paganoni Swamp
 - Fencing
 - Fire control
 - Signage and interpretative shelters

Appendix 3

Summary Table of the Stratigraphy in the Rockingham Area
(Adapted from Searle et al, 1989)

AGE	UNIT	DESCRIPTION	THICKNESS	STRATIGRAPHIC RELATIONS	OCCURRENCES
QUATERNARY	Safety Bay Sand	Prism or sheet of laminated, x-laminated to structureless sand and shelly sand	Mostly 2-6m	Sharp contact with underlying Becher Sand; locally sharp contact with rocky shore deposits	Underlies much of the plain and forms the sub-aerial surface of the plain
	Becher Sand	Wedge or prism of bio-turbated, structureless to crudely layered grey shelly sand, sand and muddy sand; local seagrass fibre	Up to 20m	Sharp contacts with underlying Bridport Calcilutite and overlying Safety Bay Sand; locally gradational contact with underlying Leschenault Formation or rocky shore deposits, or unnamed clay deposit	Underlies much of the plain; forms contemporary surface of the Rockingham and Becher banks
	Bridport Calcilutite	Wedge or ribbon or sheet of structureless carbonate mud and shelly sand	Usual 2m thick up to 10m thick	Gradational contact with underlying Cooloongup Sand and Leschenault Formation; sharp contact with overlying Becher	Occurs as buried deposit towards middle and western portion of the plain; forms contemporary surface in Wambrro Sound
	Leschenault Formation	Lens of grey/black clay mineral mud and muddy sand with	<1m	Gradational contact with underlying Cooloongup Sand; or sharp contact, estuarine shell assemblage marked by pebbles with Tamala Limestone overlain gradationally by Becher Sand or Bridport Calcilutite	In former deep depressions underlying the Rockingham-Becher Plain
PLEISTOCENE	Cooloongup Sand	Grey to yellow feldspathic quartz sand, with shelly layers	<5m	Gradational contact overlying Bridport Calcilutite and Leschenault Formation bioturbated to gradational contact with overlying Becher Sand; sharp contact with underlying Tamala Limestone	Forms thin ribbon-like deposits that drape over the Tamala Limestone and underlie Holocene sequence.
	Tamala Limestone	Pale to yellowish brown hard limestone, solution pipes rhizoliths, hard calcitised cap	Mostly 2 to 15m thick up to 40m in Spearwood Ridge, approx 90m thick at Tamworth Hill	Sharp contact with overlying Cooloongup Sand, Bridport Calcilutite and Becher Sand	Underlies all of the Holocene sediment sand Cooloongup Sand, forms the contemporary surface of the Spearwood Ridge
	Unnamed ? Pliocene/Pleistocene Unit	Grey clay, deposit geometry unknown		Gradational contact with overlying Becher sand, abuts against Tamala Limestone	Only known from subsurface in Singleton Beach area; stratigraphic position unknown