JANUARY 2001

Southern River/Forrestdale/ Brookdale/Wungong

DISTRICT STRUCTURE PLAN

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Foreword

The Southern River, Forrestdale, Brookdale, Wungong area is complex to plan for future development. It is affected by issues such as a high water table, contaminated sites, uses which have offsite impacts such as poultry farms and kennels, major infrastructure installations such as power lines, gas and water mains, important conservation and environmental sites and land fragmentation.

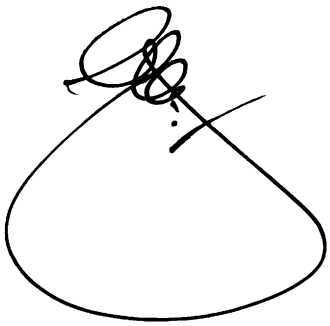
To address these issues comprehensively, the Western Australian Planning Commission has prepared the Southern River/Forrestdale/Brookdale/Wungong District Structure Plan in consultation with the Cities of Gosnells and Armadale and other key stakeholders.

The primary purpose of the District Structure Plan is to provide a broad framework for land use and development including major community facilities, conservation areas, Bush Forever sites, open space, and potential areas for development.

Extensive research and consultation has ensured that the complex array of issues has been addressed and a balanced approach to conservation of the environment and development is provided.

Completion of the District Structure Plan is a significant step in the planning process for the area and paves the way for a coordinated approach to planning in the future. Key steps to follow include the preparation of an urban water management strategy, amendments to the Metropolitan Region Scheme, outline development plans, amendments to local government town planning schemes, and detailed subdivision design. The principles contained within the District Structure Plan provide a framework for these more detailed stages of planning.

I commend the District Structure Plan to you and feel certain that it will provide an excellent guide to planning in the study area.



HON GRAHAM KIERATH MLA
Minister for Planning

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District Structure Plan Area

The study area for the District Structure Plan includes the localities of Southern River in the City of Gosnells; and Forrestdale, Brookdale and Wungong in the City of Armadale.

Purpose

The District Structure Plan provides a guide to the future development of the study area and management of key environmental issues. It includes potential development areas, road networks, major community facilities, conservation and Bush Forever areas, and a neighbourhood structure. It also provides proposals for the implementation of the plan such as zoning mechanisms, staging and financial and management arrangements.

The study area has been the subject of increasing development pressure over recent years and the Western Australian Planning Commission (WAPC) has identified the need to address the significant constraints in the area prior to further development. Issues such as the high water table, nutrient, drainage and water resource management, conservation areas, multiple ownership, and how these and community expectations for development could be integrated into a plan were dealt with in the preparation of the District Structure Plan.

District Structure Plan Approval Process

The preparation of the District Structure Plan was undertaken by consultants, Turner Master Planners Australia, under the direction of a steering committee chaired by the Ministry for Planning. Representation on the committee included the Cities of Gosnells and Armadale, Water and Rivers Commission (WRC), and Department of Environmental Protection (DEP).

This process has involved extensive community consultation, technical data collection and review, and the advice of local and State government authorities. Community input has been a significant part of this process, being sought at each of the major steps in preparation of the Plan:

- Identification of Issues and Objectives.
- Discussion and Evaluation of Options.
- Adoption of a Preferred Option.
- Review of the Draft District Structure Plan.

The preparation of the District Structure Plan forms part of a larger planning process within the planning strategies for the future of Perth established by Metroplan and other regional policies of the Western Australian Planning Commission.

The Community Brief

Initial community workshops which were attended by residents, landowners, developers and other members of the public defined the key issues and values which should influence the preparation of the draft District Structure Plan as:

- Land Suitability
- Infrastructure and Transport
- Employment
- Lifestyle and Streetscape
- Conservation and Environment
- Implementation – Including Compensation
- Roles, Responsibilities and Decision-Making

Objectives and criteria were prepared for each of these elements which were then used by the consultants as a brief to prepare the draft District Structure Plan. The draft plan was evaluated against these objectives and criteria in a community workshop and given an overall high satisfaction rating, with some additional issues also being identified. Extensive consultation was also conducted with State government departments. Comments were reviewed by the Steering Committee and the draft Plan was modified where appropriate.

A three month exhibition and comment period was provided in Step 3 to enable all members of the public and organizations to submit their written comments on the draft District Structure Plan to the Western Australian Planning Commission.

Major Planning Influences

- *Liveable Neighbourhoods* has been adopted as a guide for the establishment of a physical neighbourhood structure to shape the new communities. Under this approach, liveable neighbourhoods are clustered together in groups to support town centres which will typically contain local shops and employment opportunities.
- *Site Constraints* were mapped which showed the study area is highly constrained for urban development. The legal and policy constraints imposed by the Southern River Kennel Zone, the impacts of proposed development on nutrient export and hydrology and the septage treatment site on Armadale Road all impose significant buffers to urban development.
- *Environmental issues* fall within five main categories:
    - Drainage and nutrient management.
    - Retention of important bushland and wetland remnants.
    - Connectivity between remnant areas of bushland and wetland by multiple use corridors.
    - Buffers around wetlands to protect wetlands and minimise midge and mosquito nuisance.
    - Buffers around incompatible land uses.

These issues have been investigated thoroughly. Detailed proposals have been incorporated in the District Structure Plan to ensure that the impacts are ameliorated during the more detailed stages of planning.

- Thirteen *Bush Forever* sites are identified in the District Structure Plan. Some areas in Southern River have been earmarked for Parks and Recreation under the Metropolitan Region Scheme. Others are subject to negotiated outcomes.
- *Drainage and Groundwater Management* is regulated by the Water and Rivers Commission and the Environmental Protection Authority (EPA). The Water and Rivers Commission policy recommends that inverts of drainage systems be set no lower than the Annual Average Maximum Groundwater Level. This policy and drainage implications were examined in the technical investigations. Multiple Use Corridors recommended in the *Middle Canning Catchment Study (1996)* have been incorporated in the District Structure Plan where drainage, environmental features and open space coincide or there are advantages achieved by these elements being combined.
- All Conservation Category Wetlands are shown on the District Structure Plan. Resource Enhancement and Multiple Use Wetlands are also identified within the report. The precise boundaries of all wetlands must be confirmed with the Department of Environmental Protection and Water and Rivers Commission during the more detailed stages of planning.
- The formulation of a regional urban water management strategy will be required in order to ensure the objectives and water quality targets for the *Swan Canning Clean-up Action Plan* and Environmental Protection (Swan Canning Rivers) Policy 1999 are met.
- *Environmental Management Areas (EMAs)* identified by the EPA as groundwater capture zones of internationally and nationally significant wetlands include the area north of Armadale Road as the capture zone for Forrestdale Lake. This has been examined in the technical investigations. Refinement of the boundary of the EMA may be considered, subject to further investigation.
- *The Forrestdale Main Drain and Bailey's Branch Drain* have low capacities and need assessment prior to upgrading the system.
- The implications of existing infrastructure on the development and implementation of the District Structure Plan are not significant as the need for relocation has been minimised.

However, the infrastructure required will significantly affect the costs and strategy of development staging.

The District Structure Plan

Vision

- *The Context:* The study area is not a self-contained entity; it is an extension of the existing and abutting communities.
- *Image:* A balance is sought between maintaining areas of high conservation value and facilitating development.
- *Implementing the Vision:* Close consultation with the community established an overriding vision to promote fair and equitable outcomes for all parties with transparent decision-making and clear responsibilities.

Objectives

These objectives were developed from the community consultation workshops:

1. *Land Suitability:* To identify all land capable of providing a range of land uses which balances conservation and development, and provides for a mix of lifestyle opportunities within the intended community.
2. *Infrastructure-Transport:* To promote accessible and cost-effective infrastructure which complements the natural and built environment for existing and future communities.
3. *Employment:* To exploit the local geographic features, resources and linkages to other areas to provide accessible, appropriate and sustainable employment opportunities.
4. *Lifestyle and Streetscape:* To develop a safe and attractive environment with a sense of identity based upon the best attributes of the existing environment, where a full range of lifestyles and employment opportunities can be accommodated.
5. *Conservation and Environment:* To set aside land having a high conservation value.
6. *Implementation* – Including Compensation: To implement the District Structure Plan to provide a fair and equitable outcome for all participants.
7. *Roles, Responsibilities and Decision-Making:* To define (as precisely as possible) the decision-making and other responsibilities of those involved in the preparation, assessment and implementation of the District Structure Plan.

Principal Components of the District Structure Plan

- *Urban:* The study area was divided into four urban precincts. The area, estimated capacity populations, population growth projections for the year 2026 and percentage estimated to be occupied by 2026 are shown below for each precinct.

	AREA (hectares)	CAPACITY POPULATION	2026 POPULATION	2026% AREA OCCUPIED
Area 1: Southern River *(North of Ranford Road)*	547	15,750	10,000	57.6%
Area 2: Forrestdale *(Ranford to Armadale Road)*	526	14,250	7,500	44.4%
Area 3: Forrestdale Lake *(North of Forrestdale Lake)*	136	3,650	no significant increase	–
Area 4: Brookdale/Wungong *(South of Armadale)*	804	22,700	11,700	48.5%

Residential development is proposed within the context of *Liveable Neigbourhoods* which is indicated on the District Structure Plan. As detailed planning proceeds it is expected that this pattern of urban structuring will be modified to suit local conditions.

- *Retail:* New urban areas are proposed to be served by existing District Centres at Canning Vale, Maddington and Gosnells as well as the Armadale Regional Centre. Local neighbourhood shopping is proposed in five new "town" or "village" centres which are located within clusters of neighbourhoods. Retail floorspace needs require definition at the detailed planning stage. Additional commercial and home-based business opportunities are also provided adjacent to the town centres and within neighbourhoods. These are shown conceptually on the District Structure Plan.
- *Industry:* A major industrial area is located at the junction of Ranford Road, Armadale Road and the future Tonkin Highway. A small local industrial area is proposed in Southern River near the Kennel Zone (within the buffer area).
- *Rural:* Major rural areas are located south of Forrestdale Lake and north of Armadale Road in Forrestdale. The Forrestdale Lake area is acknowledged as an area with few constraints (other than infrastructure) and is earmarked for "Possible Future Urban Development".
- *Conservation:* Significant Environmental Protection Policy Wetlands, Conservation Category Wetlands and conservation areas and multiple use corridors are shown on the District Structure Plan based upon the detailed investigations conducted. The EPA recommends a minimum 50 metres or 1m AHD buffer around these wetlands.
- *Bush Forever Sites:* All Bush Forever sites are identified on the District Structure Plan.
- *Kennel Zones:* The Southern River Kennel Zone fronting Ranford Road has been retained. A 500 metre non-noise-sensitive use buffer has been placed around the Southern River Kennel Zone on advice from the Department of Environmental Protection to avoid noise conflict. Residential zoning and close residential development will be excluded from this buffer area unless scientific studies can demonstrate an acceptable noise impact is achievable. If such development is acceptable, covenants/ memorials on titles would be applied. It should be noted that the implementation of best practice measures by kennel operators is critical to the successful management of noise impacts.

  A special control area between 500 metres to 1 kilometre of the kennel zone applies within which urban development could occur subject to controls on the design and construction of housing where affected by potential noise nuisance. This would also include placing memorials on titles for subdivision within this special control area to advise of the potential noise nuisance. Corresponding measures are recommended for the construction and management of kennels to reduce off-site noise impacts.

  The Forrestdale Kennel Zone has not been retained with the following implementation steps recommended:

  - Rezoning by the City of Armadale.
  - Best practice guidelines to be applied to all additions.
  - Additions be limited to those allowed under non-conforming use rights.
  - Residential use between 500m and 1000m to be subject to covenants/memorials on titles advising of potential noise nuisance.
  - Residential use proposals within 500m of existing kennels to demonstrate through scientific studies an acceptable noise impact and be subject to covenants/memorials on titles.

- *Contaminated Site:* The former liquid waste disposal facility in Southern River has been the subject of an EPA assessment and ministerial conditions. The City of Gosnells is committed to complying with these conditions which include restrictions on groundwater use in the vicinity of the site.
- *Drainage:* Major drainage routes are shown on the District Structure Plan within multiple use corridors(MUCs). Drainage and open space can be combined in these MUC's where environmentally acceptable. The width of the MUCs would be dependent upon drainage requirements, natural topography, suitability for open space, conservation and landscape value.
- *Transportation:* The road framework existing in the study area and the Metropolitan Region Scheme has been adopted within the District Structure Plan. Bus services are planned to be expanded into the study area to provide links back to existing and proposed railway stations. Southern River Road is extended through to Nicholson Road. Ranford Road is to be retained although any upgrading will require a sensitive approach to construction where it crosses Balannup Lake.
- *School Sites:* Existing and proposed public schools within the study area are shown on the District Structure Plan in accordance with the WAPC Policy DC 2.4 (School Sites). Proposed private schools are not identified as their locations will need to be resolved with the relevant local governments.
- *Open Space:* Parks and Recreation reservations (existing and proposed) and other open space proposals are shown on the District Structure Plan. The other open spaces include drainage routes, significant conservation and EPP wetlands, a golf course, buffers and multiple use corridor connections.

  Private land shown as open space in the District Structure Plan is not reserved but is proposed for such use. It will be necessary for the relevant landowners and local governments to resolve the precise boundaries and extent of these open spaces within outline development plans associated with the development of the area.

  The 10 per cent Public Open Space requirement would be in addition to the open space shown on the District Structure Plan.
- *Other Development Constraints:* The study area is subject to many constraints not addressed in detail in this District Structure Plan (i.e. poultry farms and utility services or the absence of services). Those constraints were taken as matters which are required to be resolved in the normal course of the land development process. EPA and WAPC policies and draft policies will continue to apply to separate incompatible land uses. Incompatible land uses may prevent urban development occurring within buffer areas. Upon cessation of such uses, development could proceed in accordance with the District Structure Plan. Separation distances to residential development are also required from existing gas pipelines passing through the study area.

Implementation

District Structure Plan

There are a number of steps to be taken before the implementation of the District Structure Plan. Part of the process will involve the review and adoption of the District Structure Plan by the Cities of Gosnells and Armadale and initiation of rezoning amendments. The District Structure Plan will form the basis for preparation of outline development plans to guide the rezoning, subdivision and development of land. It is anticipated that the outline development plans will refine the District Structure Plan as a result of additional detailed investigations and design.

Urban Water Management Strategy

A detailed urban water management strategy is to be formulated for the study area prior to

major development. The strategy will address the issues of drainage and nutrient management at the regional level and provide a framework for site-specific drainage and nutrient management plans. A technical review committee will be established to oversee these strategies and plans and report on all associated aspects of their implementation.

Zoning in the Metropolitan Region Scheme

Any re-zoning to Urban would occur incrementally and would be cognisant of a range of factors including development within the urban front.

Infrastructure Provision Submissions

Infrastructure provision submissions will be prepared by landowners to a standard acceptable to the relevant authorities and the WAPC. Within submissions, landowners will need to demonstrate how they will provide full urban servicing for land; make commitments for contributions to appropriate infrastructure items; and prepare an outline development plan, generally in accordance with the District Structure Plan.

Local Government Town Planning Scheme Amendments

Implementation of the District Structure Plan will require amendments to the City of Gosnells and City of Armadale Town Planning Schemes to provide for:

- Infrastructure contributions as a condition of subdivision.
- Council management of contributions.
- Authority to acquire land and enter into negotiations to implement proposals.
- Expanded infrastructure items.
- Requirements for the preparation and approval of outline development plans by owners and/or Councils prior to subdivision and land development.
- Detailed financial matters to facilitate development and compensation in a fair and equitable manner.

Development Sequence

The following steps illustrate the matters to be addressed and the sequence of actions necessary for development in accordance with the District Structure Plan. Note that not all situations will be identical and this is a guide only.

- Adoption of District Structure Plan by WAPC and local governments.
- Urban Water Management Strategy (UWMS).
- Technical Review Committee reviews UWMS.
- MRS rezoning.
- EPA environmental assessment.
- Local government town planning scheme amendments for procedures, infrastructure contributions, Outline development plans, etc.
- Landowners prepare outline development plans and conduct detailed research and design including environmental assessment documentation, detailed drainage and nutrient management plans and outline development plans. An infrastructure provision submission and documentation of these matters will form the basis of a request for initiation of rezoning.
- Local government initiates rezoning.
- EPA environmental assessment (Includes Technical Review Committee advice)
- WAPC transfers land to Urban.
- Local government rezoning is finalised and the outline Development Plan is approved.
- Landowner submits subdivision application.
- WAPC approves subdivision with conditions included to implement EPA/Ministerial Environmental Assessment conditions and local government implementation measures.
- Land development proceeds.

Using this District Structure Plan

District Structure Planning is a vital step in the urban development process as it guides developers and decision-makers through all subsequent stages, including land use planning and subdivision design. However, not all issues are determined in detail during District Structure Planning, hence some elements of

District Structure Plans should be viewed as indicative only.

In the case of the study area, some of the land is complicated and constrained from a water management perspective, and further detailed work is required. This District Structure Plan will be followed by an Urban Water Management Strategy (UWMS), which will be undertaken jointly by the Ministry for Planning, Water and Rivers Commission, Department of Environmental Protection, and the Cities of Gosnells and Armadale.

The UWMS will provide specific guidance on issues such as stormwater control, drainage, and wetland management. Because the land is constrained, it will be essential that land use and subdivision planning incorporates elements of water sensitive urban design through the application of best management practices. Therefore, planners and developers referring to this District Structure Plan need to be aware that more specific guidance on water management will follow, and that this may result in modifications to aspects of the District Structure Plan in respect of land use and subdivision design.

ACKNOWLEDGEMENTS

STEERING COMMITTEE

Mike Allen (Chairman)	Ministry for Planning
John Adderley	City of Armadale
Tim McAuliffe	Water and Rivers Commission
David Ritchings and Ray Haeren	City of Gosnells
Gary Middle and Darren Walsh	Department of Environmental Protection
Ashley Wilson (Project Manager)	Ministry for Planning
Nick Leong (Executive Officer)	Ministry for Planning
Malcolm Mackay (Urban Design)	Ministry for Planning

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Edward Turner	Turner Master Planners Australia
Kevin Broughton	Broughton Planning
Jim Davies	Jim Davies and Associates
Michael Breen	Michael D Breen and Associates
Barry Muir	Muir Environmental
David Wilding	Worley Fraser Pty Ltd

Note: A3 Map
District Structure Plan

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1. Introduction

1.1 Purpose of this Report

The purpose of this document is to describe a District Structure Plan for the areas of Southern River, Forrestdale, Wungong and Brookdale. The District Structure Plan has been developed using data derived from:

- Previous studies.
- On-site assessment (i.e., environmental and land capability assessment).
- Monitoring of groundwater levels.
- Community workshops.
- Local and regional planning authorities.

Unlike traditional District Structure Plans that identify potential development areas, this District Structure Plan document also describes the physical framework for future development (including street networks, community facilities, conservation areas and neighbourhoods). In addition, the report will provide a detailed description of implementation issues, such as staging, funding of infrastructure and conservation management.

1.2 Need for a District Structure Plan

The Southern River, Forrestdale, Wungong and Brookdale areas have experienced increasing development pressures over the past 10 years. These pressures have resulted in a significant number of development proposals.

However, future development within the area is constrained by a high water table, low-lying land, regionally significant conservation areas, contaminated sites, community expectations, fragmented land ownership and limited infrastructure. As such, future development proposals need to be considered within a co-ordinated and planned context.

This District Structure Plan therefore seeks to co-ordinate the development expectations of the district while balancing environmental constraints, conservation, infrastructure provision and lifestyle, community and neighbourhood objectives.

1.3 Type of District Structure Plan

The District Structure Plan is intended to be used by State and local government authorities as a basis for the long-term planning of the district and:

- Provide a vision statement for the study area area.
- Provide a prescription for development within the study area.
- Identify areas to be set aside as regional open space.
- Provide for community infrastructure.
- Establish the basis for subsequent Metropolitan Region Scheme amendments.
- Provide a context for local government town planning scheme amendments.
- Identify future development areas.
- Nominate physical servicing infrastructure requirements.

The District Structure Plan focuses on the physical arrangement of urban areas, primary road systems, public transport, neighbourhoods, schools, open space, shopping facilities and major infrastructure.

It is intended that the District Structure Plan will:

- Be used a basis for lodging subdivision applications for individual neighbourhood areas.
- Facilitate amendments to the Metropolitan Region Scheme and local government town planning schemes for the development or conservation of land.
- Facilitate infrastructure provision.

The District Structure Plan will have no statutory effect. The District Structure Plan will be used by the Western Australian Planning Commission as a guide to amendments to the Metropolitan Region Scheme or for consideration of subsequent subdivision applications on appropriately zoned land.

1.4 Process for Adopting the District Structure Plan

The preparation of this District Structure Plan forms part of a larger planning process which involves various policy and statutory processes. Figure 1.1 diagrammatically illustrates this broader planning and development process.

The specific preparation and adoption of this District Structure Plan has involved extensive community consultation, technical data collection and the advice of local and State government authorities. Community input has formed a significant part of the process and has been sought at key steps including:

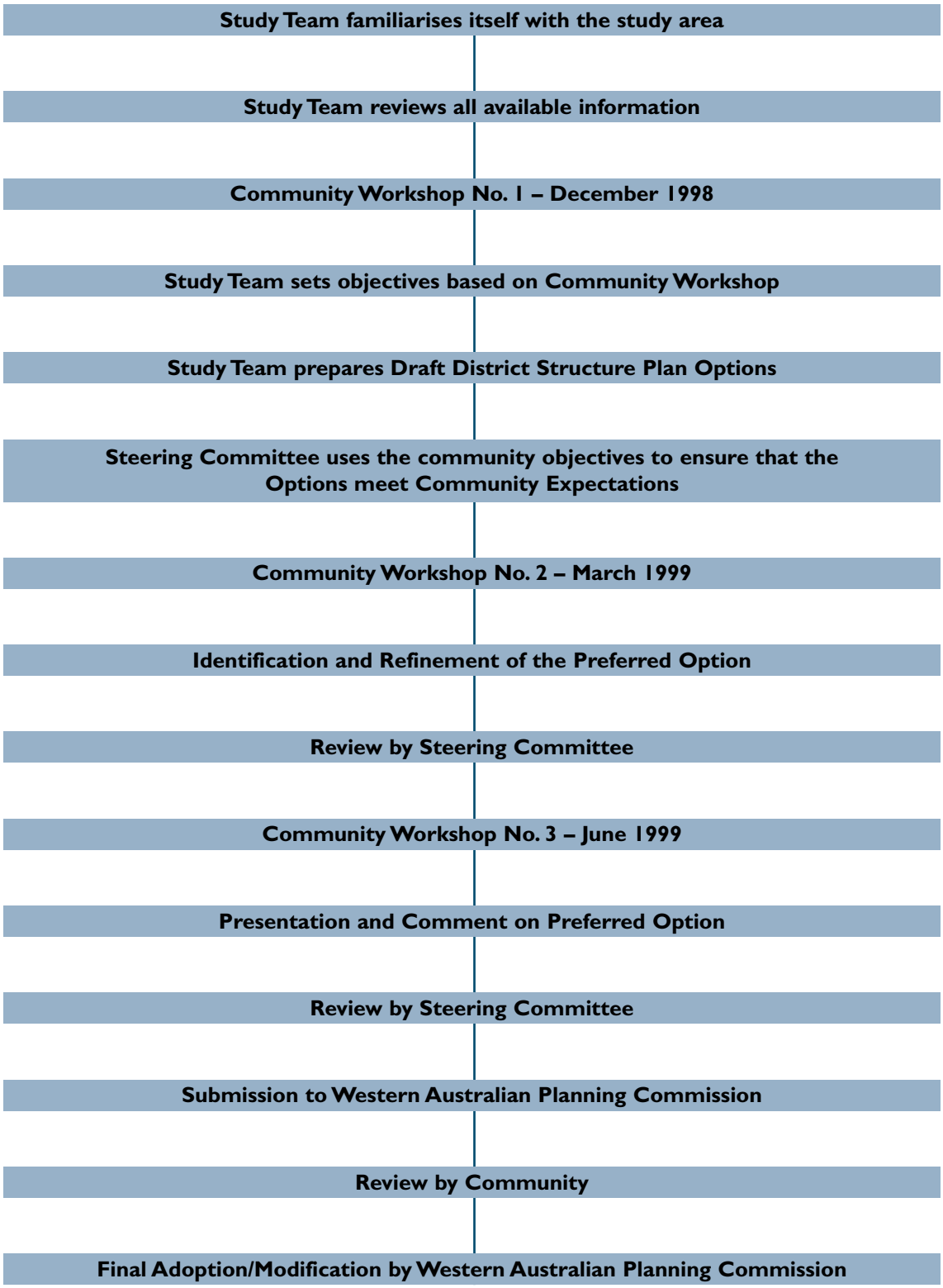
- Identification of Issues.
- Discussion of Preferred Options.
- Presentation of the Preferred Option.

Figure 1.2 diagrammatically illustrates the process that has been adopted.

The Planning Process – Figure 1.1

Note: Public comment is invited at each of the key stages in the planning process

The District Structure Plan Process – Figure 1.2



1.5 Area Covered by the Plan

The District Structure Plan area forms part of the South-East Corridor extending south of Canning Vale to include Southern River, Forrestdale, Wungong and Brookdale. The area is generally bounded by Rowley Road, Warton Road and the existing developed areas south and west of Gosnells and Armadale respectively.

The study area has an area of approximately 7,000 hectares and is illustrated in Figure 1.3.

1.6 Function of the District Structure Plan

The functions of the District Structure Plan are to:

- ***Balance environmental, lifestyle and development considerations.***

  The District Structure Plan seeks to provide a physical framework for the implementation of development opportunities while balancing the conservation, lifestyle and servicing expectations and needs of the metropolitan and local region.

- ***Provide the basis for formulating and implementing Metropolitan Region Scheme Amendments for the Southern River, Forrestdale, Wungong and Brookdale areas.***

  While a significant portion of the study area is zoned either Urban or Urban Deferred under the Metropolitan Region Scheme, it is intended that the District Structure Plan will provide the basis for additional amendments to the Metropolitan Region Scheme for the Southern River, Forrestdale, Wungong and Brookdale areas.

- ***Provide a framework for future subdivision and development.***

  The District Structure Plan provides a physical framework for urban areas, transport links, activity centres and community facilities. The Plan can be used by developers as a framework for further subdivision.

- ***Provide the basis for statutory planning and development control.***

  The District Structure Plan will provide a guide for further statutory amendments to and reviews of the City of Gosnells and City of Armadale town planning schemes and Local Planning Strategies. It will also assist in the assessment and co-ordination of development and subdivision applications.

- ***Provide a basis for servicing and transport authorities to plan their future requirements.***

  Major trunk services and transport routes are relatively expensive and require long-term forward planning and budgeting to acquire the required land for reserves and for implementation. Accurate forecasts of population potential, the location of employment, and other important land uses which affect demand for services are also required. District Structure Plans are essential for this type of planning.

- ***Provide a framework for the integration of good urban design and open space creation as part of urban water management practices.***

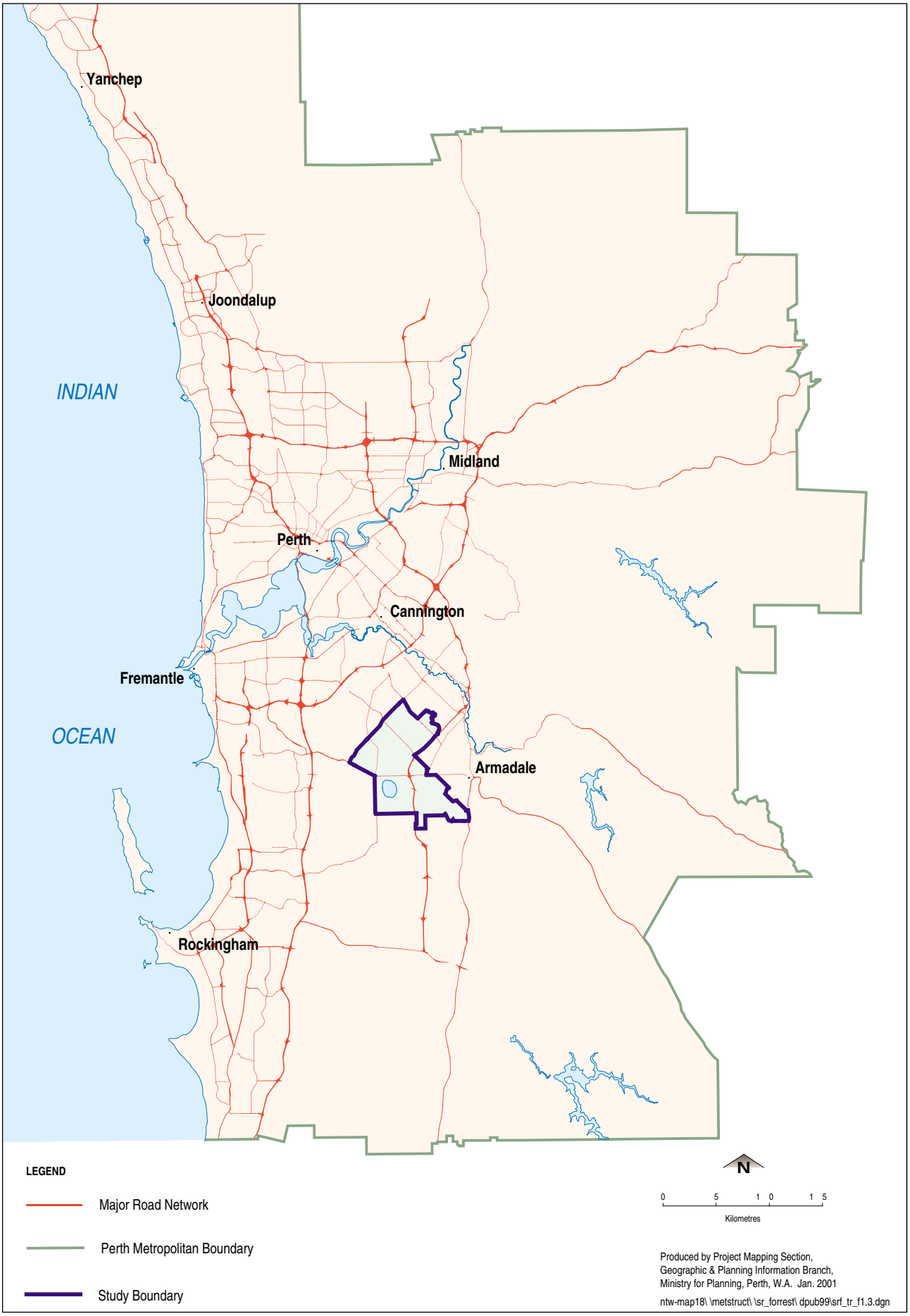
  The South-East Corridor is heavily constrained by a relatively high water table, low-lying land and areas subject to inundation. The District Structure Plan provides an opportunity for community development, recreation and a desirable urban form based around water management features.

- ***Provide a basis for staging development.***

  The District Structure Plan provides a general indication of staging with land being classified as possible future urban, future urban and urban.

1.7 Aims and Objectives

The Aims and Objectives were formulated using input obtained from the various community workshops held during the District Structure Plan process. The aims and objectives are to:



Study Area Figure 1.3

- Enhance the existing and future environment by identifying land capable of providing a sustainable mix of land uses.
- Enhance existing and future communities through the provision of accessible transport systems, appropriate and cost-effective infrastructure and use of drainage for design/recreational features.
- Create appropriate, sustainable and accessible employment opportunities for all employment types/choices represented within the intended community.
- Enhance the quality of lifestyle for present and future residents.
- Maintain, enhance and manage the existing environmental values within an urban context.
- Attain betterment for the community while preserving current lifestyles of those in the community.

1.8 Structure of this Document

The document is divided into seven chapters:

1 Introduction

2 Previous Reports and Studies

3 Existing Conditions

4 Description of the Community Consultation Process

5 Implications for the Preparation of the District Structure Plan

6 Preparation and Consideration of District Structure Plan Options

7 District Structure Plan

Attachments

The document is accompanied by supporting plans, tables and appendices.

1.9 Timing

No specific timetable for the implementation or expiration of the District Structure Plan has been identified. The District Structure Plan simply attempts to provide a framework for the physical development of the area as well as general indications of staging and implementation of the plan by:

- Identifying the best use of land based on various opportunities and constraints.
- Highlighting different categories of urbanisation according to the level of constraints currently affecting the land.
- Identifying servicing constraints.
- Recognising landowner and/or developer expectations.

The actual development of land will occur according to the priorities set by land developers and the ability of the servicing agencies to provide the essential services required. It is necessary, however, to describe the implementation options for development given the fragmented landowner characteristic of the study area.

1.10 Using this District Structure Plan.

Structure Planning is a vital step in the urban development process as it guides developers and decision-makers through all subsequent stages, including land use planning and subdivision design. However, not all issues are determined in detail during District Structure Planning, hence some elements of District Structure Plans should be viewed as indicative only.

In the case of the study area, some of the land is complicated and constrained from an water management perspective, and further detailed work is required. This District Structure Plan will be followed by an Urban Water Management Strategy (UWMS), which will be undertaken jointly by the Ministry for Planning, Water and Rivers Commission, Department of Environmental Protection, and local government.

The UWMS will provide specific guidance on issues such as stormwater control, drainage, and wetland management. Because the land is constrained, it will be essential that land use and subdivision planning incorporates elements of water sensitive urban design through the application of best management practices. Therefore, planners and developers referring to this District Structure Plan need to be aware that more specific guidance on water management will follow, and that this may result in modifications to aspects of the District Structure Plan in respect of land use and subdivision design.

1. Introduction

2. Previous Reports and Studies

The Metropolitan Region Scheme was gazetted in October 1963 for the purpose of establishing a statutory planning framework for subdivision and development within the Perth Metropolitan Region. The subsequent adoption of the Corridor Plan for Perth in 1970 did not contemplate urbanisation within the study area. To this end, the study area was regarded as part of the inter-corridor rural buffer area and part of it was included in the Jandakot Groundwater Mound. The land was not considered suitable for urban development as it was low lying and poorly drained.

As with many planning initiatives, the current proposals to urbanise the study area are the result of a long evolutionary planning process that has changed the thinking of potential development for the study area from rural to urban. This change is briefly discussed in the following review of the main planning studies and initiatives that have taken place since 1973.

2.1 Planning Structure for the South-East Corridor – Stage A (1978)

The *Corridor Plan for Perth* (1970) called for Structure Plans to be formulated for each of the proposed growth corridors. The Structure Plans sought to define the land use and transport arrangements needed for implementation. The Planning Structure for the South-East Corridor – Stage A Report (November 1978) produced by the (then) Metropolitan Region Planning Authority was produced to satisfy the recommendations of the Corridor Plan (Figure 2.1). The Structure Plan was referred to as the Stage A Structure Plan.

The Stage A Structure Plan was based on the Metropolitan Region Scheme of the time. The areas shown as 'Existing Urban' were generalisations of the Urban and Urban Deferred zones. The areas shown as 'Future Urban' were new proposals. Most of the areas shown as 'Existing Urban' referred to zoning, not the extent of existing development. The approximate boundary of the current study area has been superimposed to illustrate the relative position of the current proposals.

For the City of Gosnells, the Stage A Structure Plan calculated a population potential of 94,900 in the 'Existing' Urban zones and 18,060 in the 'Future' Urban zones. In Armadale the figures were 57,120 and 32,670 respectively. The total urban potential for the two local governments was 202,750. At that time the existing population (1976) was estimated at 40,420 for Gosnells and 27,460 for Armadale-Kelmscott. It can be seen that the plan provided for nearly three times the population at the time.

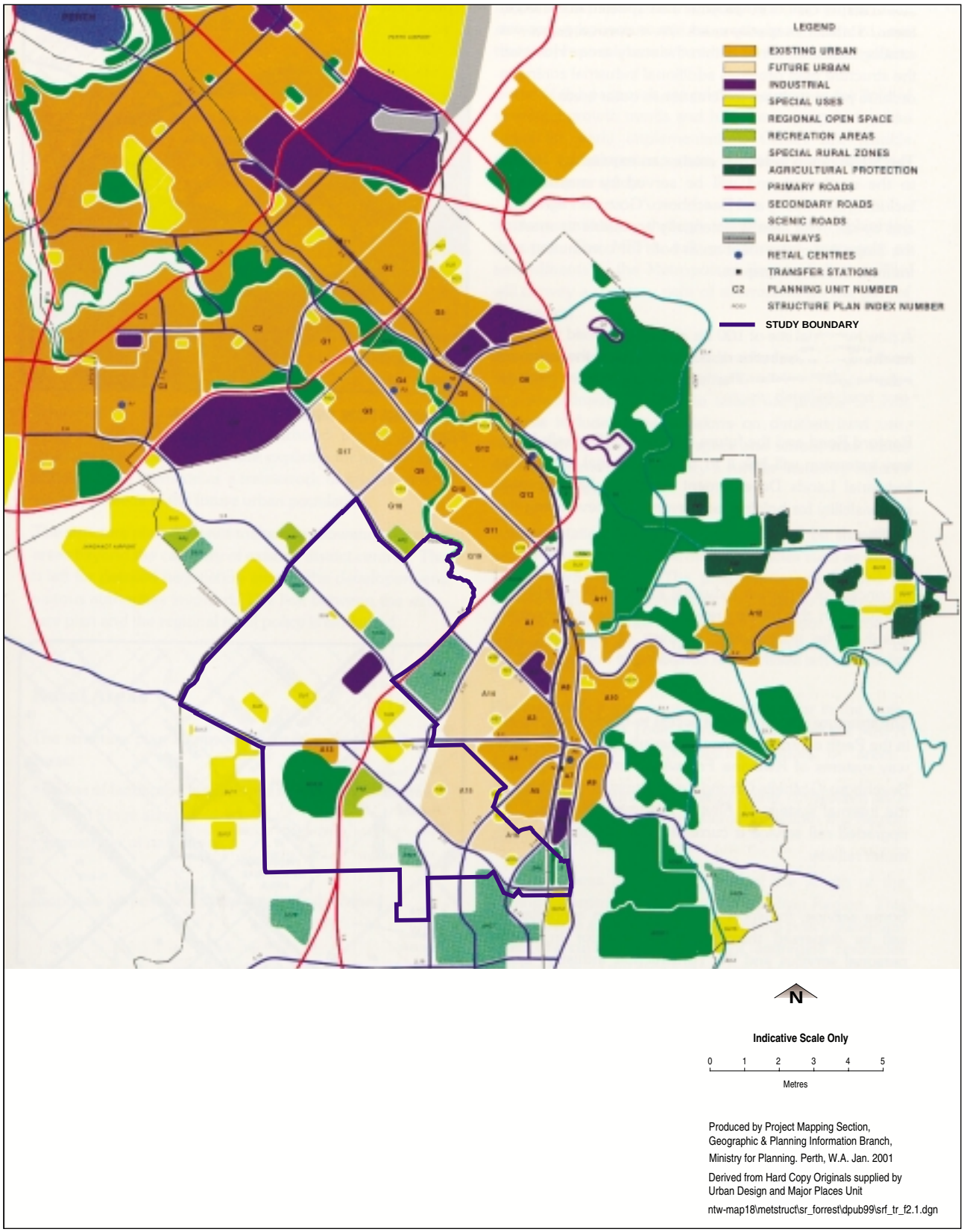
Transport was a prominent issue in the plan. The main roads, shown as blue secondary roads in the Structure Plan, reflect the orientation of the main urban corridor through Gosnells and Armadale generally envisaged by the Corridor Plan. Nicholson Road/Garden Street were intended to be the western extremity of future urban development. Most of the road proposals have since been incorporated into the Metropolitan Region Scheme although some of the alignments, such as Ranford Road, have been modified.

2.2 Planning for the Future of the Perth Metropolitan Region (1987)

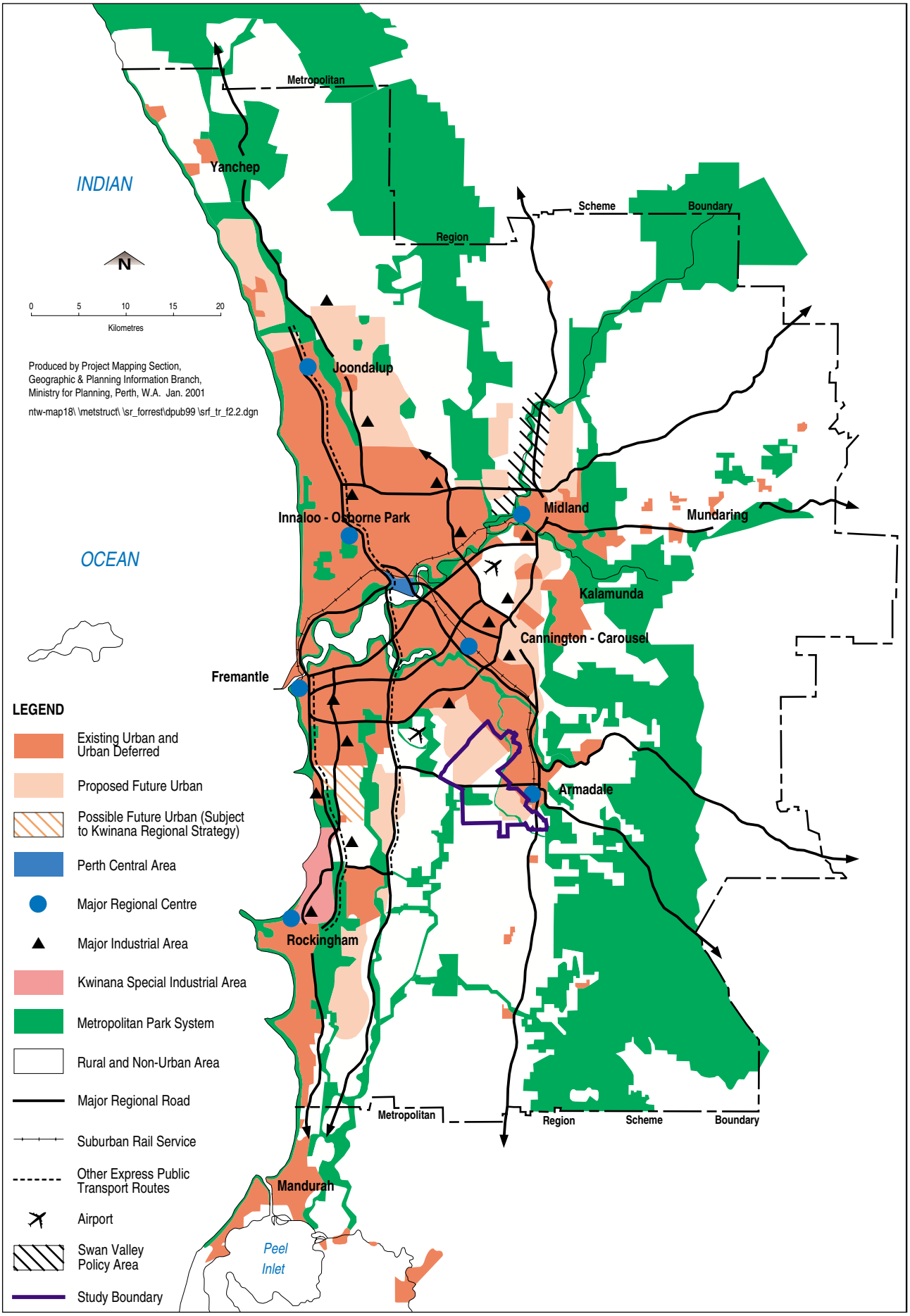
In May 1985, the then Minister for Planning announced the Government's decision to review the 1970 *Corridor Plan for Perth* and the Metropolitan Region Scheme. To this end a Review Group, comprising eminent persons in the urban development field, was established. The Review Group was supported by an inter-government agency technical group. In November 1987 the Review Group released its report titled *Planning for the Future of the Perth Metropolitan Region*.

The most important conclusion of the study was that the long urban corridors contemplated in the Corridor Plan were inefficient for servicing and transport. Further, that the corridors were socially undesirable given that the outer areas would be remote from employment areas and other facilities found in the inner areas of the Metropolitan Region.

2. Previous Reports and Studies

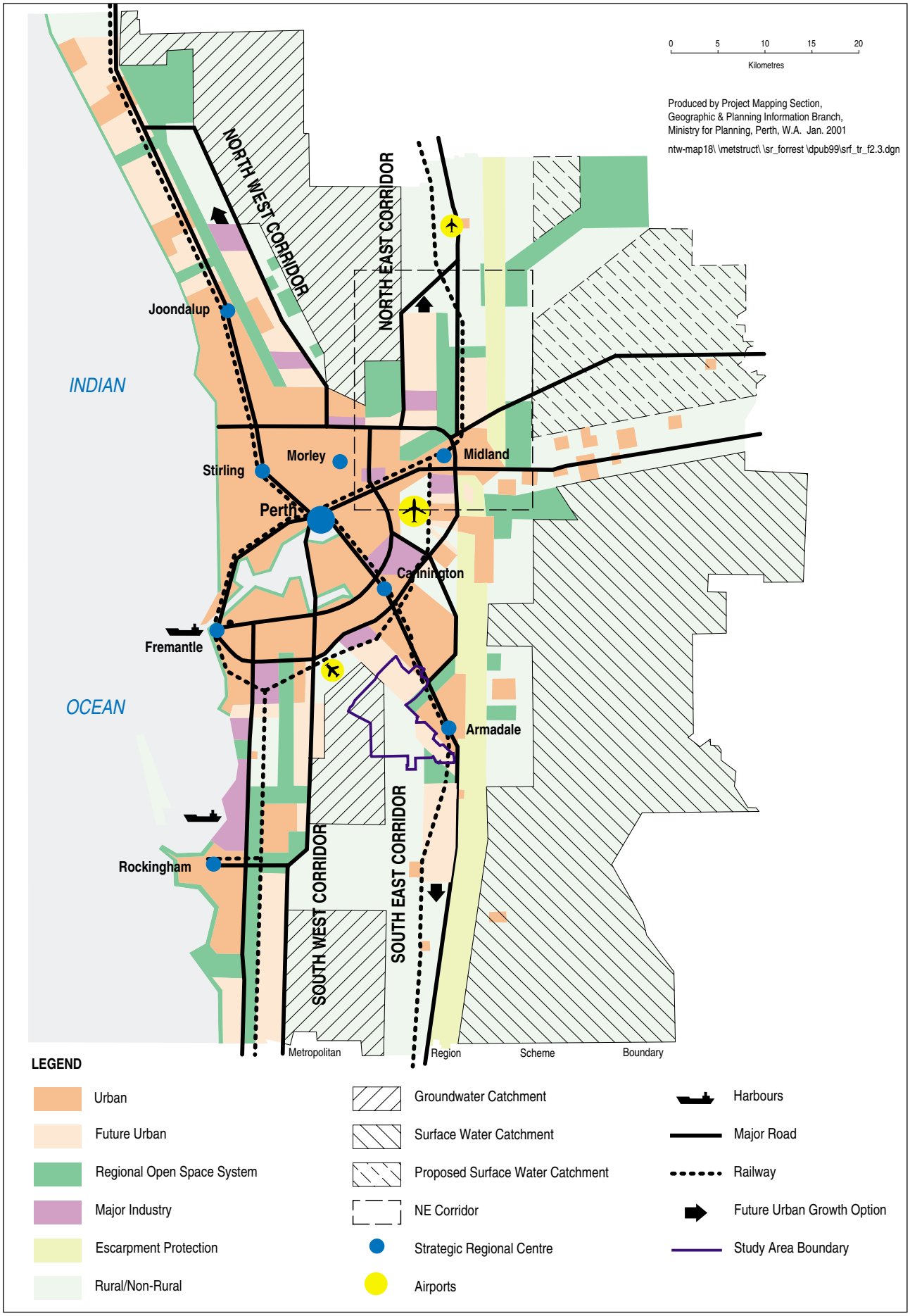


Plan A – Structure Plan for the South-East Corridor 1978 Figure 2.1



The Preferred Strategy 1987 Figure 2.2

2. Previous Reports and Studies



Metroplan 1990 Figure 2.3

The *Preferred Strategy* (1987) therefore sought to consolidate development within shorter and wider corridors. The Strategy accordingly replaced land formerly identified in the outer corridors with land in the former rural corridors closer to the core of the metropolitan region (Figure 2.2).

In the South East Corridor the *preferred strategy* proposed further extensions to the urban areas initially proposed under the 1978 *Stage A Planning Structure for the South East Corridor.* In Southern River, the urban area was extended westwards into Forrestdale to the boundary of the Jandakot Underground Water Pollution Control Area which followed Nicholson Road. The new urban area in the City of Gosnells was intended to accommodate 80,000 persons. Additional urbanisation was proposed in the City of Armadale extending the previous proposed future urban areas southwards to the Wungong Brook to accommodate a further 20,000 persons.

The rationale for these extensions was to make it possible to review and defer proposals which previously recommended an extension of the urban corridor southwards into the Shire of Serpentine Jarrahdale.

The report noted that the area previously had not been considered suitable for urban because the land was low lying, prone to inundation in parts and had a fragmented ownership. Furthermore, it was considered desirable to maintain a substantial rural wedge between the South-West and South- East Corridors.

Increased urbanisation did have a number of benefits within the South-East Corridor. Urbanisation would facilitate residential areas closer to employment and services in the existing and developing areas, would limit development costs (through economies of scale) and would satisfy perceived demand for residential development in the area.

The report was released for public comment and generated a number of submissions.

2.3 Metroplan and the Urban Expansion Policy Statement (1990)

Following the 1987 Corridor Plan Review, the then Department of Planning and Urban Development re-examined metropolitan growth patterns. The review resulted in the release of *Metroplan – A Planning Strategy for the Perth Metropolitan Region (December 1990) and the Urban Expansion Policy Statement for the Perth Metropolitan Region (November 1990).*

Metroplan was adopted as a metropolitan-wide Structure Plan for the Perth region. *Metroplan* retained many of the features of the 1970 Corridor Plan (i.e. the corridor structure) as well as those future urban areas proposed in the 1987 Corridor Review. See Figures 2.3 and 2.4.

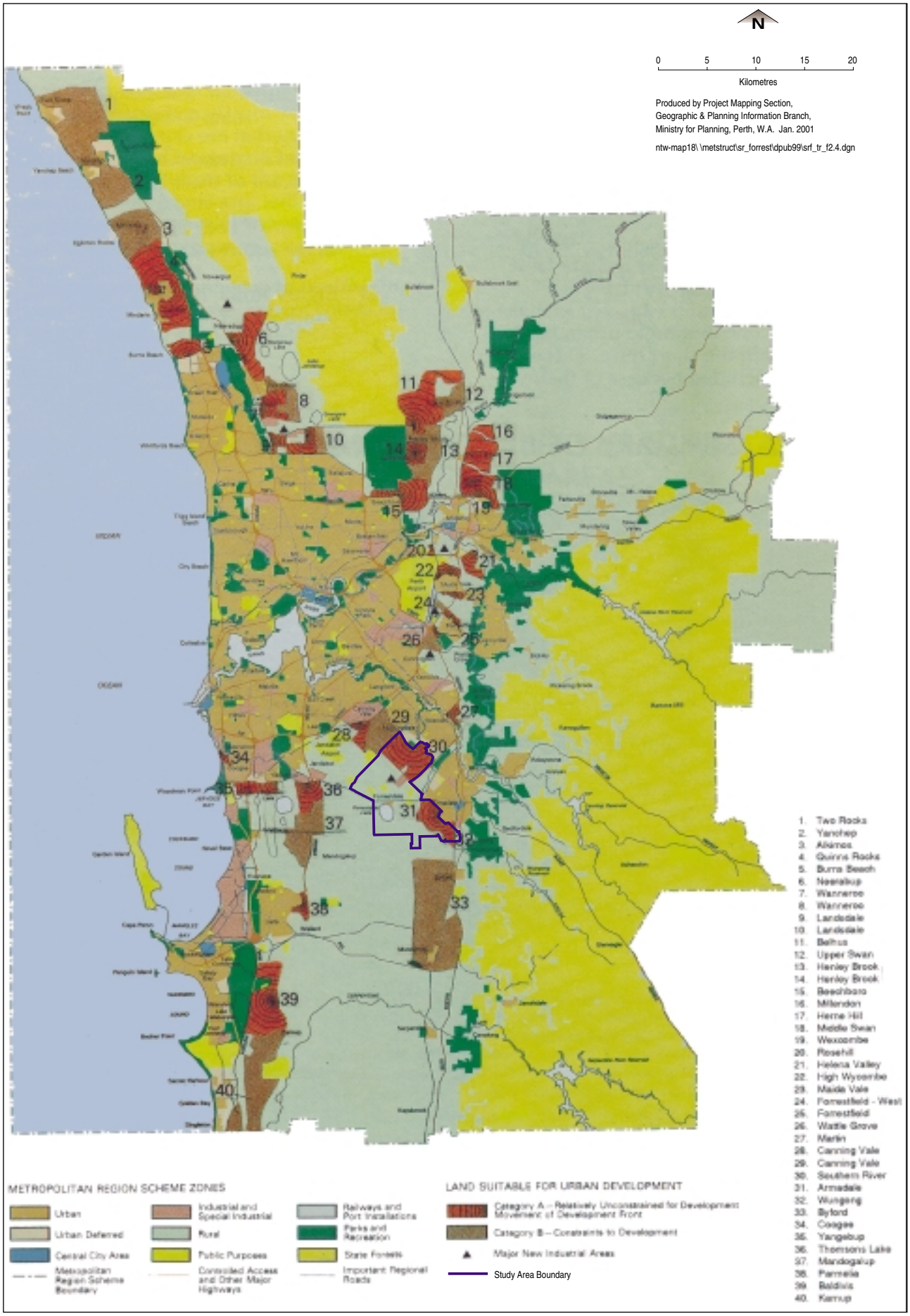
The Urban Expansion Policy Statement was intended to provide a detailed description of future urban areas as well as an indication of timing.

Metroplan and the *Urban Expansion Policy Statement* identified 1,850 hectares for future urban in Canning Vale and in Forrestdale as far west as Ranford Road. Within the City of Armadale, 810 hectares of future urban land was identified (comparable to the same area identified the 1987 Corridor Plan Review). The most significant difference between *Metroplan* and the Corridor Plan Review is that *Metroplan* identified about 4,800 hectares of potential urban land south of Armadale in the Shire of Serpentine-Jarrahdale.

An examination of the earlier work undertaken for the preparation of *Metroplan* and the *Urban Expansion Policy Statement* indicated that the Forrestdale area was excluded from urban development based on a submission from the City of Armadale. The City of Armadale generally opposed urban development in Forrestdale as it was felt that future development could detract from the role of the Armadale City Centre.

Since this time the City of Armadale has changed its view and is prepared to consider alternative regional land use options as far west

2. Previous Reports and Studies



Urban Expansion Policy 1990 Figure 2.4

as Warton and Forrest Roads (further west than was initially contemplated in the Corridor Review). The City of Armadale has indicated that support for any new urbanisation would be dependent on:

- environmental compatibility;
- comprehensive structure planning;
- revision of *Metroplan* to strategically include the area; and
- demonstration of adequate public transport to service the area.

It should also be noted that the *Urban Expansion Policy Statement* showed the Canning Vale area in Gosnells as having constraints to development. This was on the basis of a submission from the City of Gosnells which re-iterated the views of affected residents who, for the most part, objected to the area being urbanised. This position has apparently also changed with the City of Gosnells conducting a more recent survey which showed the majority of residents supporting urbanisation.

2.4 Previous Structure Planning for Southern River

In October 1991, in response to *Metroplan,* a notional structure plan was submitted to the (then) Department of Planning and Urban Development. The structure plan sought to support an urban zoning proposal for the area bounded by Warton Road on the north, the proposed Garden Street on the east, the future alignment of the Tonkin Highway on the south and Ranford Road on the west. The Department of Planning and Urban Development considered that the notional structure plan did not address the key constraints adequately.

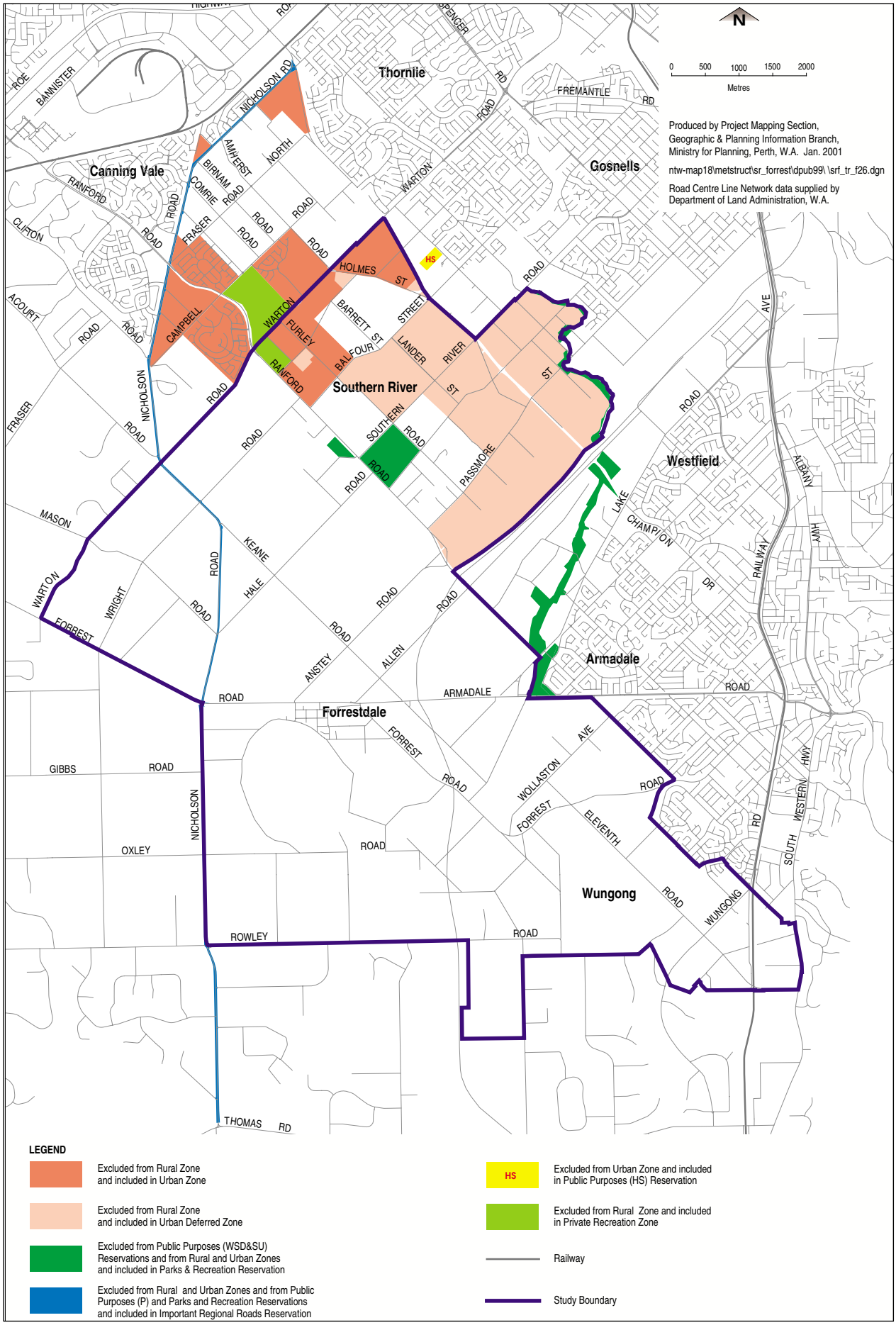
In July 1993, partly in response to the above proposal, but also as part of its program to implement Metroplan, the (then) State Planning Commission initiated Metropolitan Region Scheme Amendment (No. 927/33) covering the whole of the Southern River area and part of Canning Vale west to Nicholson Road. See Figure 2.5. The proposed urban area covered approximately 2000 hectares with an estimated population potential of 50,000.

In September 1993 the Department of Planning and Urban Development expanded the original structure plan to cover the area included in the Metropolitan Region Scheme Amendment (No 927/33). However, as a result of concerns expressed by a number of agencies, including the City of Gosnells, the Water Authority of Western Australia, the Department of Conservation and Environment and the Department of Environmental Protection, and also as a result of submissions received, the proposed amendment was substantially modified (Refer to Figure 2.6).

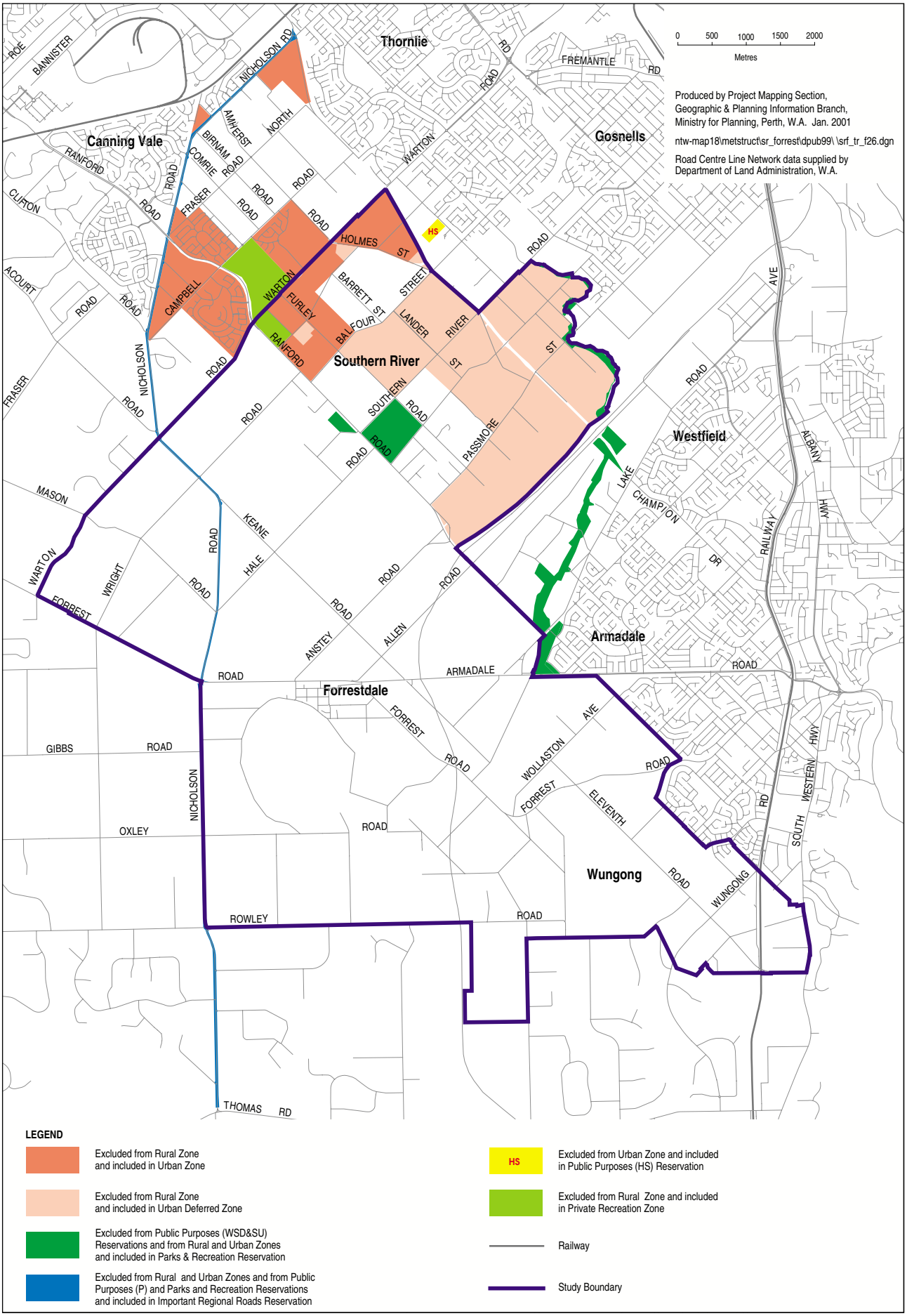
To address the concerns raised during the MRS amendment process, the Department of Planning and Urban Development (in consultation with the City of Gosnells) produced a draft structure plan for the area covered by the amendment. While the plan was not formally adopted by the Western Australian Planning Commission, the document was used by the Ministry for Planning as a guide to planning intentions for the area. See Figure 2.7.

In April 1996 a draft structure plan was submitted in support of a request for the lifting of the Urban Deferred zoning to Urban in the Metropolitan Region Scheme for an area bounded by Phoebe, Matison, Woongan and Passmore Streets. The plan covers approximately 110 hectares. The proposals in this plan are substantially different to those envisaged in the draft structure plan produced by the Department of Planning and Urban Development in that a large area of proposed regional open space has been reduced to a comparatively narrow linear park along the natural drainage channel through the site.

2. Previous Reports and Studies

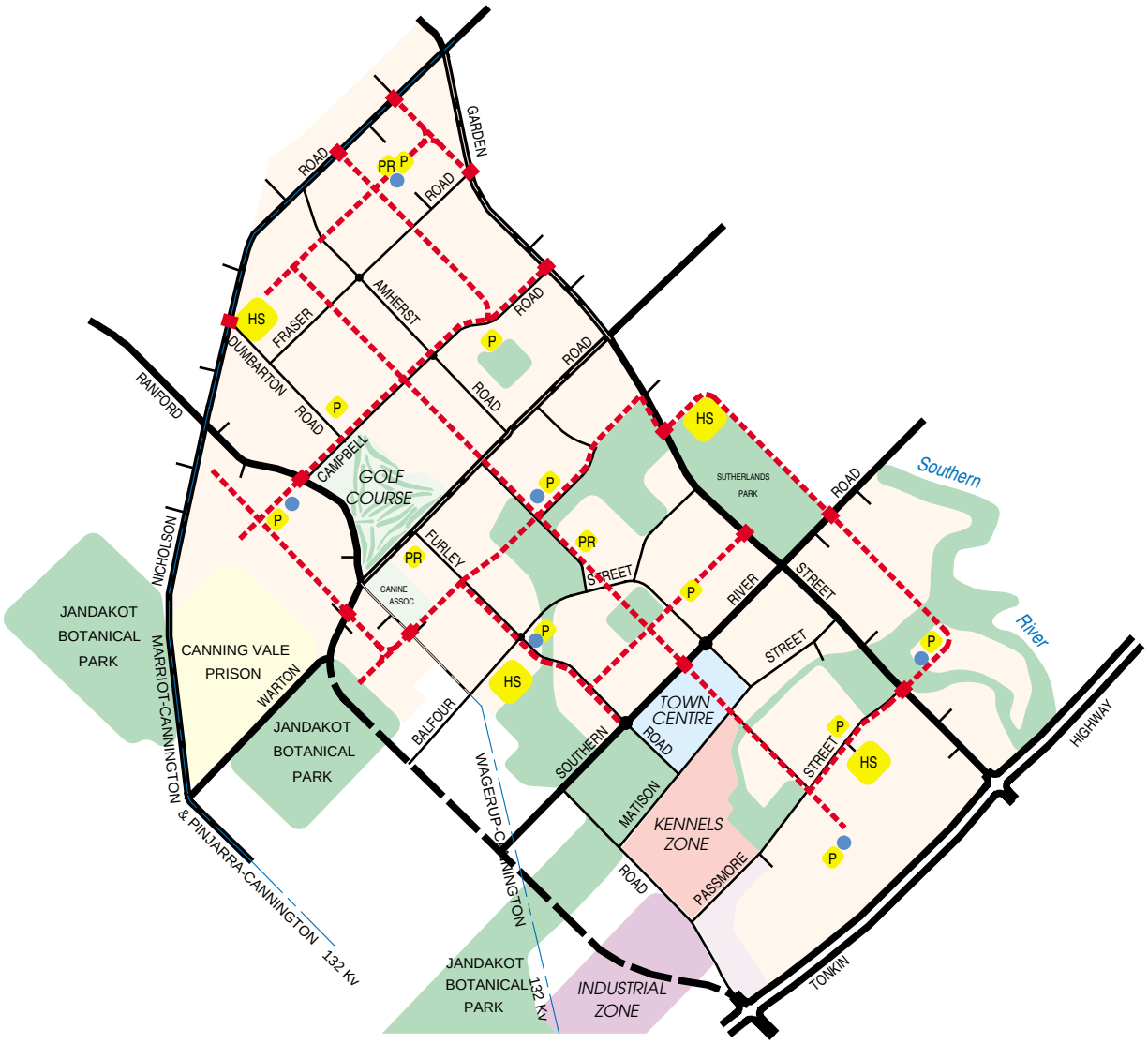


MRS Amendment No. 927/33 as Advertised 1993 Figure 2.5



MRS Amendment No. 927/33 as Approved Figure 2.6

2. Previous Reports and Studies



Southern River Draft Structure Plan 1996 Figure 2.7

2.5 Previous Structure Planning for Forrestdale (North of Forrest/Armadale Road)

In February 1994, in response to the South West Corridor Omnibus Amendment Stage A (No 938/77), landowners lodged a submission arguing in favour of urbanising approximately 600 hectares of land between Ranford Road and Nicholson Road as far south as Forrest Road. The submission included a concept plan.

The concept plan took into account proposals for Parks and Recreation reserves as part of the Jandakot Botanic Park which were derived from the draft *Jandakot Land Use and Water Management Strategy* (October 1992). The proposal was not adopted at the time because it was considered premature and insufficient work had been undertaken to resolve perceived drainage and environmental constraints.

In December 1994, the *Forrestdale Industrial Study* identified the need for industrial and commercial land in the City of Armadale. The study recommended the establishment of an industrial business park of approximately 170 hectares on a site generally bounded by Ranford Road, Armadale Road and the future alignment of the Tonkin Highway. The proposal, which has the support of the City of Armadale was incorporated into the recent South East Corridor Omnibus Metropolitan Region Scheme Amendment No. 979/33 as an Industrial zone.

South of Armadale Road the proposal included an 18 or 27 hole public golf course on predominantly Western Australian Planning Commission owned land adjacent the Water Corporation waste water treatment plant.

In May 1995, a concept plan for a golf course was put forward ('the Armadale Golf Course Commercial Village') on Part Lot 101, Twelfth Road Forrestdale. This proposal has the support of the City of Armadale.

2.6 Previous Structure Planning in the Forrestdale-Brookdale/Wungong Area (South of Forrest/Armadale Roads)

In July 1995, Taylor and Burrell submitted a structure plan and report for the area described as the South Armadale – Brookdale/Wungong area. The boundary for this structure plan coincides with the boundary for the current study area and included about 1,000 hectares of land assessed as having urban potential. The area is bounded on the east by the South West Highway and Wungong Brook, on the south by the Wungong Brook and Rowley Road, to the west by the extension of the Tonkin Highway and to the north by Eighth Road and Armadale Road. The report divided the area into seven planning cells and recommended detailed land use proposals for each.

The above structure plan has been endorsed by the City of Armadale and formed the basis of the South East Corridor Omnibus Amendment No. 2 to the Metropolitan Region Scheme.

In April 1996, in response to the South East Corridor Omnibus Amendment No. 2 to the Metropolitan Region Scheme (No. 979/33), a submission was made for Urban Deferred zoning for Lot 1, Hopkinson Road. The site is located immediately south of Rowley Road and east of the future Tonkin Highway. The proposals are for a residential neighbourhood development based around a central lake. The proposal was not given any status in the omnibus amendment. Lot 1 Hopkinson Road has been included in this study area being the last remaining undeveloped area in this part of the City of Armadale.

In January 1997, landowners in the area bounded by Warton, Nicholson and Forrest Roads, proposed two conceptual layouts over about 400 hectares of land with an estimated population potential of 12,000.

One proposal features a 2 kilometre rowing course orientated in a south-west to north-east direction to follow the low-lying natural drainage line. This feature would serve three purposes. It would be a regional recreation facility of metropolitan wide significance. It would serve as a detention basin in the water management of the area in a way compatible with the recommendations of the Middle Canning Catchment Water Resources Management Strategy discussed in Section 5. It would also provide fill for the adjoining land so it could be developed for residential purposes.

The proposal is predicated on the basis that the fill is needed for housing to obtain the minimum 1.5 metres clearance from the water table without having to lower the water table below the Average Annual Maximum Groundwater Level. However, the lake concept is complex, involving large scale engineering works and requiring coordinated management. In a situation of multiple land ownership this may not be practical.

2.7 South-East Corridor Structure Plan – June 1996

The *South-East Corridor Structure Plan* was adopted by the Western Australian Planning Commission in June 1996. The document sought to establish new neighbourhoods around Byford and Mundijong of approximately 30,000 people. It is intended that appropriate linkages to the Byford and Mundijong townsites will be provided for in this District Structure Plan.

2.8 Liveable Neighbourhoods Community Design Code (1997)

Liveable Neighbourhoods seeks to guide the sustainable urban development of Western Australia. The document was released by the Western Australian Planning Commission in November 1997 with a view to implementing its recommendations and undertaking a review over a period of twelve (12) months. The review period has now been extended for a further two (2) years.

Liveable Neighbourhoods aims to establish walkable neighbourhoods and a stronger sense of community. This is to be achieved through:

- Clustering mixed land uses, employment centres and community facilities within central areas.
- Limiting the dependence on car usage in favour of pedestrian and cycle movement systems.
- Arranging the physical environment to increase social interaction.
- The provision of mixed uses to maximise local employment, security and access to community facilities.
- The provisions of a range of housing types and lot sizes to cater for diverse lifestyle choices.
- The design and provision of accessible and appropriate movement systems (including public transport).

To demonstrate the above objectives, the Code provides detailed illustrations of desirable urban areas and physical arrangements of land uses.

In addition, *Liveable Neighbourhoods* seeks to consider cultural and environmental issues. To this end, the document recommends the avoidance of significant environmental constraints and a more comprehensive approach to open space and urban water management. It is considered that the latter issue will have a significant bearing on the South-East Corridor.

It is intended that the principles of *Liveable Neighbourhoods* should be applied to all new urban areas, including those within this District Structure Plan.

2.9 Bush Forever (2000)

Bush Forever was released in draft form by the Government of Western Australia in November 1998 for the purpose of identifying areas of regionally significant bushland within the metropolitan area. The document seeks to identify and limit the further clearing of the remaining remnant vegetation complexes which

traditionally have been cleared during 100 years of urban development.

It is the intention of *Bush Forever* to protect approximately ten (10) per cent of all remaining vegetation complexes for posterity. Where possible, the areas of remnant vegetation have been identified due to their pristine condition, ability to maintain threatened ecological communities, size and availability.

Bush Forever sites have been identified according to defined criteria:

- Representation of 10% of each key vegetation type.
- Protection of rare or threatened ecological communities or species.
- Size, shape and condition of the land.
- Whether the land contains wetlands which have regionally significant bushland.
- Other vegetation values such as linkage and core ecological processes.
- The social and economic values of a particular land or resource, including land use zoning and the wider financial considerations of Government.

Bush Forever provides for protection of regionally significant vegetation through the following mechanisms:

i. **Reservation and Acquisition of High Priority Bush Forever Sites**

   $100m over 10 years has been allocated through the Metropolitan Region Improvement Fund for Western Australian Planning Commission acquisition of sites with the highest conservation values.

ii. **Negotiated Planning Solutions**

   Negotiated planning solutions aim to maximise the retention of vegetation through statutory planning processes and development trade-offs. This option applies mainly to the small proportion of non-rural zoned land, and will involve landowners developing planning and design solutions to achieve bushland objectives whilst still allowing some development to proceed. These may include structure planning, guided development schemes, subdivision and development controls. Developers are encouraged to liaise with the Bush Forever Office before submitting a formal proposal. As a rule, regionally significant vegetation will be secured through open space over and above the normal 10% and will be ceded free of cost.

iii. **Complementary Mechanisms**

   In rural areas, individually tailored land management agreements may be formed between landowners and government to encourage the private management of Bush Forever sites. These may include voluntary land covenanting and private land management agreements and advisory advice for management, town planning scheme conservation zoning and special control areas. The focus is on encouraging private land management consistent with preservation of Bushland values.

A number of *Bush Forever* sites have been identified within the study area. The majority of the sites have been previously identified by previous studies (i.e. System 6) or formed part of Environmental Protection Wetlands.

Bush Forever sites are shown on the District Structure Plan. Figure 1 – Attachment 'B' illustrates the location and reference numbers of *Bush Forever* sites within the study area.

2. Previous Reports and Studies

3. Existing Conditions

The purpose of this section is to describe the current physical, planning and social characteristics/ implications of the study area.

3.1 Physical Characteristics (General)

3.1.1 Climate

The South West Region of Western Australia is characterised by a Mediterranean climate comprising hot dry summers and cool wet winters. The micro climate of the study area (at the edge of the Swan Coastal Plain) is comparable to the Mediterranean climate, however experiences marginally higher variations due to its 15-20 kilometre distance to the coast which significantly limits the cooling effect of afternoon coastal breezes. On the hottest days, when the hot easterly winds are strongest, the coastal breezes sometimes do not reach as far inland as the study area.

During summer, the mean temperature in the study area is approximately 23 degrees Celsius. The mean daily temperature for the study area in January and February, the hottest months, is approximately 32 degrees Celsius (3-4 degrees hotter than coastal regions).

Wind speeds during winter and summer are relatively similar. Winter winds are typically from the south-west and south. Summer is characterised by strong easterly winds. Afternoon winds are westerly (or 'sea-breezes'). The easterly winds are exacerbated by winds running off the slopes of the Darling Scarp ('katabatic' winds). Average speeds are 22 km/h gusting up to 100 km/h. During winter, the winds average about 17 km/h from the south west, but occasionally winter squalls can bring gusts up to 130 kilometres an hour.

Approximately, 88% of the rainfall in the study area falls during the months of May to October. The average rainfall in the study area is typically 920 mm but can fluctuate markedly from season to season. Due to the flat topography and high water table, flooding and heavy inundation occurs regularly. An extensive drainage system has been introduced by the Regional Water Authorities and local landowners to minimise the effects of flooding and inundation.

3.1.2 Landform/Topography

The study area is located on the eastern portion of the Swan Coastal Plain. Land on the Swan Coastal Plain is typically undulating with higher elevations being associated with dune systems of the Bassendean and Guildford sands.

The land is predominantly flat. Variations in the landform are not typically visible to the naked eye. Most of the land in the study area varies in height from 25 to 30 metres AHD. Notwithstanding, the very south-east corner of the study area rises to the lower foothills of the Darling Scarp to 70 metres AHD.

Other than a limited area of sand dunes on the western edge of the study area, which rise 5 to 10 metres above the surrounding ground, there are no prominent hills or other topographical features in the study area. The landform is characterised by a number of low-lying swamp/lake features that provide some visual relief to the predominantly flat character.

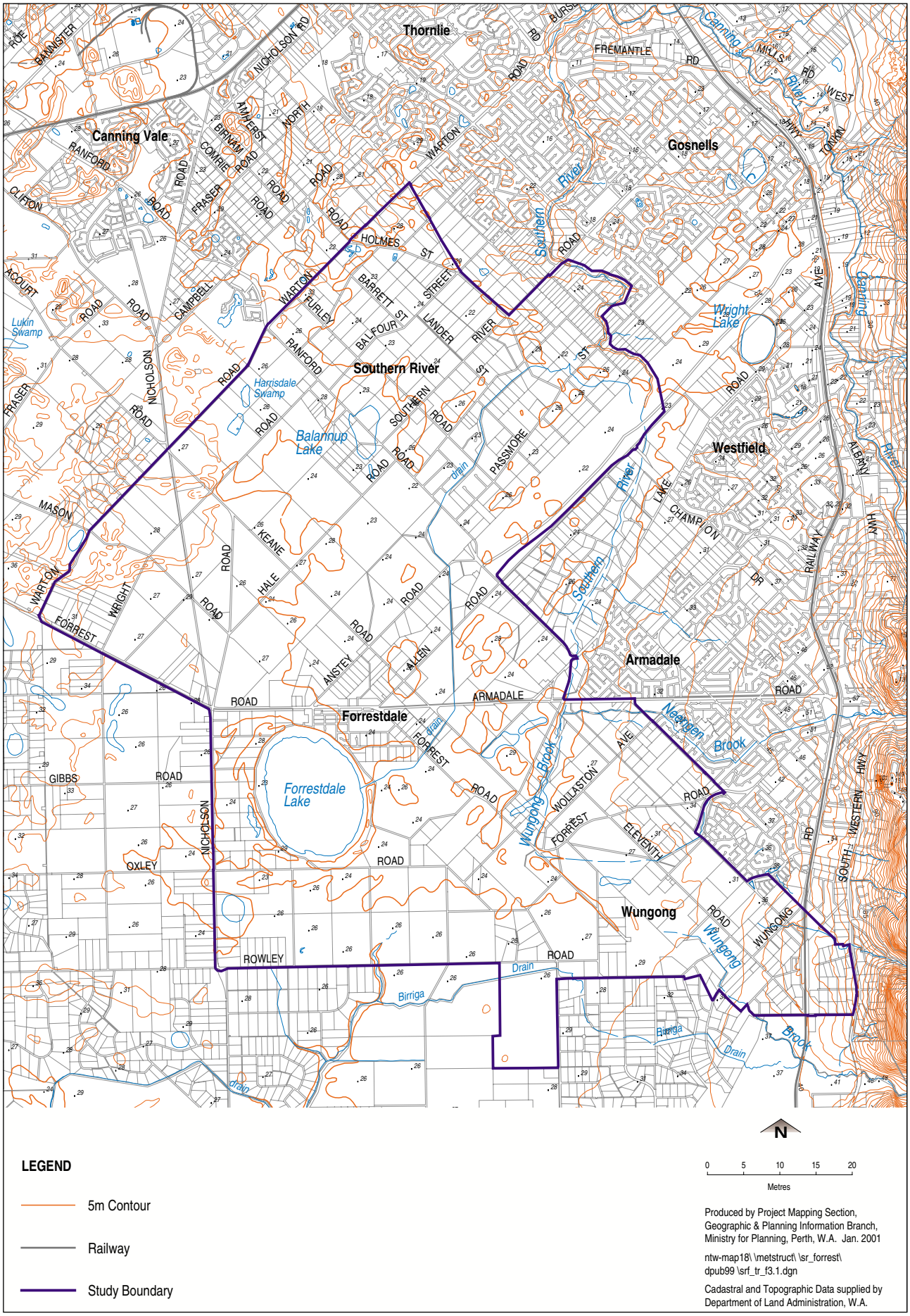
In summary, the landform of the Study area has only a limited number of natural features that could be utilised within the urban form to improve future residential amenity. It may be necessary to establish urban development, parks and open spaces adjacent to the existing water features to achieve higher amenity. Refer to Figure 3.1.

3.1.3 Soil Characteristics

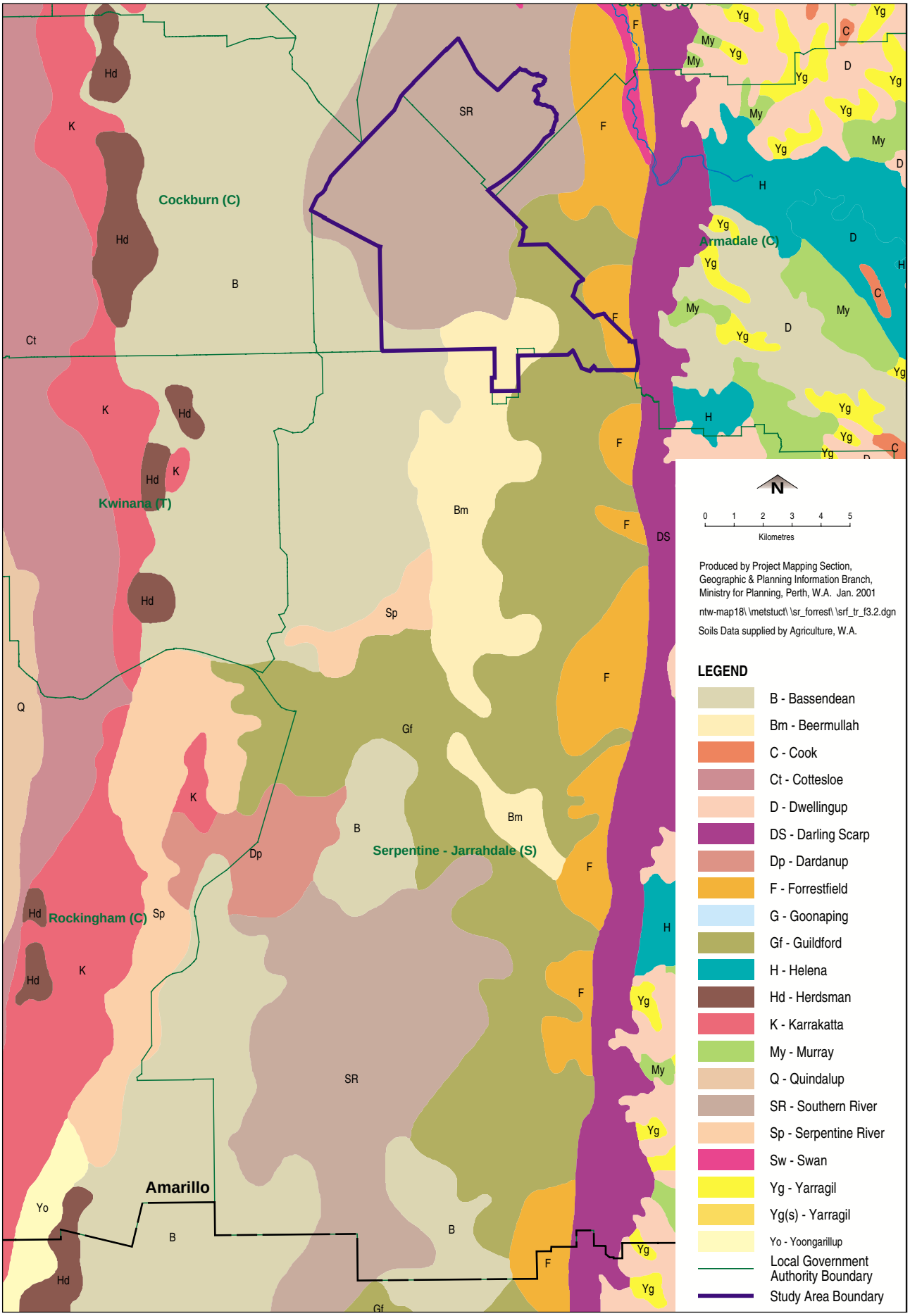
The Department of Minerals and Energy has previously mapped the soil characteristics of the study area. The soil map indicates that the study area is characterised by several key soil types (refer to Figure 3.2):

- Guildford.
- Bassendean.
- Southern River.

3. Existing Conditions



Topography Figure 3.1



Regional Soils Figure 3.2

Most of the central and western part of the study area is within the Southern River Complex. This complex is made up of Aeolian sand, low lying and mostly waterlogged in winter. It has limited fertility for agriculture and is easily denuded by livestock. It is generally assessed as having a low capability for housing although the more isolated higher dunes have fair capability. The more fertile Guildford formation, which occupies the whole of the south-east part of the study area, is a very flat alluvial plain, with a higher clay content. It is more fertile and has been extensively used for agriculture, mainly livestock grazing.

Figure 3.2 illustrates that the green and light blue areas on the plan are generally characterised by lower lying soils or those areas subject to inundation. These areas generally correspond with the Southern River soil types. The yellow brown colours highlights those soils with better development prospects. These soil types correspond with the Bassendean and Guildford soil formation.

3.1.4 Land Capability

The capability of the land to support urban/industrial land uses as well as rural development has been investigated.

Using Figure 3.2, those areas coloured in shades of yellow to brown have a fair to high capability to support urban development. The urban and drainage services in these areas should not limit subdivision and development.

Those areas coloured in shades of green and blue are generally assessed as having a poor to very poor capability for urban development. Careful planning, both land use and engineering, will be required to resolve the drainage and environmental issues associated with these geological and soil units if they are to be urbanised.

The land capability for rural residential uses is shown in Figure 3.3. The plan indicates that the majority of the land has a low capability to support rural residential subdivision and development. Detailed on-site planning will be required to demonstrate minimum lot sizes for these areas should they be identified for intensive rural subdivision and development.

3.2 Drainage and Groundwater

3.2.1 Surface Hydrology

The regional drainage of the study area falls into two major catchments. Most of the study area is situated within the Canning River catchment. The Canning River catchment is fed by Southern River which is located in the eastern part of the study area. The southern portion of the study area drains into the Peel Inlet catchment via the Serpentine River.

i. Natural Watercourses

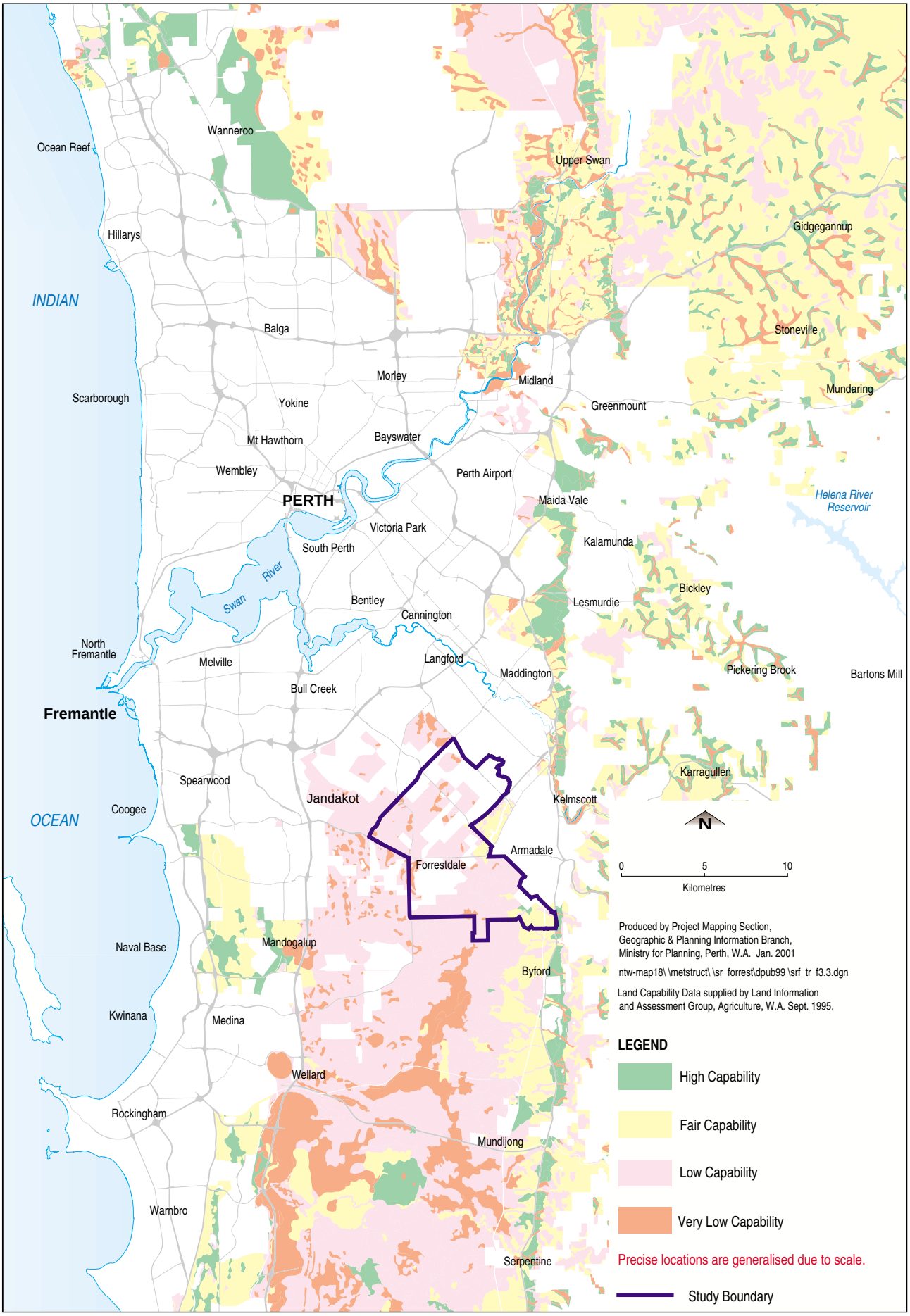
The natural watercourses in the study area (in order of increasing size) are:

- Neerigen Brook.
- Wungong Brook.
- Southern River.

The Southern River begins at the confluence of Wungong Brook and Neerigen Brook (North Drain) adjacent to Armadale Rd. The river discharges into the Canning River north of the study area. Wungong Brook flows into the study area south of the City of Armadale and becomes the Southern River at the confluence of the northern branch of Neerigen Brook Drain. Neerigen Brook is modified into a Water Corporation (WC) main drain at South Western Hwy where it splits into north and south branches that discharge into Wungong Brook.

ii. Wetlands

The main basin wetlands are Forrestdale Lake and Balannup Lake. Forrestdale Lake is a RAMSAR wetland, classified as a permanently inundated basin (lake). Balannup Lake is an EPP category wetland classified as a seasonally inundated basin (sumpland) (Hill et all, 1996). Other wetlands throughout



Land Capability for Rural Residential Figure 3.3

the study area are classified as sumplands or seasonally waterlogged basins (damplands). Most of the study area is mapped as seasonally waterlogged flat palusplain.

iii. Water Corporation (WC) Drains

The WC main drains in the study area with reference numbers are Wungong Brook (61801), Neerigen Brook South (61602), Neerigen Brook North (61605), Bailey's (61402), Keane Road (61403), Birrega (90501) including Birrega Sub P (90540) and Birrega Sub Q (90541) and Forrestdale (61401).

The primary role of these drains is to reduce winter inundation and the high water table of the agricultural land. Forrestdale Main Drain connects Forrestdale Lake to the Southern River.

3.2.2 Groundwater

Groundwater occurs throughout the area and is generally at a shallow depth ranging from 0 to 3m below the natural surface.

i. AAMGL

A preliminary figure showing Average Annual Maximum Groundwater Level (AAMGL) was prepared by the Water and Rivers Commission for the central shallow-water-table portion of the study area (Whelans,1999). The AAMGL values were obtained by adjusting the water table data from bores at the time of measurement (Howard Tan WRC pers. comm).

The groundwater flow generally follows the surface flow (north to north-east). In the south of the study area, Forrestdale Lake groundwater capture zone dominates the groundwater picture.

ii. Depth to AAMGL

Preliminary studies and review of current guidelines show that the shallow depth to the water table will result in sand fill being required over a significant portion of the area if development is to occur. Generally:

- More than 1m of fill will be required for inundated areas.
- Less than 1m will be needed for the areas with AAMGL between 0 and 1m below natural surface.
- No fill will be required for the areas where the AAMGL is more than 1m below the surface.

A detailed assessment and description of drainage and groundwater issues was conducted by the Study Team (JDA,1999).

3.3 Environmental Resources

3.3.1 Remnant Vegetation

The remnant vegetation in the study area coincides closely with the regional soils associations. Most of the central part of the study area is Southern River Vegetation complex whereas the south-east part is Guildford Vegetation complex. The Southern River complex is described as open woodland comprising jarrah, marri and banksias, with flooded gums and paperbarks in wetter areas. The more fertile Guildford complex is described as open forest of jarrah, marri and wandoo with sheoak and banksias.

As discussed in Section 2.9 of this report, the Western Australian Planning Commission has recently finalised Bush Forever. The purpose of the document has been to identify regionally significant remnant bushland as well as mechanisms for acquiring, managing, ceding or reserving significant vegetation.

A total of 13 Bush Forever sites have been identified within the study area. A number of the sites correspond with existing reserves for Parks and Recreation, including:

- Forrestdale Lake.
- Balannup Lake.
- Piara Nature Reserve.

Refer to Figure 1 – Attachment B (Bush Forever Sites).

3.3.2 Fauna

The study area contains important wetlands, vegetation and native fauna. The Water and Rivers Commission has advised that some 72 bird species have been recorded, numerous amphibians, mammals, reptiles and insects. No significant fauna types are characterised within the study area outside recognised conservation reserves and larger areas of remnant bushland. All but the most common fauna species have been lost from the rural areas because of land clearing and other disturbance.

The EPA has recommended that detailed fauna assessments be undertaken as part of more detailed levels of planning to ensure that development and subdivision is cognisant and sensitive to the protection of native fauna. These should also include details of management measures to deal with issues such as habitat protection, fauna relocation, prevention of road kills and non-native animal control.

3.3.3 Groundwater Resources – Protection

The Southern River soil unit is characterised by relatively sandy soils and a high groundwater table. A feature of the high groundwater table is the Jandakot Groundwater Mound (located along the western boundary of the study area). The Jandakot mound is an area of elevated Bassendean sands which retains rainwater which then percolates in a radiating pattern away from the mound. The groundwater flow through the study area is predominantly easterly towards the Canning and Southern Rivers.

The protection of groundwater quality is an important issue given that the groundwater aquifer is used for public water supply. Being an unconfined aquifer in highly porous soils close to the surface, it is prone to contamination. Until recently the Jandakot groundwater supply was protected by the Jandakot Underground Water Pollution Control Area. The boundary was relatively arbitrary in that it was based on cadastral rather than hydrographic considerations. The eastern boundary of the Control Area is along Nicholson Road.

In 1994, a Select Committee on Metropolitan Development and Groundwater Supplies recommended that the groundwater protection areas be reviewed on hydrographic principles and the groundwater areas, once redefined, be better protected. In August 1996, the Western Australian Planning Commission advertised an amendment to the Metropolitan Region Scheme (No. 981/33) to create a Rural Groundwater Protection zone and a Water Catchment reservation based on the revised groundwater areas as defined by hydrological modelling. The purpose of the zones and reserves is the same but the reserves have been created over Crown land only.

The amendment was gazetted in late 1998. Local government amendments are now required to provide compatibility with the Metropolitan Region Scheme.

3.3.4 Wetlands

The wetland types classified under the Semeniuk system bear a close correlation to those shown in Attachment B (Appendix B). Three types of basin wetlands and two types of flat wetlands are identified in the study area. Basin wetlands are basin shaped depressions in the landform and are usually well defined. Flat wetlands result from rainwater not draining away and can remain as shallow sheets of water over large areas. High groundwater/aquifer levels also contribute to wetland levels.

Forrestdale Lake is described as a basin wetland permanently inundated. In fact most of the lake dries out towards the end of summer. There are 24 sumpland basin wetlands which are described as being seasonally inundated. These are located in a band running north-south through the study area. A very large proportion of the remaining central part of the study area is classified as dampland basin wetlands being seasonally waterlogged.

Most of the south-east corner of the study area, identified as Guildford Formation, is classified as a palusplain flat wetland being seasonally

waterlogged. The very flat upper reaches of the Southern River which are prone to annual inundation by flooding, are described as floodplain.

A long period of settlement and agricultural activity has substantially altered the natural vegetation and groundwater regime so that most of the wetlands are degraded to varying degrees. In the interests of conservation, the Water and Rivers Commission, in conjunction with the Department of Environmental Protection, has carried out studies to assess the conservation potential for management purposes. Three management categories have been proposed by WRC and DEP as follows:

i. **Conservation.**
   The priority management objective is to conserve and enhance the existing conservation values of the wetlands. No clearing or development is considered appropriate. Ideally these areas should be incorporated and managed as part of the metropolitan regional open space system.

ii. **Resource Enhancement.**
   These are important wetlands which may be degraded to varying degrees, but which still have conservation value and where, by good management, the conservation values, such as natural vegetation, can be restored. These areas could remain in private ownership if responsible management is undertaken, but are not recommended for development. If there is to be development, very careful assessment and planning is required to ensure that conservation attributes are not unduly damaged (or further damaged).

iii. **Multiple Use.**
   This type of wetland comprises most of the palusplain type wetland. Multiple use is intended to indicate that the land can be developed but the development must be sympathetic to the wetland status of the land and be based on water sensitive design principles.

The Water and Rivers Commission's management objectives for the wetlands in the study area are described in Figure 3.4. It can be seen that the emphasis is on the lakes and most of the sumpland wetlands (i.e. those that contain open water over all or part of the year), that have been afforded conservation status. Some damplands are also included. Notwithstanding, most of the wetlands have varying levels of conservation value.

A detailed assessment of all unreserved conservation areas, lakes and wetlands is provided in Attachment 'B' (Evaluation of Wetland Conservation Issues – Muir Environmental 1999). Note that arising from this assessment, some wetlands (but not Conservation Category) were included in areas designated for development.

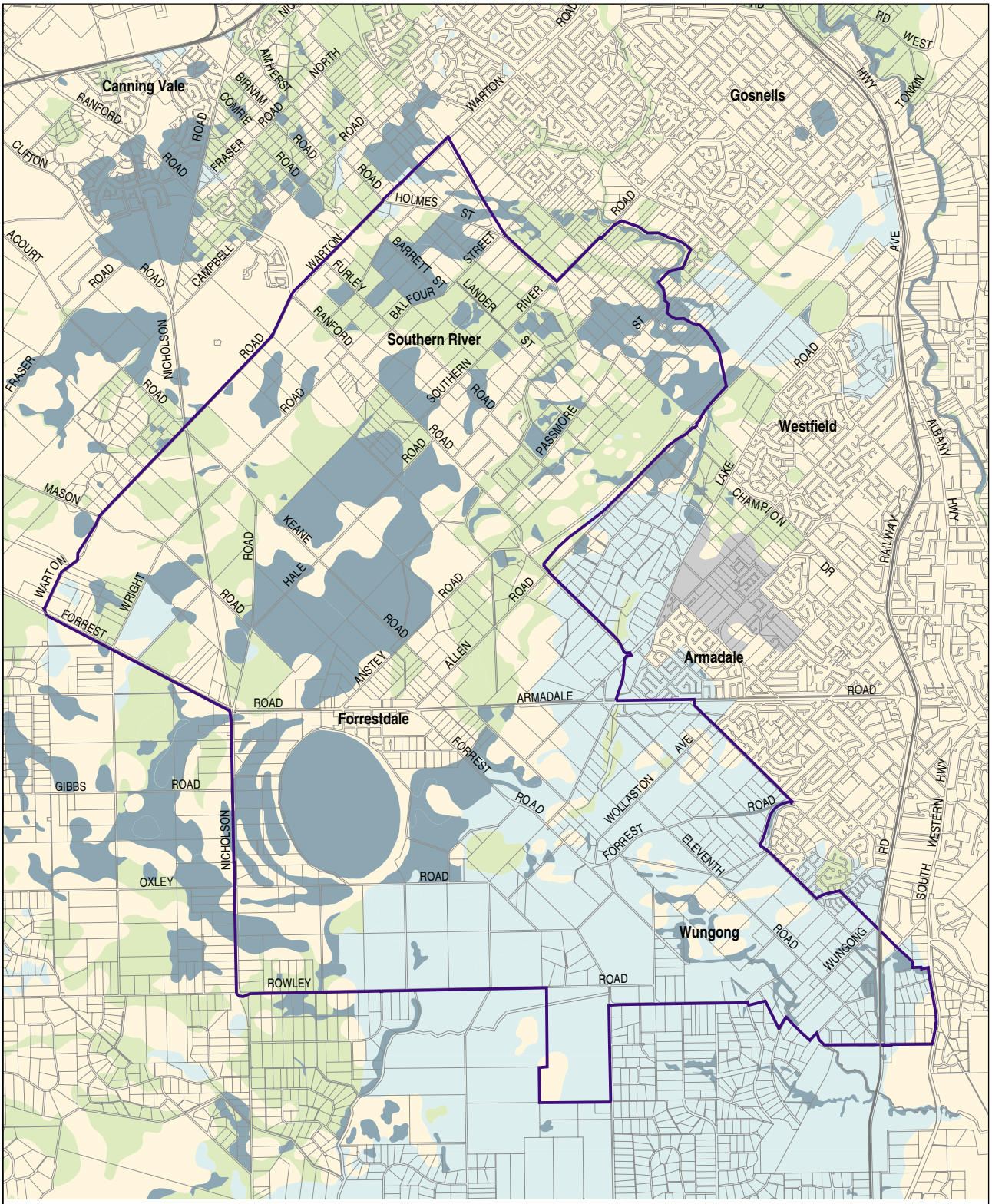
It should be noted that the boundaries of wetlands shown in Figure 3.4 are not definitive and will need confirmation by the DEP and WRC in the later stages of planning.

3.3.5 Insect Nuisance

As previously discussed, the Swan Coastal Plain is characterised by a number of permanent or seasonal wetlands or lake systems. A significant number of these wetlands and lake systems are located within the study area. These wetlands and lake systems are potential habitats for midges and mosquitoes. A full description of the types of midges and mosquitos, and their habitats, are provided within Attachment B.

The potential impact (or nuisance) of midges and mosquitoes has increased over the past 10 years due to a number of factors:

- Awareness and prevalence of mosquito borne viruses (i.e. Ross River).
- Increased use of existing or man-made wetlands as drainage management, entrance statements and/or nutrient stripping ponds.
- Removal and decreasing width of vegetation buffers.



LEGEND

- Conservation
- Dryland
- Sustainable Use - Multiple Use
- Not Assessed
- Resource Enhancement
- Railway
- Study Boundary

N

0 1 2

Kilometres

Produced by Project Mapping Section, Geographic & Planning Information Branch, Ministry for Planning, Perth, W.A. Jan. 2001

ntw-map18\ \metstruct\ \sr_forrest\ \srf_tr_f3.4.dgn

Cadastral Data supplied by Department of Land Administration, W.A.

Wetland Management Data supplied by Water and Rivers Commission, W.A.

Wetland Management Objectives

Figure 3.4

Midges and mosquitoes are active in summer particularly during evenings. Habitats vary from open water, muddy swamp lands, surrounding vegetation and damp sands. Their nuisance depends on a number of factors including:

- Prevailing Winds.
- Proximity to hosts (e.g. human settlements).
- Temperature.
- Rates of rainfall and evaporation.

To date, there have been no accepted standards imposed for the distance of midge buffers. The City of Cockburn (situated immediately west of the study area) is impacted by midge and mosquito nuisance along the Spearwood lake system. Control has been by extensive baiting and spraying. However, complaints are still frequent. There is also evidence that the eradication programs are having an adverse effect on the ecology of the wetlands.

To obviate this problem, the City of Cockburn has adopted a policy, based on the frequency of complaints from residents, to discourage new residential subdivision within 500 metres of wetlands known to have midge problems. Should any housing occur within the buffer, it is to be designed to accommodate the midge problem. Typically, a memorial is also required on affected Certificates of Title alerting prospective purchasers to potential midge problems.

A comparable policy has been adopted by the City of Armadale. The Policy seeks to discourage additional residential subdivision within 1 kilometre of Forrestdale Lake based on a history of nuisance problems associated with midges.

Other research being carried out by the Department of Entomology at the University of Western Australia, suggests a vegetation buffer of 400 metres would suffice. The areas within this buffer could be used for non residential purposes or low density residential such as Special Rural, provided natural vegetation coverage is substantial and the residents are tolerant of the problem.

A full discussion of this issue is provided in Attachment B.

3.3.6 Existing Conservation Policy Areas (System 6 – EPP)

There are a number of conservation policy areas located within the study area (refer to Attachment B). It can be seen that most of these policy areas are now protected by reserves.

There are two System 6 areas within the study area:

i. **Forrestdale Lake.**
The majority of the recommended Forrestdale Lake System 6 area is now reserved for Parks and Recreation (with the exception of about 12 hectares on the western side – comprising the northern halves of Lots 15 and 13 Nicholson Road). It is also a nominated Bush Forever site.

Forrestdale Lake was one of five wetlands in the southwest of Western Australia to be nominated as a Ramsar Convention wetland. Forrestdale Lake is the third most important wetland reserve in south-west Australia for the variety and number of bird species. A maximum of 17,484 birds were counted there in January 1983. Seventy one species of water birds have been recorded at the lake which regularly supports more than 10,000 water birds including the long-toed stint which migrates from Siberia. It is a good example of a wetland of its type, many of which have been destroyed, and thus it fulfils three of the criteria for nomination as a Ramsar Convention wetland.

It is noted that the Ramsar Convention was a convention on wetlands of international importance, especially water fowl habitat, named after the Iranian city where the text was adopted in 1971. It is an inter-governmental treaty which provides a framework for international co-operation for conservation of wetland habitats.

Note: A3 Map
Figure 3.5

Blank page follows map

The convention adopts an extremely broad definition of the term "wetlands". They are "areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine waters, the depth of which at low tide does not exceed 6m".

ii. **Along Southern River**
At Southern River, the Parks and Recreation reserve has incorporated Most of the System 6 reserve along Southern River has been designated as Parks and Recreation.

There are eighteen Environmental Protection Policy (or EPP) Lakes situated within the study area. Eleven of the lakes/wetlands are now reserved for Parks and Recreation. The remainder of the lakes/wetlands are relatively small wetlands scattered through-out the study area.

There is one Environmental Protection Authority System 6 'Threatened (flora) Communities' site identified in the study area. It is in Brookdale in the south-east corner of the study area.

Forrestdale Lake Reserve is also a registered Aboriginal heritage site. It is all contained within the existing reserve.

This District Structure Plan recommends secure tenure for those areas not yet protected.

3.3.7 The Middle Canning Catchment Water Resources Management Study (Stage 2 – September 1996)

The area described as the Middle Canning (River) Catchment covers most of the study area with the exception of the south-west part which coincides approximately with the Guildford Soils Association discussed in Section 3.2.
The study reflects most of the drainage related conservation issues and constraints to urbanisation. The south-west part of the catchment study area, west of Forrestdale Lake, falls outside the study area and will not be directly considered in this report.

The study was released in a draft form by the Water and Rivers Commission in September 1996. It addressed groundwater, drainage, wetland conservation and remnant vegetation issues in the context of prevailing conditions and of recent water resource management criteria which require that the Average Annual Maximum Ground Water Level (AAMGL) be retained as the basis for all future drainage of urban areas.

The recommendations of the study were synthesised on a map, shown as Figure 3.5. The WRC map showed:

i. **Category One (Conservation) Areas.**
These areas are recommended as "inappropriate and/or unsuitable" for urban development and should be protected within reserves. They comprise the existing Parks and Recreation reserves in the Metropolitan Region Scheme and important wetlands and areas of vegetation outside the reserves. The boundaries of Category One areas are generally consistent with the conservation values addressed elsewhere in this section of the report.

ii. **Category Two (Conservation) Areas.**
These are areas considered unsuitable and/or are undesirable for urban development but may be used for recreation, to enhance the urban setting or as multiple use corridors. Some of these areas correlate with the conservation values identified elsewhere in this section, others do not.

iii. **Multiple Use Corridors.**
The multiple use corridors are shown as linear open spaces along drainage corridors through the future urban areas. The corridors are nominally 200 metres wide. These corridors appear to be unrelated to any areas of the conservation value identified elsewhere in this report. In some cases, they do not follow existing natural or constructed drainage lines. The rationale is based on flood protection and water quality

management for the future urban areas to be built in areas of very flat topography and high groundwater table. Use of the corridors could be rationalised by locating public open space, recreation, public amenities, walk trails and cycle paths within them.

The Middle Canning Study recommends that the remainder of the area is considered suitable for urban development subject to meeting such requirements as a minimum of 1 to 1.5 metre clearance between the development level and the AAMGL. However, in support of this District Structure Plan, a detailed assessment of groundwater hydrology has been undertaken. It is recommended that fill levels vary depending on depth to AAMGL (refer to Section 5).

One of the most contentious issues for District Structure Planning is the configuration and extent of the multiple use corridors. The concept has recently been introduced into Structure Planning in the South-East Corridor in the Byford and Mundijong localities. Typically, protection of natural watercourses as linear open spaces would have been achieved under current planning practices although the corridors might not have been as wide or contain specific water quality enhancing measures.

Given that the objective for urban drainage in the study area is to restrict the peak rate of discharge and the quality of stormwater to the receiving rivers at pre-urban levels, there will be a need for retention space for stormwater. Preferably, retention of stormwater should be as close to its source as possible to limit the potential for the conveyance and mobilisation of nutrients and other contaminants. It would appear that in some instances (particularly where urban corridors between wetlands are narrow), the multiple use corridors could be used as the connecting links or to consolidate the open space, in place of the Conservation Category wetlands described above.

As a basis for the nominal 200 metres width of the corridors, the Middle Canning Study notes that multiple use corridors need to be of sufficient size to:

- ensure residential development is protected from flooding;
- accommodate stormwater detention basins and artificial wetlands that comply with design criteria;
- enable water to be filtered through vegetated areas to meet water quality criteria;
- protect environmental values and provide wildlife habitat; and
- provide recreational opportunities normally expected by an urban population of its public open space.

It should be noted that the width of the multiple-use corridors (taken from Figure 20 of the Middle Canning Catchment Study, Stage 2, 1996) average about 200 metres. This is a diagrammatic representation only as the text explains that the width would vary between 30-200 metres.

While the criteria for the size of multiple use corridors may be valid, the relationship to the size of the corridors will depend on local conditions. Within the Byford-Mundijong areas and New South Wales to which the Catchment Study refers, the corridors are the only open space through otherwise continuous urban areas on impervious soils. Whereas, the soils in the study area are very much more porous and transmissive and the proposed urban areas are interspersed by large interlinked wetland areas which are the natural drainage tracts for this area.

Buffer width requirements around wetlands depends on local factors (soil and groundwater conditions). The width of land for buffers can also be reduced using engineering techniques to achieve the same objectives.

3.4 Land Use

3.4.1 General Land Use Description

The study area is characterised by a relatively diverse range of land uses. Typically, the areas can be characterised into the following sub-areas:

i. **Northern sub-area (Southern River).**
The northern sub-area of Southern River and Forrestdale is represented by several recently developed residential subdivisions (including Sanctuary Waters and Forrest Lakes). The remainder of the land is characterised by a range of rural and regional open space facilities (i.e. Sutherlands Park and the City of Gosnells Golf Course).

The area includes the Southern River Kennel Zone.

ii. **West (Forrestdale).**
The western sub-area of Forrestdale is sparsely developed. The majority of the land is used for limited rural pursuits (such as the agistment of horses and grazing of cattle). The most intensive land uses within the precinct appear to be the Forrestdale kennel area. A number of private school uses and institutional activities (including Banksia and Canning Vale detention centres) have been developed within the area in recent years.

A limited area of the land has been developed for Rural-Residential or Special Rural uses.

iii. **South-East sub-area (Wungong/Brookdale).**
The southern sub-area of Forrestdale and Wungong/Brookdale is characterised by a range of land uses, including:

- Forrestdale Townsite.
- Forrestdale Lake.
- Armadale residential areas (West Armadale).
- Armadale Golf Course (to be relocated).
- Armadale Rubbish Disposal site.
- Septage treatment site.

The remainder of the land is developed for the keeping of horses and grazing of cattle.

3.4.2 Land uses – Potential Impact on Extent and Type of Development

In preparing this District Structure Plan, a number of land uses that cause off-site impacts have been identified. These impacts (whether noise, odour, dust, health risk or pollutant) could potentially conflict with future residential development and therefore, require buffers or transitional land uses to minimise or prevent off-site impacts such as:

- Gaseous emissions that could cause health problems at high dosages and reduced amenity at lower levels.
- Noise.
- Dust or vapours.
- Odour.

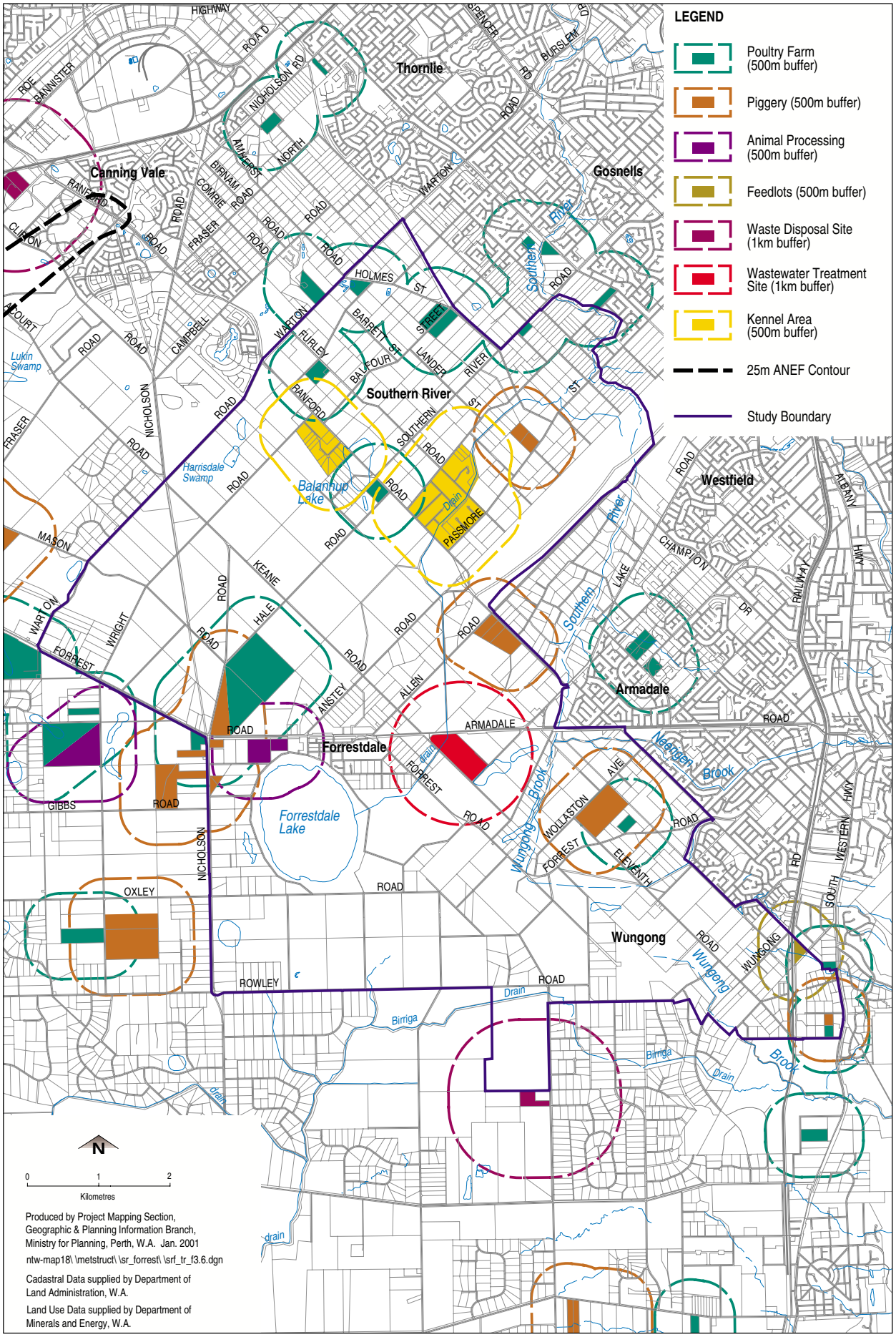
The Department of Environmental Protection has produced a number of draft documents which describe the minimum recommended buffers distances for various land uses. The document, *Policies, Guidelines and Criteria for Environmental Impact Assessment* (June 1997) provides buffers distances as a guide only. Draft Policy No. 3 for *Industrial – Residential Buffer Areas(Separation Distances)* provides recommended buffers for a number of land uses. On-site investigations should also be made.

A description of the conflicting land uses and recommended buffers is provided under the following headings. The location of each constraint (and its potential buffer) is shown in Figure 3.6 Existing Conflicting Land Uses.

i. **Poultry and Pig Farms**
A total of 11 poultry and 5 pig farms are shown on Figure 3.6 with nominal 500 metre buffers taken from the periphery of the property on which the farms are located. Most of these activities are located in small subdivision areas and are concentrated in Southern River, south-west Armadale and Brookdale. These uses will constrain development in the affected areas in the short to medium term, say 10-15 years. Forrestdale, with its larger land holdings is relatively unconstrained.

ii. **Kennel Zones**
Two kennel zones exist in Southern River and Forrestdale either side of Ranford Road, with a total of about 150 lots. The Gosnells

3. Existing Conditions



Existing Conflicting Land Uses Figure 3.6

Council has taken the view that the Southern River Kennel Zone should be retained and that buffer zones to non-compatible uses such as residential should be provided.

In addition to the kennel zones, the Canine Association has premises at the corner of Ranford Road and Warton Road. The Association is active, holding training sessions, competitions and the like on most weekends. Consideration of appropriate adjacent uses is therefore important.

The noise from dog kennels is considered serious for residential development because it often occurs at the quietest time of the night and, by its nature, can be a nuisance. The Department of Environmental Protection recommended buffer around these zones for residential development is 500 metres and a special control area between 500 metres and 1 kilometre.

iii. **Animal Feedlot**
The data available at the Ministry for Planning identifies an animal feedlot in south-west Armadale, in an area already zoned Urban in both the Metropolitan Region Scheme and the local government town planning scheme. Department of Environmental Protection draft recommendations are for a 600 metre buffer around these uses. Aerial photography interpretation suggests that if this activity ever occurred on this site it was very low intensity. In any event, the feedlot use will have to be terminated if urban development is to occur.

iv. **Animal Processing**
Current Ministry for Planning data from the Rural Strategy has identified an animal processing establishment on the northern end of Forrestdale Lake, south of Forrest Road, just outside the Parks and Recreation reserve. This is a skin drying shed which would require a 500 metre buffer.

v. **Jandakot Airport Noise Buffer**
Only a small part of the western side of Canning Vale is within the projected 20 ANEF noise contour from Jandakot Airport. See Figure 3.6. This should not affect residential development within the study area.

vi. **Waste Water Septage Disposal Area.**
A waste water septage disposal site is located east of Forrestdale Lake on the south east quadrant of the future intersection of the Tonkin Highway extension and Forrest Road. At present it is operated under lease from the Water Corporation by the Health Department. As a septage area the required buffer area is one kilometre radius. It is likely that these works will be developed as a waste water treatment plant in the future to meet expanding urban requirements for the study area. Because the new treatment plant would be based on new technology the Water Corporation has recommended a 500 metre buffer from the edge of the treatment site (Figure 3.6).

vii. **Former Noxious Liquid Waste Dump**
The site is located on Lot 1768 Southern River Road (refer to Figure 3.6). The site is owned by the City of Gosnells. The nearest residential area is the kennel zone located approximately 300 metres to the south-east.

The site operated for 26 years from 1955 to 1981. Wastes comprised mainly night soil (liquid septage) and brewery wastes although other wastes including animal carcasses were known to have been disposed of. The dumping site is approximately 250 metres by 350 metres.

Surface water from the site discharges into the Forrestdale main drain from where it flows into the headwaters of the Southern River (a tributary of the Canning River.)

Sampling of local bores does not, however, show that contamination has spread far. Work in a Consultative Environmental

Review (CER) carried out for the City of Gosnells (published May 1996) found slight arsenic contamination in a bore 1,300 metres from the site but found contamination of closer bores no worse than bores from unsewered areas elsewhere in the metropolitan area. The conclusion was that while water was not fit for drinking, it was not a health hazard.

The CER proposed that, as a safety precaution, within 1,500 metres radius of the site, alternative potable water be brought in for future development. Also, any new development within this radius will require a detailed hydrological study, and where such a study cannot eliminate the risk to prospective purchasers/residents a memorial on title should warn residents of this. If development caused any risk to existing residents it should not be approved.

viii. **Landfill Rubbish Disposal Sites**
There is one site at the southern extremity of the study area in Forrestdale. It is understood the site is almost filled to capacity and is expected to be closed within one or two years.

ix. **Western Australian Natural Gas Pipeline**
A Western Australian Natural Gas Pipeline (WANG) traverses the study area in a north-south direction. The pipeline was constructed prior to any contemplation of urban development and as such, has been constructed to a rural standard (i.e. no encasement, limited depth).

Discussions with WANG and Department of Minerals and Energy indicate that a buffer of approximately 30 metres would generally apply to urban development. Modifications to the pipeline (such as concrete encasement) will permit a lesser buffer (if required).

3.5 Infrastructure

While the area is relatively undeveloped in an urban sense, there is significant infrastructure that passes through or is adjacent to the study area.

Each of the services can be used as a foundation for the expansion of the infrastructure at a district level. The main infrastructure components that now exist in the area are briefly described under the following headings.

3.5.1 Roads

There are a number of existing main roads and distributor roads within the area. These include:

i. **The South Western Highway**
The South Western Highway passes to the immediate east of the study area. This is the main north-south link between the area and Perth with linkages to the Tonkin Highway.

ii. **Armadale Road**
This is the main east west feeder between the South West Highway to the east and Nicholson Road to the west and extending to the Kwinana Freeway and further west towards Kwinana and Fremantle.

iii. **Ranford Road**
This is a principal east-west feeder road between the Kwinana Freeway and Forrestdale. Ranford Road provides a distributor function to the existing residential areas in Canning Vale.

Other significant roads in the area include Nicholson Road (north-south movements and linkage to Canning Vale) and Rowley Road (east-west movement across the southern section of the District Structure Plan area). The most significant road planned for the future is the Tonkin Highway which ultimately will be extended south generally through the centre of the study area.

These roads must be incorporated into the District Structure Plan without any major shifts in alignments.

3.5.2 Rail

A passenger rail service currently operates adjacent to the study area. Passenger stations are located at Kelmscott (north), Armadale (east) and Byford (south) (country line only) providing

transport nodes that may service the District Structure Plan area.

From these hubs it would be expected that as the demand grows in the area, bus services will radiate and park and ride facilities will be developed.

3.5.3 Water Supply

A major trunk water supply main traverses the study area from the north-west to the south-east along Ranford Road. The area generally north of Ranford Road and bounded by Tonkin Highway and Wanton Road is serviced by a distribution system that services the large lots in this area. The area generally to the south of Ranford Road that is within the District Structure Plan area does not have any water supply distribution system.

The Serpentine Trunk Main traverses part of the study area but is unavailable for reticulation purposes.

These services remain relatively unchanged by the District Structure Plan.

3.5.4 Sewerage Reticulation

No deep sewerage currently exists within the District Structure Plan area although some areas adjacent do have deep sewerage. Based on the Water Corporation's preliminary planning for the area, there will be a series of pumping stations and pressure mains required throughout the area which will eventually discharge the sewage to the west.

3.5.5 Wastewater Treatment

The existing Westfield Wastewater Treatment Plant is currently used as a treatment facility for effluent from septic systems and while its need will be reduced as the infill sewerage program sees more and more households connected to deep sewer, the life expectancy of this plant is still in the order of 30 years.

Its presence and the need for buffers around it will significantly influence the overall staging of development work.

3.5.6 Power

Western Power has a number of main transmission lines and a local distribution network in the area and therefore power is not seen as a constraint to the development strategy.

3.5.7 Gas

Gas transmission lines and a high pressure gas main exist in the area. The expansion of the gas system through an expanded supply network is considered feasible for the area.

3. Existing Conditions

4. Description of the Community Consultation Process

4.1 Purpose of Community Participation

The Ministry for Planning, City of Armadale and City of Gosnells have been committed to an open and accountable program of community consultation throughout the preparation of this District Structure Plan. The community consultation program recognised that good land use planning requires consideration of all physical factors such as landform and environmental constraints as well as social values and expectations.

The community consultation process was an effective mechanism for facilitating the flow of information between the decision makers (being the Study Team and Committee) and the community. The process enabled decision makers to identify issues and incorporate them within the final Plan.

4.2 Process of Consultation

A total of three separate community workshops were held at each level of decision-making:

- Identification of Issues.
- Discussion of Options.
- Adoption of Preferred Option.

The first workshop was held over two days in December 1998. Interested and affected members of the Community were invited to attend through mail distribution.

Over 100 members of the community (including residents, land developers, business operators and community groups) attended the first workshop which sought to identify:

- Why a new District Structure Plan was required.
- Who was preparing the District Structure Plan.
- The process for preparing and adopting a District Structure Plan.
- The objectives of the District Structure Plan.
- Key issues that may affect the District Structure Plan.

During the first workshop evening, members of the community were asked to contribute written comments on key issues, matters that may influence the District Structure Plan and community values. The second day session sought to refine the previous evening's data into headings identified by the community:

- Land Suitability.
- Infrastructure – Transport.
- Employment.
- Lifestyle and Streetscape.
- Conservation and Environment.
- Implementation – Including Compensation.
- Roles/Responsibilities/Decision-Making.

The various data for each heading was further refined by the Study Team to establish summaries of the issues. The summaries were used by the Study Team to prepare and assess the various District Structure Plan options. The key objectives for each of the headings were adopted as the aims and objectives for this District Structure Plan (refer to Part 1).

The second workshop was held on 24 March 1999. The purpose of the second workshop (attended by approximately 140 people) was to allow members of the community to review and comment on three District Structure Plan options. Each of the District Structure Plans are described in Chapter 6 of this report.

Attendees were asked to identify individual elements which were considered desirable or undesirable. Furthermore, the community was asked to assess the three District Structure Plans options using the same seven key headings derived from the first community consultation exercise. To this end, the community provided the following general responses:

- To provide a single central employment node.
- To utilise and reinforce the role of existing Regional and District Centres.
- To fully adopt the principles of Liveable Neighbourhoods.

A full description of community comments received during the second community workshop are provided in Chapter 6.

A third workshop was held on 9 June 1999. The purpose of the workshop was to allow the community to comment on the draft preferred option. The workshop was attended by approximately 200 people. As with the previous workshop sessions, the community was asked to comment on whether the plan met the seven objectives they had identified.

From the meeting, the community provided the following broad comments:

- That the preservation of Bush Forever areas should be a State cost and should be acquired by the State.
- That all kennel areas (particularly the Southern River Kennel Zone) be retained.
- That all kennel areas be surrounded by transitional land uses (such as golf course, light Industry and commercial).
- That if kennel areas were to be relocated, full compensation to be paid.

Each of the above comments were given due consideration by the Study Team and Steering Committee.

4.3 Community Brief (Value, Goal Setting and Challenges)

The previous section has identified that seven key headings were identified by the community. The key headings were used by the Study Team to list the values, objectives and challenges of preparing and implementing the District Structure Plan. A complete list of the values, objectives and challenges is provided in Attachment 'C'.

The list of values, objectives and challenges were used by the Study Team and Steering Committee to establish assessment criteria for the preparation of the District Structure Plan. The assessment criteria have been used throughout the preparation of the District Structure Plan so that the final plan maintains faith with the initial (and ongoing) expectations of the community.

A complete list of the assessment criteria developed by the community is provided in the following table. The assessment criteria relate to the seven key headings (also) established by the community.

Table 4.1 – Community Brief (Assessment Criteria)

Community Objective	Assessment Criteria
Land Suitability	• Map all existing land uses, their constraints and opportunities (maps developed). • Protection of the most significant conservation areas. • Incorporation of drainage waters to enhance conservation or development areas. • Diversity of a sustainable mix of land use opportunities.
Infrastructure – Transport	• Provide multi-functional drainage areas which can perform/accommodate engineering, conservation, recreational, marketable and amenity activities. • Provide an accessible and permeable transport structure which links to community, employment, education and recreational nodes. • Ensure a high level of infrastructure provision. • Promote a cost-effective and accessible public transport system. • A plan which ensures a good design maximising permeability and accessibility. • A plan which ensures the maximise use of drainage as water features.
Employment	• Set aside land for education establishments. • Set aside appropriate land areas for sustainable employment. • Minimise travel time to workplaces. • Establish minimum servicing requirements for all employment areas/types.
Lifestyle and Streetscape	• A variety of lot sizes. • Retention of an appropriate amount of local flora. • Provision of local employment. • Local services within a walkable environment. • To develop a plan that encourages residents from all age and income levels.
Conservation and Environment	• Map existing land uses, their constraints and opportunities. • Development of a plan that protects the most significant conservation areas which can be implemented. • Provision of viable and sustainable co-existence of conservation values and urbanisation.
Implementation – Including Compensation	• Government acceptance of the District Structure Plan and its implementation strategy. • Community acceptance of the District Structure Plan and its implementation strategy.
Roles/Responsibilities and Decision Making	• People being told what decisions have been made, by whom and on what grounds. • Transparency of the processes. • Agencies and groups being responsible for their areas of responsibility. • Statesman-like leadership and responsibility exercised by the Steering Committee.

The above assessment criteria were used by the Study Team to establish a brief for developing the final District Structure Plan.

4. Description of the Community Consultation Process

5. Implications for the Preparation of the Structure Plan

The purpose of Part 5 of this report is to identify and discuss issues that will affect the study area. Each of the issues have been identified through detailed technical assessment and community workshops:

- *Liveable Neighbourhoods.*
- *Environmental.*
- *Drainage Management.*
- *Infrastructure.*

It is intended that each of the issues will be adopted as the minimum prerequisites for planning and development within the District Structure Plan area. Moreover, the issues will be used as a basis for understanding how this District Structure Plan may be implemented.

5.1 Liveable Neighbourhoods (Urban Design)

The District Structure Plan adopts the urban structuring principles defined in the *Liveable Neighbourhoods Community Design Code. Liveable Neighbourhoods* has been developed by the Ministry for Planning to provide an alternative approach to the design of neighbourhoods and towns. The Liveable Neighbourhoods design solution aims to achieve a compact, better defined and more sustainable urban communities.

Liveable Neighbourhoods encourages:

- A wide variety of housing types and sizes.
- A wide variety of local employment opportunities.
- A sense of community focused on walkable neighbourhoods and towns.
- Support for public transport.

Liveable Neighbourhoods aims to achieve better environments that are more sustainable, more liveable and more suited to the shape of our community.

In terms of structuring the urban environment, *Liveable Neighbourhoods* uses the neighbourhood unit as the fundamental building block. The neighbourhood unit is an area of approximately 50 hectares defined by a 400m radius circle. The 400m radius represents a theoretical 5 minute walk to the neighbourhood centre, where the elements of community daily needs are located. The centre of a neighbourhood may typically contain a central node such as a bus stop, telephone box, post box, corner deli or community centre. Depending on the location of the neighbourhood, other retail or employment uses may be incorporated.

Neighbourhood units are clustered together in groups of up to 10 neighbourhoods to support a larger 'town centre' neighbourhood at the centre of the cluster. The town centre may typically contain a small supermarket and other shops and employment uses that would not be viable within a neighbourhood unit.

Liveable Neighbourhoods identifies the requirement to link the neighbourhoods and town centres with a clearly legible road network. The road network should be highly interconnected to allow traffic to permeate through the urban fabric and hence reduce the need for large, expensive and highly engineered arterial roads. With lower levels of traffic, the arterial roads are then able to provide access to the centres of neighbourhoods and deliver the economic benefits of the 'movement economy' to local businesses.

In order to enhance the walkability of the neighbourhood units, and to maximise the number of residents within a five minute walk, non-residential land uses that require large areas of land, such as schools and parks, are located on the edge of the neighbourhood. In the case of primary schools, a location on the edge of the neighbourhood means that the facility can be shared between three or four neighbourhoods (which provide the optimum catchment for a primary school) while theoretically being no more than ten minutes walk from any point within the catchment.

5.1.1 A Question of Scale

In order to demonstrate the size of a typical neighbourhood cluster, Figure 5.1 illustrates a same scale comparison between a typical neighbourhood cluster and an existing piece of

urban fabric which works in a similar way i.e. an area centred on Subiaco that also comprises Shenton Park, Daglish, Jolimont, Wembley and West Leederville.

5.1.2 Site Context Analysis

In developing the District Structure Plan, a site context analysis was undertaken to understand the study area as well as the surrounding area (and how that surrounding area works as a piece of urban fabric).

The major features include the existing road network, lakes and rivers, areas reserved as Parks and Recreation, Bush Forever sites, major trunk services, existing schools, industrial area and retail areas. In addition to the retail areas, the theoretical 5 minute walk catchments to neighbourhood centres have been shown, along with the 10 minute walk catchment to larger centres and to existing and proposed railway stations.

Through a process of investigating and drawing what is there, a level of understanding is gained that will help what is proposed to provide a seamless extension of the existing urban areas while responding to particular local constraints.

5.1.3 Site Constraints

A series of constraints maps were produced with the following themes:

- Recommendations of the Middle Canning Catchment Study
- Remnant vegetation
- Town planning scheme zonings
- Metropolitan Region Scheme zonings
- Existing trunk services
- Conservation policy areas
- Land fragmentation (lot sizes)
- Existing road network
- Existing conflicting land uses
- Drainage channels and wetlands
- Wetland management objectives
- Environmental geology
- Basic raw materials, and
- Topography.

In addition, each of the sites identified under Bush Forever were taken into consideration.

A site constraints plan was produced that overlaid the above constraints. From the plan it was possible to identify scenarios that would suggest differing scopes for development depending on the number of constraints that were considered to be fixed.

5.1.4 Scope for Development

Three scenarios were evaluated. The first scenario to be considered was the 'worst case scenario' where every constraint was considered to be fixed. Very little of the study area would be available for residential development. Furthermore, the land that would be available is highly fragmented and therefore difficult to sustain a meaningful urban form.

The second was the 'best case scenario' where a number of the constraints could be eliminated through engineering, changes in existing land use, or a rationalisation of the responses to environmental constraints. A significantly larger proportion of the study area would be available for residential development, and would be considerably less fragmented.

The third was the 'likely case scenario' where a 'best guess' was taken as to what would be the likely level of constraint against urban development. This scenario accepts the constraints of the 'best case scenario' with the retention of the City of Gosnells Southern River Kennel Zone and the septage treatment site on Armadale Road, both with respective buffer zones.

Furthermore, it was identified that there would be land use issues to be resolved in regard to the Environmental Management Areas. The 'likely case scenario' shows that despite the above constraints there are still significant areas of un-fragmented land that would be available for residential development.

5. Implications for the Preparation of the Structure Plan

Liveable Neighbourhoods Scale Template Figure 5.1

5.1.5 The Impact of Multiple Use Corridors on the Urban Structure

The Middle Canning Catchment Study identifies a need for a number of multiple use corridors within the study area. The multiple use corridors are 'green' links that provide various functions:

- Drainage management.
- Passive and active open space.
- Wildlife habitat.
- Conservation linkages with common vegetation complexes.

The Middle Canning Catchment Study provides little guidance on the width of the corridors other than a generic 100m or 200m, and little guidance on the land uses that may be contained in the corridors.

Given the extent of the requirement for multiple use corridors within the study area, it was necessary to carry out a detailed design exercise on how multiple use corridors could relate to the urban structuring principles of Liveable Neighbourhoods and how they could be designed to be more responsive to the adjacent urban form.

From the results of the design exercise, illustrated in Figure 5.2, it is clear that the multiple use corridors should be located between neighbourhoods and ideally located between neighbourhood clusters. The corridor widths may be reduced in places to around 40m to reduce the land-take and increase the residential densities of the adjacent neighbourhoods, while enabling good passive surveillance of the open space from adjacent residences.

In some instances the corridor may be interrupted, with the drainage line piped for short lengths, to continue the urban fabric, particularly where there is a conflict between areas of high pedestrian use such as the neighbourhood centre, and the drainage line. In other instances the corridor width may be significantly increased from its notional width to accommodate district parkland, schools and playing fields.

The District Structure Plan shows the preferred routes for the multiple use corridors. The final width of the corridor at each point along its length will be dependent on what degree each development 'clips' its open space provision onto the corridor.

5.1.6 Urban Character

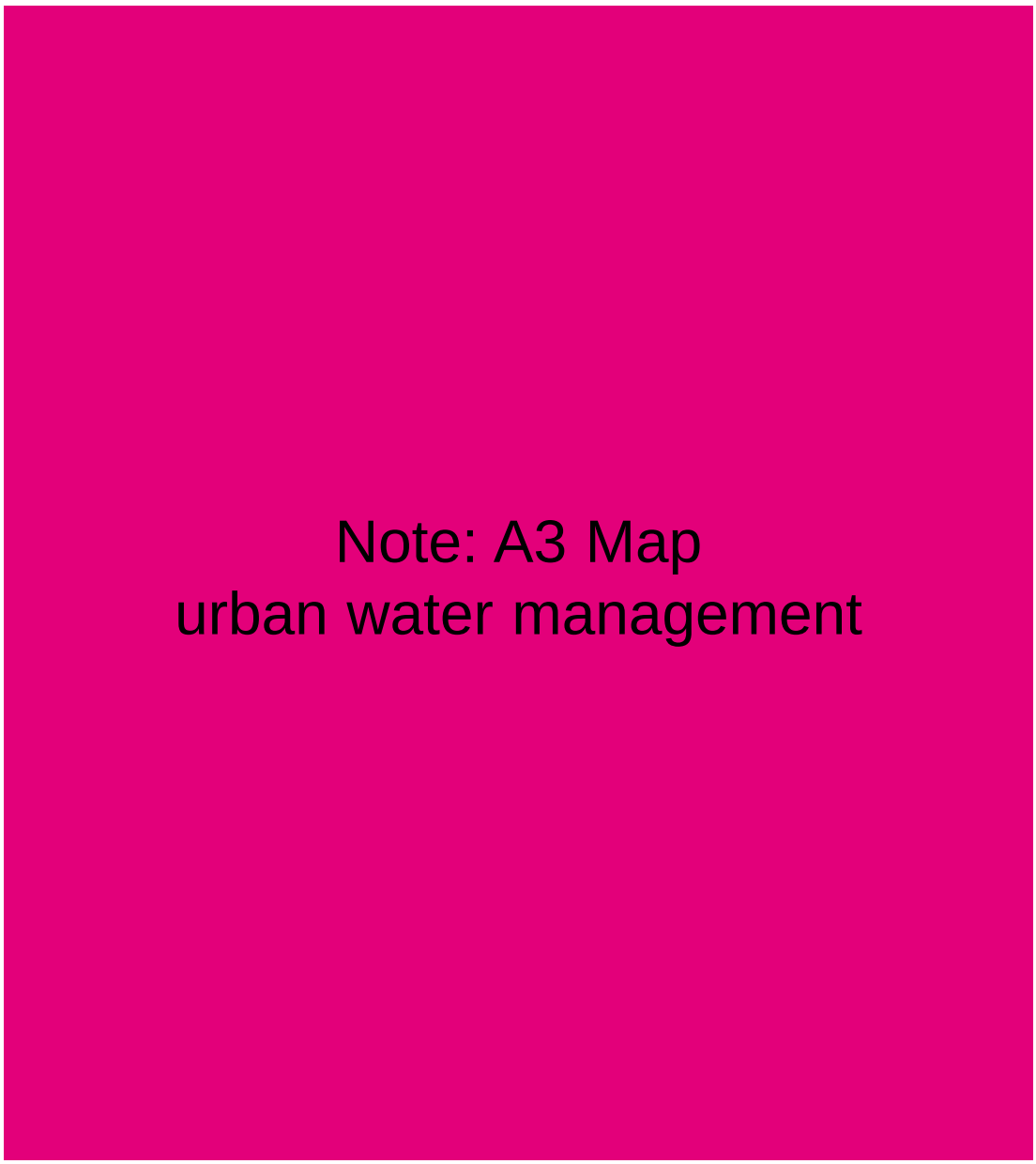
As an overall precinct the character may be determined by:

i. defining the urban development as a series of distinct town and village groupings rather an amorphous urban area;
ii. reinforcing, through the road network, the notion that the proposed urban areas 'belong' to Armadale and Gosnells respectively; and
iii. developing the 'water' theme inherent in the need for drainage and fill requirements, as well as the natural lake and wetland features.

Within the overall area there are a number of sub-precincts that have the capacity to develop a unique identity due to their locations in relation to other areas as well as subtle variations in their natural landscape characteristics. These sub-precincts coincide fortuitously with distinct neighbourhood groupings, namely:

- South Brookdale – the area south of a line extending from Harber Drive;
- Brookdale Central – the area centred on the crossing of Eleventh Road and Forrest Road;
- West Brookdale – the area bounded by Wungong Brook and the Tonkin Highway;
- Forrestdale – the area around the existing Forrestdale town-site;
- North Forrestdale – the area centred on the junction of Nicholson Road and Keane Road;
- Southern River – the area notionally south-west of Balfour Street; and
- Canning Vale East – the area to the north of a line extending from Harpenden Street.

The individual characters of these sub precincts may be defined in part by:



Urban Water Management Figure 5.2

5. Implications for the Preparation of the Structure Plan

- The use of a tree planting strategy which complements the natural vegetation characteristics of the locality and establishes an identifiable street tree theme (at least for neighbourhood connectors).
- The choice and colour of street furniture, light poles, etc.
- Kerbing and footpath details and materials.
- Prescriptive guidelines on fencing requirements.

Notwithstanding the above, the character of the sub-precincts will be determined in part by market demands which will affect block sizes, the size and type of residences, and the amount of retail and employment generating uses that may be supported in each area.

5.2 Environmental

It is clear from existing documentation there are three principal issues to be considered in relation to conservation of bushland and wetlands within the study area:

i. Retention of important bushland and wetland remnants because of their intrinsic environmental, scientific, educational and aesthetic values.
ii. Provision of connectivity between remnant areas of bushland and wetland so that the conservation values of the various areas are maximised by facilitating migration, nomadism and gene flow of the animal and plant populations.
iii. Buffers around wetlands in an effort to minimise midge and mosquito nuisance within the adjacent urbanised areas, and to protect the integrity of the wetlands.

An independent report (Attachment 'B' – Muir report) examines these issues and provides a rational basis for conservation of remnant wetland and bushland within a future urban context. It should be noted that this review dealt only with the technical and qualitative cost advantages and disadvantages of protecting land for part of the conservation estate. It did not address, or imply, any issues relating to the social impacts of the recommendations should they be adopted by any agency.

5.2.1 Significance of Wetlands

The starting point for such an assessment must be that it is recognised that nearly 80% of the wetlands on the Swan Coastal Plain between Moore River and Dunsborough have been filled, destroyed, or degraded since European settlement. Many of the remaining wetlands are affected by weed encroachment, too frequent burning, or are affected by changes to the water level or drainage regime. It is accepted throughout the scientific community that the wetlands which remain on the Swan Coastal Plain have very high scientific, educational and recreational value, and should be retained, protected and managed.

From this starting point, previous studies of wetlands in the region have attempted to determine which are in relatively good condition and should be primary targets for conservation efforts. These were identified more recently in Bush Forever. The Muir Environmental study (Attachment B) did not review these wetlands, or the conclusions which were reached about their significance. Rather, these already designated wetlands were accepted as having high conservation value.

There are several possible approaches to dealing with the remaining wetlands which are considered to be degraded to a greater or lesser degree. While it may be a laudable objective to include all remaining wetlands (and bushland) into conservation areas, it may not be practical to do so. Starting with the core of wetlands recognised as having high conservation value, an attempt was made (Ministry for Planning 1997) to incorporate the majority of the remaining wetlands into a connected system of corridors and buffers. The Muir Environmental study reviewed those corridors and buffers individually and provided an opinion on which areas might be worthy of further consideration and which were beyond practical restoration.

5.2.2 Additional Areas Which Could Enhance Designated Conservation Areas

Detailed maps of each study area should be referred to, and are presented in Attachment B. Results are summarised as follows.

Area A – Restoration of most of the area is impractical for cost and social reasons. Most of the land should remain in its current land use as a buffer (or could be restored to a more appropriate buffer), between more intense development and Balannup Lake. The rest could be made available for development.

Area B – Area B was proposed to create a corridor to link remnant bushland with the Southern River. Some of the land in the north-east sector, between Bush Forever area 464 and the river could be restored for this purpose, but whether such a move is practical and socially acceptable would need to be determined. The remainder of Area B is too degraded or expensive to restore and manage, and could be made available for development.

Area C – This is a very large area surrounding Bush Forever area 125. Part of the area could be used to create a restored buffer around B125, but this may not be required if the area of B125 is reduced by negotiations (which it is understood are under way). The rest should be designated for development.

Area D – parts of the area which are bushland are probably best left in current land use, with measures introduced to prevent any further clearing or subdivision. There would be considerable conservation advantages in linking B342 to B262 (Piara Nature Reserve) by an appropriate corridor. The remainder could be developed for urban purposes.

Area E – Restoration could provide a part-linkage at the western end, and the margins of the Brook could be restored to create a useful conservation corridor. The rest could be used for development. The isolated wetlands at the western end could be linked to the Forrestdale Golf Course.

Areas F And G – mostly cleared, parkland-cleared, and degraded, and have limited conservation value.

5.2.3 Enhancement of Wetlands and Reduction of Management Cost

Buffers around wetlands serve conservation and social purposes. In most cases in the study area, the amount of land available has been diminished by previous activities which have destroyed or degraded the surrounding bushland. As development proceeds, it is clearly unwise to develop houses to the edge of wetlands (for geotechnical or flooding reasons), and so an opportunity exists to create a buffer of either remnant or artificially constructed vegetation between the wetland and the development.

5.2.4 Midge and Mosquito Control or Reduction

Midges and mosquitos may be a nuisance in urban areas because they are attracted to household and street lights, and may occur in huge numbers. Some species of midge are so small they can pass through normal household flyscreens, and so may enter houses. Mosquitoes, especially *Aedes vigilax* and *Culex anullirostris,* are known carriers of Epidemic Polyarthritis, also known as Ross River Virus.

It is troublesome and expensive to apply insecticides or to control the water levels in the lakes (the trigger to hatching of some species) with any degree of precision. Further, the mosquitoes (and other nuisance insects) are an integral part of the wetland ecology and, by controlling them, predatory insects, reptiles, birds and mammals which also occupy the wetland are deprived of a food source and the ecology of the wetland as a whole is damaged.

Preservation or enhancement of dense vegetation buffers around wetlands is a much less expensive and damaging option than attempting to control the insects or the wetland water level. The buffers reduce light penetration into the wetlands, thus discouraging all but a

few midges which occur near the margins. They also help to reduce mosquito activity.

One of the significant factors in midge and mosquito problems near lakes is that the surrounding vegetation has been cleared to "improve the vista of the lake". It is the "improving" process, whereby the dense margin vegetation is removed, which exacerbates the problem. Adequate buffers should be retained on all sides of wetlands if the midge and mosquito problem is to be reduced.

5.2.5 Width and Density of Buffers

There are no generally accepted standards for the width of midge buffers, but there is increasing scientific opinion that the buffer should be determined by the vegetation characteristics, not by a set width, but at least 200m of densely vegetated buffer is required.

The draft Structure Plan (MfP 1997) states that the "City of Cockburn has adopted a policy, based on analysis of frequency of complaints from residents, to discourage new residential development within 500m of wetlands known to have midge problems". If housing is developed within this distance it must be designed to accommodate the midge problem. The City of Cockburn also imposes a caveat on the property, certifying that the owner is aware of, and accepts, the midge problems. A similar approach has been taken by the Department of Defence in New South Wales. This policy seems to be in accordance with findings elsewhere.

Clearing of buffers for short-term visual (and financial) gain by developers must be weighed up against long-term loss of amenity and ongoing management expense by the local government authority. The environmental, social and financial cost of a policy allowing narrow buffers around wetlands far outweighs the financial gain to the local government from rates, etc.

The EPA supports the recommendation of a dense vegetation buffer of at least 200 metres around wetlands with the potential to provide habitat for midge and mosquitoes. Additional buffers between wetlands with known midge problems such as Forrestdale Lake are however recommended. A buffer of 500–1000 metres is required between midge infested wetlands and sensitive urban development to minimise amenity impacts.

5.3 Drainage Management

5.3.1 Regional Drainage and Groundwater Issues

i. Natural Drainage

The natural drainage channels of the study area are shown on Figure 3.4. The Southern River and Wungong Brook are the two most significant natural drainage channels through the study area and both feed into the Canning River. In places (where the very flat natural topography has caused the river channel to disappear into wider wetland areas) drains have been dug to channel the river through these areas.

ii. Artificial Drainage

Over most of the study area the land elevation is so uniform that there are no natural drainage channels, rather there is an interconnected system of wetlands. Given the limited drainage ability, an extensive network of rural drains has been constructed for agricultural and urban activities. These drains comprise both Main Drains under the control of the Water Corporation and a more extensive network of smaller drains controlled by local government, particularly in road reserves, together with private drains on freehold land.

iii. Capacity of existing system

The system of drains which are maintained by the Water Corporation is referred to as Main Drainage (comprising Main Drains and Branch Drains), fed by other generally smaller drains maintained by local government and by landholders.

The capacity of a drainage system can de described by the flow capacity (in suitable units such as cubic metres) which each drain

can convey at bankfull, or in terms of the recurrence interval capacity, otherwise known as return period, of bankfull flow. Drains are usually designed for a specific return period such that the flow capacity, and therefore channel size, tends to increase in a downstream direction as more land contributes run-off.

During construction of the Forrestdale Main Drain and Bailey's Branch Drain in the 1970s, the capacity was estimated as 10 years, meaning overflow would only occur 1 year in 10 years, on average. In more recent assessments however, flow rates from gauged catchments on the coastal plain indicate that the original basis for design tended to underestimate flows, so that the Main Drains will overflow far more often than intended, perhaps 1 year in 2 years. The design flow capacity of these drains is approximately 2.5 L/s/ha, which occurs one in two years.

The significance of this limitation on Main Drain flow capacity is that when land use change is proposed, the Water Corporation requires the flow from developed land to be restricted to 2.5 L/s/ha or some lower rate, in instances where flooding has been a common problem.

5.3.2 Wetlands

All types of wetlands are represented in the study area including:

- Basin wetlands (lakes, damplands, sumplands).
- Flat wetlands (palusplain, floodplain).
- Channel wetlands (rivers, creeks and drains).

A large portion of the central study area is classified as dampland basin wetlands being seasonally waterlogged. Much of the south-eastern corner of the study area is classified as a palusplain flat wetlands being seasonally waterlogged.

A long period of agricultural activity has resulted in extensive clearing of natural vegetation with a consequent rise in water table, associated with the reduction in the transpiration. It follows that many of the extant wetlands are experiencing higher water tables than during previous centuries.

5.3.3 Wetland Management Categories

i. Conservation

The priority management objective is to conserve and enhance the existing conservation values of the wetlands. No clearing or development is considered appropriate. These areas should be reserved and managed as part of the metropolitan regional open space.

ii. Resource Enhancement

Resource Enhancement wetlands are important wetlands which may be degraded to varying degrees, but which still have conservation value and where, by good management, the conservation values such as natural vegetation can be restored. These areas could remain in private ownership if responsible management is undertaken, but are not recommended for development. If there is to be development, very careful assessment and planning is required to not unduly damage the conservation values.

iii. Multiple Use

This type of wetland comprises most of the palusplain type wetlands. Multiple use is intended to indicate that the land can be developed but the development must be sympathetic to the wetlands status of the land and be based on water sensitive design principles.

5.3.4 Acceptable Drain Levels

The term "water table" is defined as the elevation of groundwater in an unconfined aquifer, such as occurs beneath the study area. The term "groundwater level" is a generic term and may apply to the elevation of either an unconfined aquifer, or a confined groundwater system at greater depth. In this report the terms

water table and groundwater level are both used to refer to the water table within the study area.

Groundwater level in the study area rises and falls seasonally by one to two metres, typical of the Swan Coastal Plain, in response to wet and dry times of the year, usually reaching a maximum in October and a minimum in April. Annual maxima and minima vary from year to year depending on annual rainfall and temperature distribution, and a cumulative effect is evident in long-term monitor-bore records, with highest and lowest groundwater levels occurring at the end of a sustained wet or dry series of years.

To describe the groundwater level at any location, several summary statistics may be estimated from available monitor bore records including:

- Average groundwater level (AGL), being the average level throughout the period, between the spring peak and autumn low.
- Maximum groundwater level (MGL), being the highest recorded value.
- Lowest groundwater level (LGL), being the lowest recorded value.
- Average Annual Maximum Groundwater Level (AAMGL), being the average of a sequence of annual maximum values.
- Average Annual Lowest Groundwater Level (AALGL), being the average of a sequence of annual minimum values.
- Groundwater level trend (GLT), being the rate at which values are rising or falling with time.

Agriculture on much of the coastal plain has involved replacement (removal) of native tree and understorey vegetation species with annual crops and pastures. As these have lower canopy interception and transpiration rates, this clearing has resulted in a rise in groundwater level in some areas, depending on the type of vegetation removed and the soil type. In places this rise intersects the natural surface, with increased water ponding and waterlogging than under natural vegetation. However, it is estimated that the increase in groundwater levels in the study area is not great given that the water levels in Forrestdale Lake and Balannup Swamp are very shallow and dry out in summer.

With a time lag of perhaps 20 or 50 years, the development of much of Perth from natural vegetation or cleared agricultural land to residential has been achieved by land drainage. This term implies open or piped drains formed below the natural land surface (and below AAMGL and in many cases close to the AALGL) to remove excess surface or groundwater. These drains generally discharge to larger drains or natural waterbodies and have allowed the settlement of the coastal plain. However, such developments that occurred in those times were responsible for allowing rich groundwater to escape into the riverine system, the loss of wetlands and the loss of valuable water resources on the coastal plain. These established drainage systems are typically set at an elevation close to AALGL, such that between one and two metres of dry ground is provided above the water table, to prevent foundation and rising damp problems.

It can therefore be argued that land drainage on the coastal plain has been a response to the rise in water table occasioned by the earlier clearing of native vegetation for agriculture. Indeed once the consequence had been appreciated, agricultural clearing and land drainage were commenced at the same time.

In recent years a number of local publications have presented new criteria for drainage design, under the banner of Water Sensitive Design (WSD), the cardinal principle of which is to "maintain water balance".

Best management practices of WSD have been published, from which designers can choose to create an appropriate treatment. Several of these publications refer to the need to prevent excessive export of groundwater and nutrients to river systems, which are becoming eutrophic, by recommending that inverts of drainage systems are set no lower than AAMGL (referred

to here as the "AAMGL policy"), even where this is at the ground surface (EVA 1994, EVA 1996, EVA 1998).

The AAMGL policy is being applied by the Water and Rivers Commission (the WRC) to all new land developments on the coastal plain. The same policy forms an integral part of the Stormwater Strategy for Byford and Mundijong (EVA 1994) and Middle Canning Catchment Management Study (EVA 1996). The boundary of the Middle Canning Study includes much of the District Structure Plan area.

The Water and Rivers Commission sees merit in setting the groundwater level in new areas higher than those developed up to the 1980s. In formulating this policy, the level of the AAMGL is maintained to prevent too much nutrient rich groundwater draining from the area, polluting water bodies downstream, preventing the drying out the wetlands and saving the groundwater dependent vegetation. In most cases, in the high groundwater areas, the Commission encourages use of groundwater for domestic irrigation purposes, using water resources wisely. In the study area the AAMGL has been mapped and is based on data collected over the last 25 years. This AAMGL is mapped approximately 0.5m below an extrapolation of 80 years of data from metropolitan areas, due to the higher rainfall levels earlier in the last century. The WRC supports a balance between environment and development and uses the AAMGL based on only the last 25 years. Where man-made agricultural open drain and formal drains exist, such as the Forrestdale Main Drain, the AAMGL map allows for the local lowering of water table, accepting the invert levels of those drains as the AAMGL.

During land development a subsoil drainage network is permitted, as long as is laid at or above the AAMGL. Fill must be imported to give a good separation between the soil surface and the groundwater. This subsoil network is different from those installed prior to the AAMGL policy in the sense that the current policy on the use of subsoil will prevent the groundwater from rising above the AAMGL, whereas the past practice actively reduced the groundwater level.

A manual of Stormwater Quality Management has been published by WRC and includes a series of Best Management Practices of Water Sensitive Urban Design that developers can choose from to provide a treatment train.

5.3.5 Multiple Use Corridors

Multiple use corridors (MUCs) were introduced into Australian literature in 1993 (NSW Department of Planning 1993) and have been recommended in WA in WSD Guidelines (Whelans, 1993) and in Byford, Mundijong and Middle Canning Catchment Drainage Strategies (EVA 1994, 1996). The stated functions of MUCs include flood conveyance, wildlife corridors, public open space and cycle paths. None has yet been formed on the coastal plain, a major reason for which is reluctance by all parties to accept responsibility for their maintenance.

With respect to the study area, MUCs were recommended in the Middle Canning Catchment Study (EVA 1996), the width of which was not stated but was variously described as being between 30m and 200m, and nominally 100m wide.

The most contentious issue for District Structure Planning is the configuration and extent of the MUCs. Normally protection of natural watercourses as linear open spaces would have been under current planning practices, although the corridors might not have been as wide nor contain so many water quality enhancing features.

The District Structure Plan has taken into consideration the flow path of the drains and environmental issues in determining the location of the MUCs.

5.3.6 Environmental Management Areas

Environmental Management Areas (EMAs) are described as groundwater capture zones of internationally and nationally significant

wetlands. Protection of groundwater quality, as well as surface water quality, entering significant wetlands is acknowledged as relevant to protect the status of such wetlands.

The WRC and the DEP accept the recommended EMA boundary by Dames & Moore's 1997 report, however both are prepared to consider amending it should long-term data become available.

5.3.7 Existing Developments in Study Area Vicinity

Several examples exist of residential land use change within similar, adjacent landscapes. These form the basis for assessment of potential within the study area.

i. The Avenues

This development features three water table lakes, which overflow to the Hughes St Branch Drain and Amherst Branch Drain. The development site was filled by approximately 1m to provide sufficient clearance above water table, and subsoil drains which discharge to the lakes control water table rise. The development was approved in the early 1990s prior to the AAMGL policy, and the drains may be set below AAMGL (probably between AAMGL and AGL). Hence some rainfall is conveyed via the subsoil drainage system to the lakes and then downstream to the Main Drains, rather than flowing directly overland to the lakes and drains. The lakes form attractive water features and attenuate peak flows in 10 year events to the required Main Drain design rate of approximately 1.0 L/s/ha. The Avenues would be viewed neutrally by WRC from a nutrient management point of view, as it incorporates neither an MUC nor an artificial wetland, and hence is assumed to be exporting relatively high levels of nutrients.

ii. Brookland Green

This is a more recent development and incorporates a series of water features within an MUC, including a wet detention basin, a vegetated wetland and a narrow overflow swale drain, set at approximately AAMGL, linking the MUC with the downstream property boundary. Brookland Green is viewed positively by WRC in terms of water and nutrient management because of these water management features – despite there being no data so support this perception.

In summary, the lack of any rigorous monitoring data on nutrient export rates from recent, contrasting developments means that there is no sure indication of which design most closely approaches the nutrient export reduction objective.

5.3.8 Land Development Options

i. Fill and AAMGL

The study area has extensive areas where the water table is close to the ground surface, so that foundation stability, rising damp and inundation are appreciable design issues. However, this has been discussed in Section 5.3.4, which sets out where the subsoil network can be placed to give sufficient separation to groundwater. The engineering options for land development are either imported fill to raise the finished surface above the groundwater level, or drainage to lower the water table below the natural surface. With the fill option, the change of land use from native vegetation or cleared land to residential usually also results in a rise in water table, the prevention of which requires subsoil drainage. There is little opportunity for cut-to-fill, given the lack of topography within the study area.

In parts of Perth, including the study area, where these water table conditions occur, the cost of land development increases markedly with the required depth of imported fill to satisfy water related project assessment criteria, including the AAMGL policy. In these cases, economic evaluation must be carried out to ensure the viability of land development without compromising environmental considerations.

Where the subsoil network and the required fill are in place, the design engineering infrastructure must take into account the AAMGL, surface/fill level in determining the levels of the roads etc. The settings of the drains to reflect the influence of AAMGL contour line should be carried out in a drainage strategy for the area. The drainage strategy for the study area has not been completed. In the interim, developers must consult with the WRC to manage draining one development to the others.

ii. **Main Drainage Upgrade**

The capacity of the Forrestdale Main Drain and of Baileys Branch Drain is low, so that considerable attenuation of runoff by developers is usually required by the Water Corporation, prior to allowing for connection to the system.

Whereas Main Drainage is generally designed to cater for the 10 year return period flow, the system within the study area is believed to be only capable of conveying the two year flow, at most.

No hydraulic computer model of the Forrestdale Main Drain has been prepared, and this seems now to be an essential tool to formally and objectively assess the system, prior to any consideration to upgrade the system.

The upgrade or other measures to be taken will be part of a drainage strategy.

5.3.9 Land Use Within Forrestdale Lake EMA

It is considered that the desired outcome of protection of the wetlands from polluted groundwater discharge would be better served by allowing some change in land use within the EMA, rather than by maintaining all current land uses.

This position is based on the fact that several poultry farms produce solid wastes which fall directly through the chicken sheds on to the bare soil beneath, and is directly conveyed as a groundwater pollution plume towards Forrestdale Lake. In addition, a service station is sited on the corner of Forrest Road and Nicholson Road within the EMA, and a groundwater pollution plume undoubtedly already exists which will migrate downgradient to the lake.

Rather than presume against land use change within the Forrestdale Lake EMA boundary, these point sources of groundwater pollution could be removed and replaced by managed acceptable land uses with appropriate environmental and drainage management programs.

5.4 Infrastructure

The infrastructure component of a potential development is capital intensive and therefore it is a significant consideration in the development of a District Structure Plan. The determination of an economically feasible implementation strategy is relevant to infrastructure Planning.

While the final staging may be determined by other factors, such as potential property values and land take-up, infrastructure will have major implications when considering:

- Development fronts.
- Incremental development costs.
- Timing.
- Pre-funding for new or relocated services.
- Development approvals.

In this section these implications will be examined for the main infrastructure required to meet the District Structure Plan.

5.4.1 Road Networks

The District Structure Plan makes use of the existing main road network throughout the study area. Roads such as Armadale Road, Southern River Road, Holmes Road, Ranford Road, Forrest Road and Lakes Road remain link roads throughout the area with Ranford, Armadale and Holmes having strong links to the proposed extension of the Tonkin Highway. This is a key issue. The District Structure Plan has not

nominated any major road closures although some road deviations are proposed.

The District Structure Plan has used the existing road system to develop strong linkages to the various development areas. In the case of the proposed industrial area, it has main roads bordering it, thereby providing easy access for vehicles journeying to and from the area.

The subdivisional roads within the various neighbourhoods and zones are not defined under the District Structure Plan. Their locations will be determined at the detailed planning stage of the development and will have more freedom in configuration and linkages within each zone.

The width and designation of each of the major link roads are not defined within this District Structure Plan but reflect previous traffic planning in the area. The road reserves and the carriageway widths are addressed in Section 5.5.

Elsewhere in the area, roads through the various neighbourhoods, small commercial areas and linking the zones can be developed to suit community needs. Included here are such options as:

i. Widened road reserves and street side parking to encourage development of local community and commercial facilities.
ii. Narrow streets with calming devices to minimise traffic volumes and speed through residential areas.
iii. Priority measures where needed to allow the development of an efficient transport system throughout the area.

5.4.2 Water Supply

Major trunk water mains traverse the area, the most significant being located in Armadale Road, Ranford Road, Eighth Avenue, Lakes Road and Nicholson Road.

These services are generally located within the existing road reserves which are proposed to remain predominantly in their current location so no significant relocation of major water services are anticipated.

Currently there are reticulated water services to the area north of Ranford Road and the existing residential development off Armadale Road.

Expanded services into the areas designated for additional development in the District Structure Plan will need to be planned in conjunction with the Water Corporation. The Corporation's approach is to plan and budget works on a five year program that enables it to provide services to new fronts of development. Should the development fronts materialise in advance of the Water Corporation's planning and budgets, then the developer will be responsible for pre-funding any major upgrade of the existing Water Corporations system. The pre-funding is then returned to the developer at the time when the works are budgeted for in the Corporation's capital works budget.

The main implications this has for the area are that forward planning and implementation strategies are needed to enable the Water Corporation to plan and budget work, and having major capital expenditure undertaken separately from the development work with significant financial benefits to the developers of the area.

5.4.3 Wastewater

Similar to water supply, wastewater, or deep sewerage, systems are best handled along moving development fronts. For the study area that has predominantly level topography, there will be a number of pumping stations and pressure mains dispersed throughout the area which allows some minor flexibility in the subdivision stage.

Similar to water supply, the Water Corporation undertakes forward planning for the area and some preliminary planning has been carried out. The area of Southern River is located predominantly outside existing sewerage catchment and will require significant works for

it to be fully integrated into the overall wastewater collection system in the region.

As with water supply, to undertake major infrastructure development ahead of the Water Corporation's capital program will place financial responsibility on the developers in the form of pre-funding work. In the case of Southern River, this pre-funding could be significant as the length of services required to connect to the existing system is considerable and, given the high water table in the area, construction of major trunk sewers and pumping stations will be expensive.

An alternative to the pre-funding option is the provision of temporary work. This can be in the form of a smaller pumping station and pressure main that will enable development to proceed separate to development fronts. This alternative is usually less capital intensive than the pre-funding option but there is no refund of the capital investment at a later date by the Water Corporation.

The implementation of the wastewater collection system in the District Structure Plan, given the topography, high water table and the fact that most of the area is outside existing wastewater catchment boundary, means the provision of a wastewater collection system will be at significant cost. It is expected that the majority of trenching in the area will require dewatering, some temporary works will be necessary and pre-funding of some major works may be required by the Water Corporation.

The planning of the wastewater system and the staging and implementation strategy will be important so that commercial factors do not unduly impede the development process.

5.4.4 Power

The power distribution system throughout the area will need significant upgrading to provide adequate services to the District Structure Plan area.

To meet current standards in residential and commercial development, the minimum requirements will mean that the supply, including high voltage feeders, will need to be put underground, grids established throughout the area to provide security of supply, and a number of major sub-stations located throughout the area to facilitate the work.

As with other services, to properly stage and implement the work, forward planning is needed so that the District Structure Plan provides for economically sustainable development.

Under current Western Power policies, developers are responsible for the design and implementation of power reticulation throughout developments but Western Power maintains responsibility for the provision of adequate power. Based on this policy, Western Power can levy significant headworks charges to upgrade works.

Unlike the Water Corporation which sets a standard headworks charges for water, wastewater and drainage on a per lot basis, Western Power determines such costs on a development by development basis which could disadvantage some developers and advantage others. It is therefore an option to discuss with Western Power the possibility of developing a uniform headworks cost for the area included in the District Structure Plan. Given the long life of the development and fragmented land ownership, a co-ordinated scheme will need to be developed.

5.4.5 Gas

High pressure gas mains within the District Structure Plan area are located within the Armadale and Nicholson Road reserves. The proximity of high pressure gas mains to the residential areas in Perth has been the subject of a number of studies and Quantitative Risk Assessments (QRAs). These QRAs have provided guidelines of buffer zones based on DEP guideline of individual risk.

The EPA's Draft Guidance Achieving EPA Risk Criteria for development in proximity to existing and proposed High Pressure Gas Transmission Pipelines indicates the CMS(WANG) pipeline alone requires a separation of 32 metres each side of the centre line of the pipeline. Setbacks for schools, hospitals, shopping centres and other places where large numbers of people congregate are double this distance.

Low pressure gas distribution throughout the area will form part of the infrastructure development. Although not part of statutory requirements, AlintaGas should be kept informed so that adequate provision can be made when developing staging and implementation strategies.

5.4.6 Communications

Telstra maps for the area indicate that its trunk system servicing the area is predominantly within the Armadale Road reserve. It currently has no major facilities within private land, so generally there are no major encumbrances on the Telstra system.

The Telstra maps indicate a significant space capacity within its current conduits. Augmentation of services would not be a major problem and they should be capable of responding to user demands.

5.4.7 Staging

The staging of development will be complex and subject to population growth and commercial viability. Existing population projections for the four definable areas of the District Structure Plan are:

- Area 1 (Southern River)
- Area 2 (Forrestdale)
- Area 3 (Forrestdale Lake)
- Area 4 (Brookdale/Wungong)

Forrestdale Lake is the only one of the four areas that does not show significant population growth. For the other three, the population figures indicate that they will grow to approximately 50 to 60% of their population capacity by the year 2026, thereby increasing the population in the area by around 36,000.

In the three areas, there are some demographic and infrastructure issues that may influence the development sequence.

Previously it was suggested that growth in the area would best be facilitated on a moving development front and this is likely to be determined by infrastructure costs. For Area 1 (Southern River) and Area 2 (Forrestdale), this front will come from the north west. It is expected that Ranford Road becomes the initial service corridor.

While Area 1 (Southern River) lies to the south of Gosnells and Maddington it is unlikely that the existing Infrastructure to the north will provide sufficient capacity to handle growth from this area and therefore infrastructure will need to extend from the south through Area 2. On this basis, Area 2 (Forrestdale) would appear the most suitable for the first stage of development.

To the east, Area 4 (Brookdale/Wungong) is located to the south of Armadale and is subject to separate constraints and opportunities. Currently, development is happening in the region, which is anticipated to continue independent of other areas.

The central area, Area 3 (Forrestdale Lake), is poorly serviced and includes the Forrestdale Wastewater Treatment Plant, therefore limiting growth opportunities. It is anticipated that this area may remain relatively dormant until growth in the surrounding three areas encroaches on Southern River.

5.4.8 Conclusions

The District Structure Plan is built around major roads providing links to and through the area. In doing so, the District Structure Plan has maintained a significant proportion of major infrastructure that is now existing within the area and has minimised the need for major relocation

work. Therefore, the implication of existing infrastructure on the development and implementation of the District Structure Plan is not significant. This is an important advantage given the fragmented land ownership in the area.

The significant implications come from new and augmentation of the existing infrastructure. The area of the District Structure Plan is beyond existing developments and moving fronts, therefore there are major new linkages that will be required for all services.

The level topography and high water table in the area also has a significant impact on infrastructure as it will attract additional costs associated with both depth and dewatering.

Based on the above findings, it is concluded that the infrastructure for the area will impact significantly on both costs and timing of developments that fall within the District Structure Plan area. The significant infrastructure issues that must be addressed are as follows:

- Development fronts must be as near as possible to existing facilities to minimise major new linkages.
- A staged implementation strategy must be developed to allow planning and budgeting of major capital works by service authorities.
- Temporary linkages must be identified to enable options to be analysed against other alternatives such as pre-funding.
- To best facilitate development in the area, uniform headworks charges should be levied equally over all proposed lots. While this is consistent with Water Corporation policy it is not so with Western Power, therefore it may be appropriate to initiate dialogue with Western Power.
- The area has potential to be linked to existing railway stations at Gosnells and Armadale as well as a third rail link to the proposed Canning Vale Railway Station, thus providing a variety of transport linkages.
- Cycling facilities must be addressed, as most arterial roads on the study area do not provide a good cycle riding environment in their present configuration.

5.5 Transport

5.5.1 Railway

A passenger rail service currently operates along the eastern boundary of the District Structure Plan area. Stations at Kelmscott (north), Armadale (east) and Byford (south) will service the Armadale and Wungong areas of the District Structure Plan. Stations at Maddington and Gosnells provide transport hubs for the area north of Ranford Road and east of Warton Road.

From these existing hubs it would be expected that as the demand grows in the area, bus services will radiate and park and ride facilities will be developed.

In addition, three new railway stations are proposed to the northwest of the District Structure Plan as part of the South West Metropolitan Railway. The new stations are:

- Thornlie Station (at Spencer Street)
- Nicholson Station (at Nicholson Road); and
- Canning Vale Station (at Ranford Road)

Of these three (3) stations, Thornlie and Canning Vale will have train/bus interchange facilities. These facilities are expected to be developed within the next four to six years. The new services will provide a fast rail transit link both to the south to Jandakot and Rockingham and Mandurah, and north to Cannington, Victoria Park and Perth.

The South West Metropolitan Railway will be integrated into the Northern Suburbs Railway (linking to Joondalup). These railway stations are planned with 'kiss & ride' and 'park & ride' facilities that are easily accessed from the District Structure Plan area.

A major bus transfer interchange is proposed at the Canning Vale Station at Ranford Road. Buses on Garden Street and Nicholson Road could potentially stop at the Nicholson Road Station. The South West Metropolitan Railway Master Plan predicts very significant railway patronage from the Southern River – Wungong area.

5.5.2 Bus Routes

The Department of Transport publication Better Public Transport, a ten year plan for Transperth (1998 – 2007) provides details of the bus routes plan throughout Perth through to the year 2007. Apart from one cross suburban route, Armadale to the proposed Thompson Lake railway station, no other services are planned within the District Structure Plan area although there are a number of services extending to the border of the area. The most significant is a service terminating at the intersection of Ranford Road and Warton Road which will form part of the proposed System 21 Transperth link.

The planning and development of bus routes throughout the area has been discussed with the Department of Transport. Possible bus routes are shown on the District Structure Plan.

To facilitate the bus routes within the developed area, additional linkages may need to be created between the various centres and zones.

5.5.3 Other Regional Roads

The existing road layout reflects the current rural status of the study area. The pattern is essentially a grid network. Not all of the road reserves have been constructed. Typically, the roads that have been constructed are designed to a rural standard.

i. **Tonkin Highway**
The Tonkin Highway Primary Regional Road reservation is included in the Metropolitan Region Scheme. Preliminary carriageway designs are available. No further land requirements or modifications of the alignment are anticipated in the District Structure Plan. Construction of the road is included in the State Government's Ten Year Road Plan.

ii. **Nicholson Road**
This Other Regional Road reservation through the study area is based on a conceptual four lane divided standard. No changes are envisaged by the District Structure Plan. At present the road through the study area is a single carriageway constructed to rural standards.

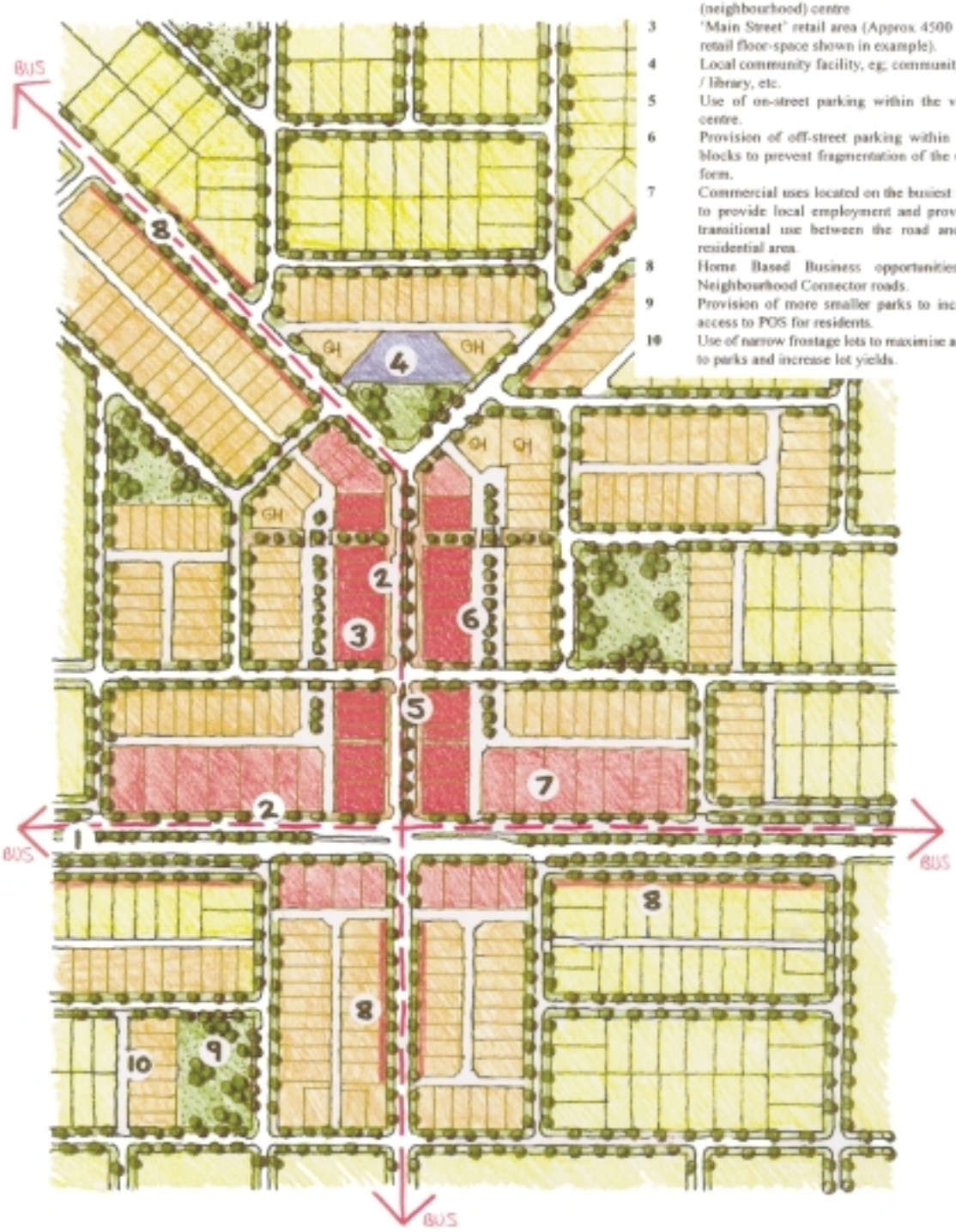
iii. **Ranford Road**
This is an Other Regional Road through the study area. Improvements have been made to Ranford Road in Canning Vale where it becomes a dual carriageway west of Nicholson Road. However through most of the study area it is a single carriageway road constructed to a rural standard. It is anticipated that ultimately this will be upgraded through to Forrest Road as traffic demand increases.

iv. **Garden Street**
This Other Regional Road reservation, on the eastern boundary of the study area, from Nicholson Road in the north to Lake Road in the south, is reflected in the Metropolitan Region Scheme. The road has not been constructed. The proposed road south of Southern River Road requires further investigation to determine requirements and alignment. Some sections of Garden Street conflict with Bush Forever sites.

v. **Warton Road**
This Other Regional Road Reservation is reflected in the Metropolitan Region Scheme west to Ranford Road. The road is maintained on its existing alignment between Ranford and Forrest Roads. Further investigation is required to assess whether the Regional Road status is required for this extension. It is currently a single carriageway, constructed to a rural standard through the study area.

vi. **Southern River Road**
Southern River Road is one of the main transport spines connecting neighbourhoods between Garden Street and Nicholson Road. This road is currently under investigation by the Ministry for Planning as another Other Regional Road between Ranford Road and Spencer Road east of the study area. It anticipated that the road will be incorporated into the Metropolitan Region Scheme. A four lane capacity will be required for the part of the road between Chamberlain Street and Garden Street. The District Structure Plan

5. Implications for the Preparation of the Structure Plan



Typical Plan of Large Village Centre Figure 5.3

LEGEND

1 Bus Routes pass through the centre of the neighbourhood.
2 Bus Stop located at the village (neighbourhood) centre
3 Potential to establish a local park at the village centre to provide a sense of place and add value to adjacent lots.
4 Small amount of retail, eg; 250 m^2 Deli.
5 Local community facility, eg; community hall.
6 Potential for some (residential compatible) commercial uses to provide local employment.
7 Home Based Business opportunities on Neighbourhood Connector roads.
8 Provision of more smaller parks to increase access to POS for residents.
9 Use of narrow frontage lots to maximise access to parks and increase lot yields.

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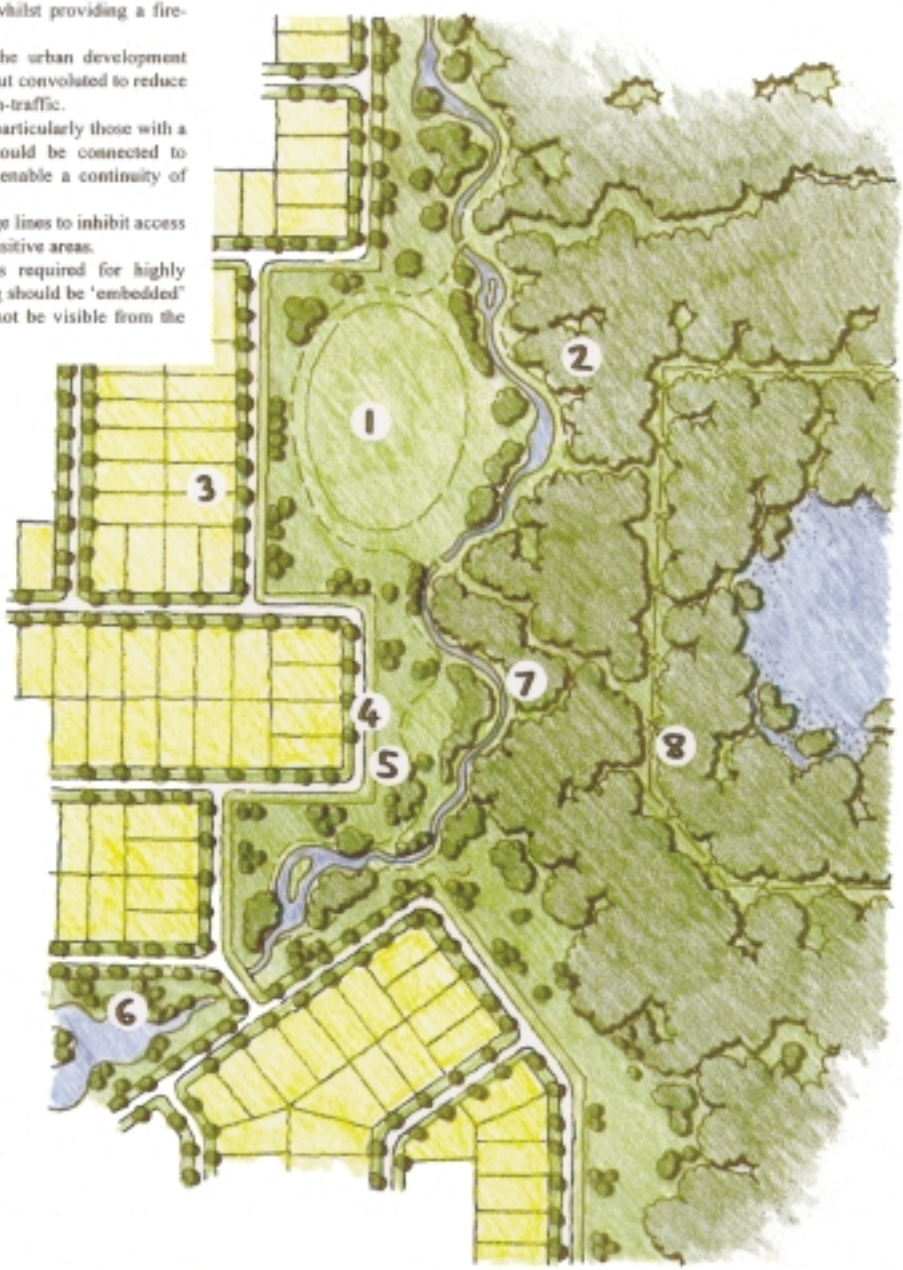
Typical Plan of Small Village Centre Figure 5.4

5. Implications for the Preparation of the Structure Plan

LEGEND

1 Use of POS to provide a transitional use between conservation areas and urban development.
2 Bushland provides a scenic backdrop to the POS.
3 Development to 'front' onto the parklands.
4 Perimeter streets provide public and emergency access to parklands, whilst providing a fire-break.
5 Perimeter streets to the urban development should be connected but convoluted to reduce desirability for through-traffic.
6 Larger areas of POS, particularly those with a drainage function, should be connected to adjacent bushland to enable a continuity of landscape character.
7 Potential to use drainage lines to inhibit access to environmentally sensitive areas.
8 If security fencing is required for highly sensitive areas, fencing should be 'embedded' within bushland and not be visible from the street.



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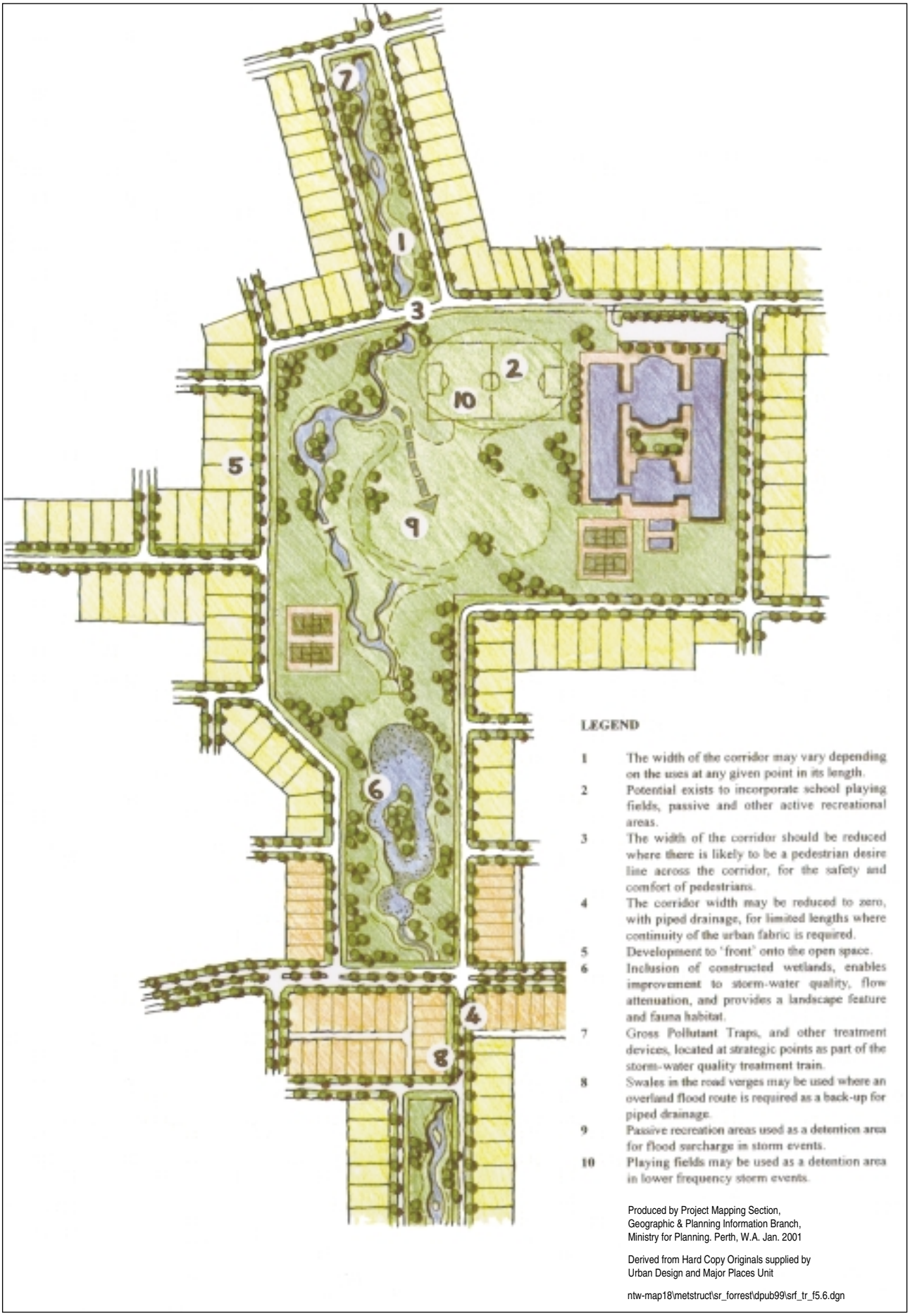
Typical Plan of Neighbourhood Edge/Conservation Figure 5.5



Typical Plan of part of 'Green-Link' Figure 5.6

provides for the extension of this road to Nicholson Road.

vii. **Forrest/Armadale Road**
This road is the most important east-west connector road between the South-East and South-West Corridors. The road links Armadale with Fremantle. It is reserved as an Other Regional Road in the Metropolitan Region Scheme. At present, the dual carriageway stops immediately east of the study area boundary. The single carriageway through the study area has been upgraded. No changes to the alignment or reserve width have been proposed by this District Structure Plan.

5.5.4 Transport Planning

Planning the major road system in the study area is primarily the responsibility of the Ministry for Planning in co-operation with the local government. Main Roads WA is responsible for Tonkin Highway and Forrestdale/Armadale Road.

Much of the transport planning in the study area to date has been based on two traffic studies carried out in 1995:

- The South East Corridor Transport Study, Ove Arup & Partners, January 1995; and
- The Canning Vale and Southern River Transport Assessment, RJ Nairn and Partners December 1995.

The Ove Arup study recommended the following hierarchy:

- Garden Street.
  Maintain as a four lane divided road with no direct access from residential lots.
- Ranford Road.
  Provide a reserve allocation for future upgrading of the current road to a six lane road in the long term.
- Armadale/Forrest Road.
  Provide a reserve allocation for future upgrading of the current road to a six lane road in the long term. However, current planning is for four lanes.
- Warton Road.
  Provide a reserve allocation to accommodate a four lane divided road from Forrest Road to Albany Highway.
- Southern River Road.
  Maintain as a four lane divided regional road.
- Tonkin Highway.
  Maintain as a four lane divided road to expressway standard.

These recommendations are still applicable for this District Structure Plan, though further refinement is required to assess road requirements against current proposals in the District Structure Plan.

For the most part, the existing regional road system is formalised by the Metropolitan Region Scheme. However, there are still some outstanding issues which need to be addressed.

i. **Garden Street**
Garden Street, between Nicholson Road and Tonkin Highway extension, forms part of the eastern boundary of the District Structure Plan. It is in the Metropolitan Region Scheme as a 40 metre wide reserve. The Ministry for Planning has a conceptual design for the road but this is to be revised as construction proceeds. Major intersection points are provided at Fraser Road North, Warton Road, Holmes Street, just north of Sutherland Park, Southern River Road, Tonkin Highway and Lake Road.

ii. **Ranford Road**
Ranford Road is potentially the busiest road in the study area. It is defined in the Metropolitan Region Scheme as a 40 metre wide reserve sufficient for ultimately six traffic lanes.

The existing single carriageway is considered to be well below standard, but the proposed upgrading to a six lane dual carriageway road is considered unacceptable.

If Ranford Road is upgraded, special attention will need to be given to the environmental, drainage and intersection issues as well as consideration of bicycle lanes and pedestrian crossings. Alternative alignments in the vicinity of Balannup Lake should be investigated. Upgrading of alternative roads should be examined before upgrading of Ranford Road. If no practical alternative exists then a particularly sensitive approach to construction will be required, including the likelihood of bridging.

iii. Nicholson Road

Nicholson Road has only recently been classified as an Other Regional Road and incorporated into the Metropolitan Region Scheme with a reserve varying in width from about 30 to 40 metres. It will, nevertheless, become a major arterial road from Thomas Road in the south to Albany Highway in the north. Parts of the road, adjacent to Hakea (Canning Vale) Prison and south of Armadale Road are adjacent to the water supply trunk main. The design includes provision for a six (6) metre wide median which could accommodate two of the three 132kv power transmission lines.

iv. Warton Road

Warton Road is reserved as an Other Regional Road in the Metropolitan Region Scheme between Garden Street and Ranford Road with a road reserve varying from 32-38 metres in width. In accordance with the proposals of the Ove Arup study, it is proposed to extend Warton Road to Forrest Road along the existing Warton Road alignment. This Other Regional Road alignment can be finalised once the Metropolitan Region Scheme amendment is final.

v. Southern River Road

Southern River Road is currently a rural road through the study area linking Ranford Road with Albany Highway via Dorothy Street in Gosnells. It is proposed as an Other Regional Road, east of Ranford Road, by the Ministry for Planning which has recently completed a conceptual design based on a 32 metre wide road reserve. This reserve width is less than the 40 metres which is normally recommended through rural areas proposed for future urban development.

Within the District Structure Plan, it is proposed to extend Southern River Road east of Nicholson Road to make it the main east-west connector road linking the new urban areas to the existing urban corridor east of Southern River. The road will directly link the future town (commercial) centres of Forrestdale, Southern River and Gosnells.

vi. Forrest/Armadale Road

Forrest/Armadale Road is an Other Regional Road in the Metropolitan Region Scheme. West of Tonkin Highway the width of the reserve varies from 44 metres upwards. East of Tonkin Highway it is a 32 metre wide reserve. While this would accord with the traffic projections in the Ove Arup study which had volumes very much higher on the west (32,000 vpd), than the east (12,800 vpd) this should be reviewed in terms of current urban proposals south of Armadale Road.

vii. Forrest Road South

The Ove Arup study recommended that Forrest Road, south of Armadale Road be an Other Regional Road. This is maintained in the District Structure Plan. More detailed planning will be required for this road if it is to be included in the Metropolitan Region Scheme. Depending on the outcome of the transport review for the study area, Forrest Road South could be designated as an Other Regional Road in the Metropolitan Region Scheme.

viii. Rowley Road

At present Rowley Road is a discontinuous east-west rural road. It forms the southern

boundary to urbanisation both in this corridor and in the South West Corridor (Jandakot Urban area). In the South West Corridor Structure Plan, Rowley Road has been linked into Wattleup Road as a direct connection between the Jandakot urban area, the Kwinana Freeway and Rockingham Road.

In the District Structure Plan it is proposed that Rowley Road, east of the Tonkin Highway, be connected through to the South Western Highway, but not as a major regional road. West of Tonkin Highway there is potential for Rowley Road to be upgraded to an Other Regional Road as an east-west connector between the Tonkin Highway, Kwinana Freeway and Rockingham Road along the southern edge of urbanisation in both corridors. In this way, the two urban corridors will be directly linked. However, this is a strategic road planning issue that should be further investigated by the Ministry for Planning.

Consideration should be given to the upgrading of Rowley Road between the Tonkin Highway and Rockingham Road and its designation as an Other Regional Road in the Metropolitan Region Scheme.

ix. **Tonkin Highway Extension**
The Tonkin Highway extension is included in the Metropolitan Region Scheme as a Primary Regional Road. It will provide strategic access to the study area particularly by linking the proposed industrial area with the other industrial areas within the metropolitan region.

5.5.5 Public Transport

Planning for public transport in and across the study area is essential. Preliminary modelling by the Department of Transport indicates most public transport travel will be northwards directed towards Perth and the inner areas of the metropolitan region. For this reason, the current Department of Transport strategy is to have efficient bus feeder services along Garden Street, Ranford Road and Nicholson Road feeding to future passenger rail stations at Nicholson Road and Ranford Road on the existing freight line.

Possible bus routes are shown on the District Structure Plan. Services will evolve over time to meet growing demand as development occurs. It is, however, important that the design of the roads mentioned above take into account public transport requirements especially in the vicinity of the rail stations. In addition, if it is projected that high levels of traffic congestion will be experienced on any of the north-south station feeder roads, then arrangements should be made to give priority for buses. High volumes of traffic also create an undesirable environment for pedestrians and cyclists unless separate facilities are provided.

5.5.6 Walking and Cycling

Walking and cycling will be an important transport mode in the study area. The topography is virtually flat and ideal for these transport modes. The Department of Transport has produced a preliminary bike plan for the study area. Additional work will be required to further develop the plan to take advantage of the multiple-use corridors and other opportunities that will become evident as more detailed planning proceeds.

The opportunities for developing pedestrian systems, both as a dual use of bike paths, but also recreational through the open spaces and recreation areas, require more detailed study. High amenity and safety of dual use paths combined with the consolidation of land uses will assist with the promotion of walking and cycling.

The Department of Transport should continue developing the bike plan for the study area in response to the District Structure Plan and more detailed local plans that will follow.

6. Preparation and Consideration of Structure Plan Options

As part of the preparation of the District Structure Plan, a number of options were produced. The options incorporated a number of alternative land use and design proposals based on:

- *The varying or definitive expectations of the community.*
- *Land capability (including drainage, landscape assessment).*
- *Servicing issues.*
- *Current urban/community design principles.*

Three options were prepared for consideration by the community. Each option was described and evaluated at the second community workshop held in March 1999. A full description of the community consideration/participation exercise is provided in Section 4 of this report.

None of the options were presented as a preferred option. To this end, each option contained a number of possible land use and design elements within separate plans, as follows:

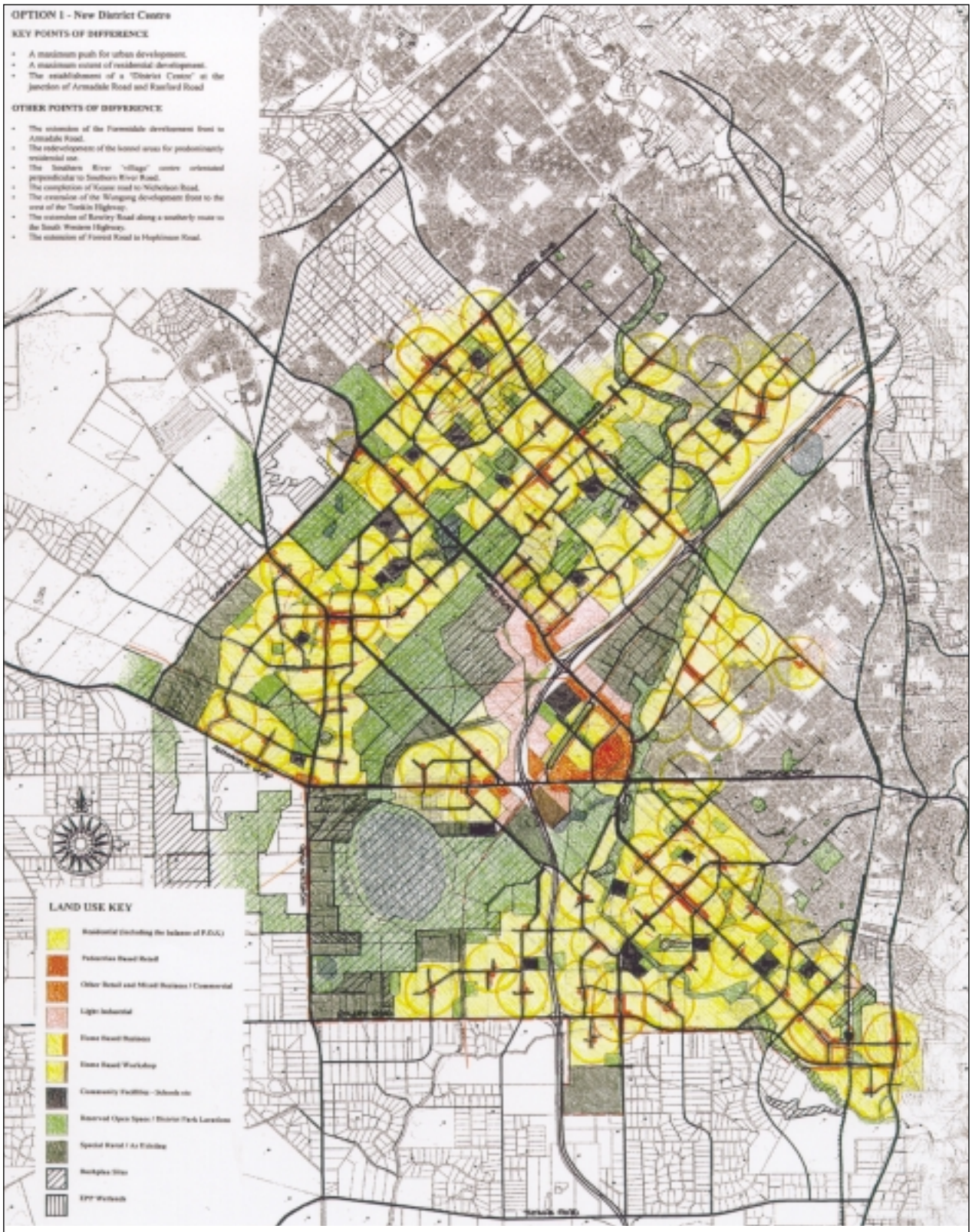
6.1 Option 1 – New District Centre/Maximum Urbanisation

Option 1 (Figure 6.1) primarily sought to facilitate maximum residential development. The residential development would be linked to a new District/Regional centre located centrally within the study area. The key elements included:

- The extension of the Forrestdale development front to Armadale Road to create an additional village centre.
- The redevelopment of the kennel areas for predominately residential uses.
- Establishment of a Southern River village (perpendicular to Southern River Road).
- Connection of Keane Street to Nicholson Road.
- Extension of the Brookdale development front west of Tonkin Highway.
- The extension of Rowley Road along a southerly route to the South Western Highway.
- The extension of Forrest Road to Hopkinson Road.

The community comments on this option are shown in Table 6.1.

6. Preparation and Consideration of Structure Plan Options



Preliminary Option – Option 1 Figure 6.1

Table 6.1 – Community Comments (Option 1)

Community Objective	Community Comments
Land Suitability	• Kennel zone (about half of the responses in favour of retention and half against. Some indications to keep Gosnells Kennel Zone but delete Forrestdale Kennel Zone). • Urbanisation (community strongly in favour of maximising urban development). • Bush Forever (not generally favoured but some conservation areas considered necessary). • Centralisation of industry favoured.
Infrastructure – Transport	• Maximum urbanisation favoured by community. • District Centres and Liveable Neighbourhoods favoured (particularly latter).
Employment	• District Centres and Liveable Neighbourhoods favoured (particularly latter). • Some support for centralised industry.
Lifestyle and Streetscape	• Kennel zone – equivocal views for and against retention. • District Centres and Liveable Neighbourhoods favoured (particularly latter). • Bush Forever not favoured but conservation of some areas considered important.
Conservation and Environment	• Bush Forever not generally favoured, but agreement that some conservation areas should be retained.
Implementation – Including Compensation	• Nil.
Roles/Responsibilities and Decision Making	• Kennel zone equivalent reasons for and against retention. • Urbanisation (community favours maximisation). • District Centres and Liveable Neighbourhoods favoured, especially the latter. • Bush Forever not favoured but some conservation considered necessary.

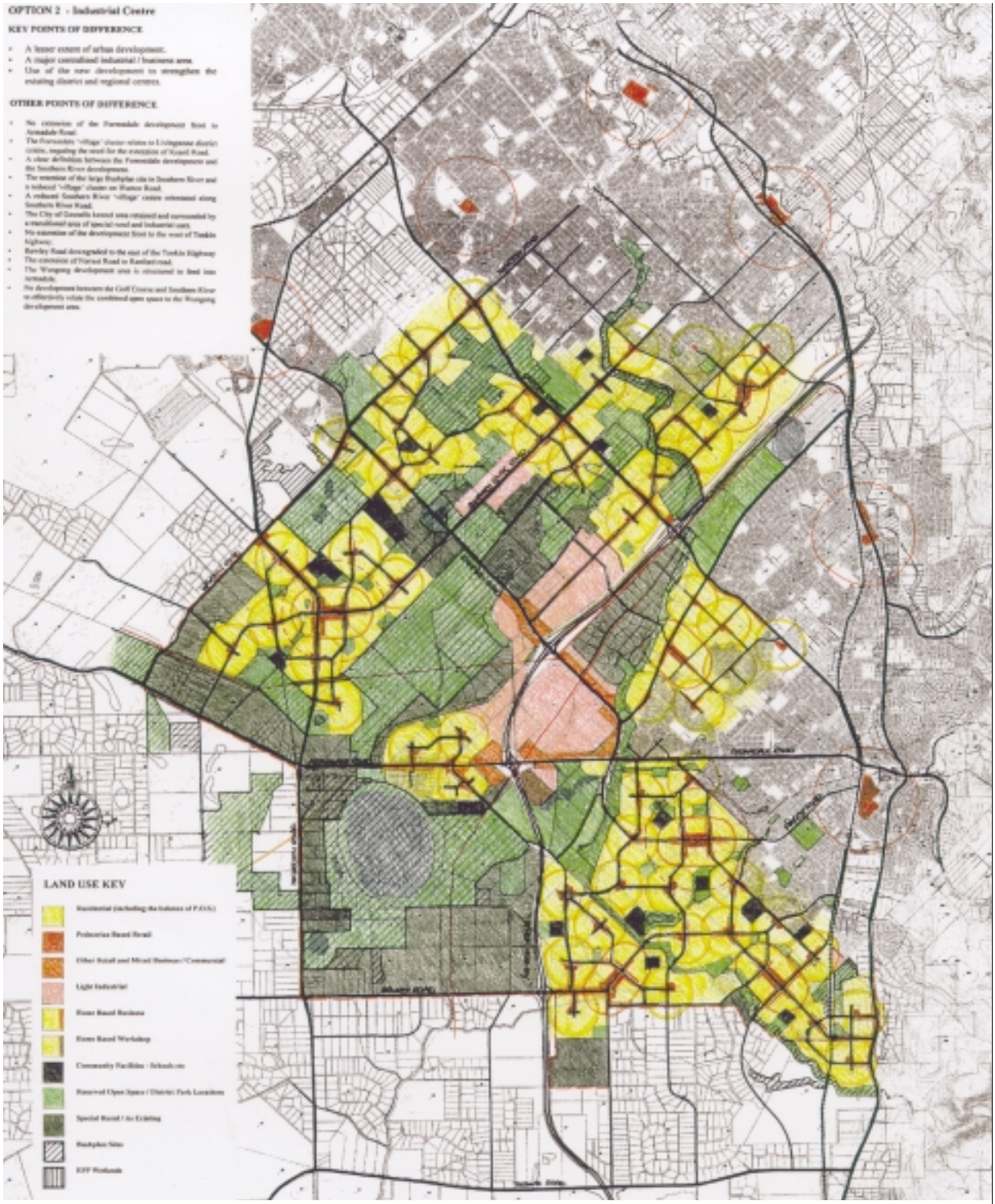
6.2 Option 2 – Industrial Centre/Use Existing Retail Centres

Option 2 (refer to Figure 6.2) proposed a reduced amount of residential development compared with Option 1. The primary intent of Option 2 was to establish a large industrial/business area within the central part of the study area. The key elements included:

- Use of the new residential areas to strengthen the existing District and Regional Centres.
- No extension of the Forrestdale development front to Armadale Road.
- The Forrestdale village to form part of the Livingston District Centre (no extension of Keane Street).
- A clear distinction between the Forrestdale and Southern River centres.
- The retention of the large Bush Forever area within Southern River.
- A reduced Southern River village centre orientated along Southern River Road.
- Retention of the Southern River Kennel zone surrounded by a transitional area of Special Rural and Industrial Uses.
- No extension of the development front west of Tonkin Highway.
- Rowley Road downgraded east of Tonkin Highway.
- The extension of Forrest Road to Ranford Road.
- The Brookdale development area is structured to provide that roads link to Armadale.

Community comments on this option are provided in Table 6.2.

6. Preparation and Consideration of Structure Plan Options



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Indicative Scale Only

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Table 6.2 – Community Comments (Option 2)

Community Objective	Community Comments
Land Suitability	• Rural feel/aesthetic values (like) and number of Bush Forever sites, too much green (dislike). • Industry (dislike).
Infrastructure – Transport	• Nil.
Employment	• Concentration and containment of industry (opportunities for employment) (Like). • Dog Kennel areas (dislike). • Industry (dislike).
Lifestyle and Streetscape	• Rural feel/aesthetic values (like). • Industry (dislike). • Lack of density diversity (dislike). • Change to increase housing density and reduce industry (i.e. like Option 1).
Conservation and Environment	• Rural feel/aesthetic values (like). • Size and number of Bush Forever sites, too much green (dislike). • Pollution (urban and rural concerns). • Change/reduce Bush Forever sites and reduce amount of green.
Implementation – Including Compensation	• Dog Kennel areas (dislike)
Roles/Responsibilities and Decision Making	• Nil

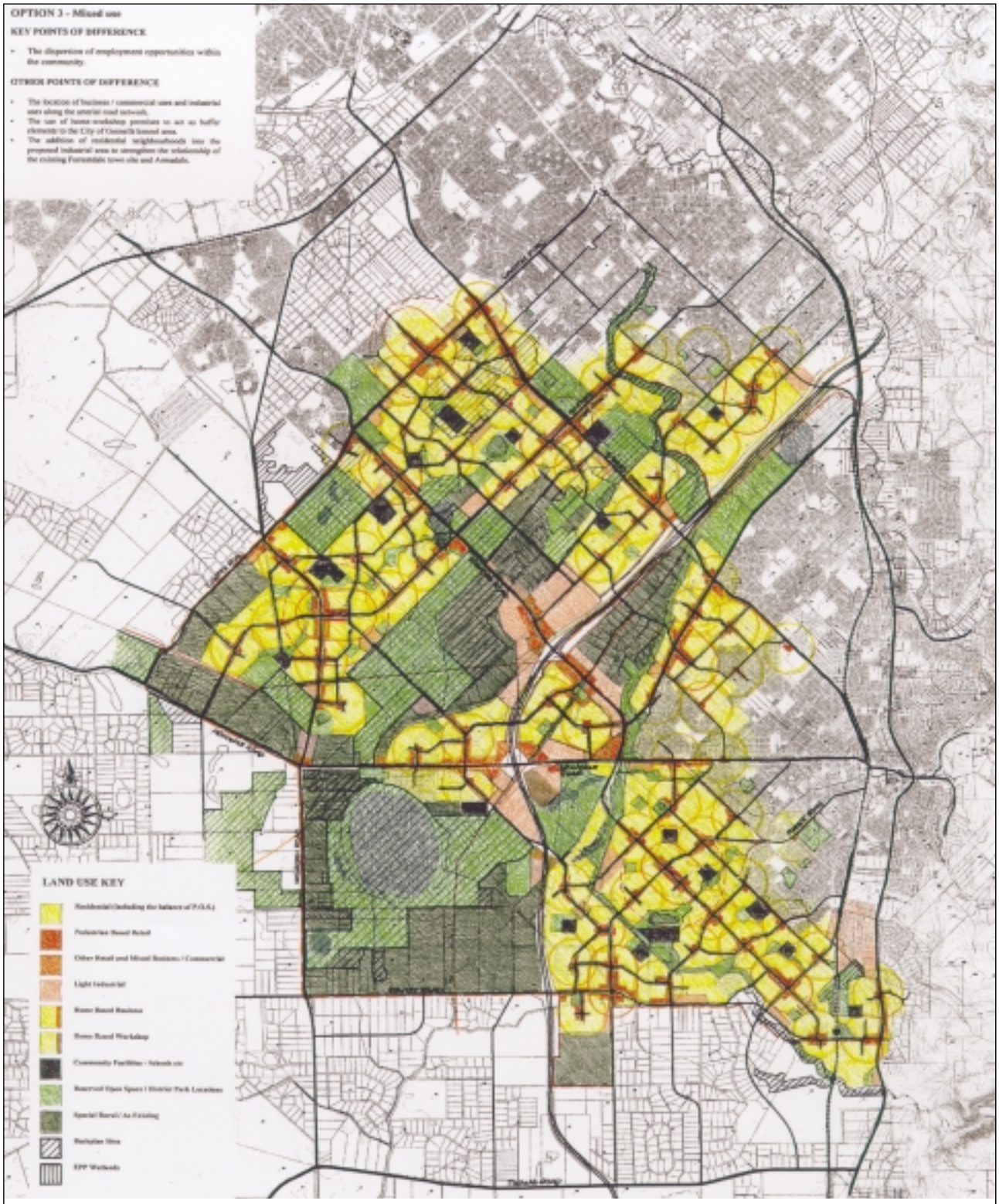
6.3 Option 3 – Mixed Use/Dispersed Industrial and Commercial

Option 3 (refer to Figure 6.3) proposed to establish dispersed employment sites within individual neighbourhoods. The principal elements of the plan included:

- The location of business/commercial use and industrial uses along arterial road networks.
- The use of home workshop premises to provide a transitional buffer between the kennel zone and predominantly residential neighbourhoods.
- The addition of residential neighbourhoods into the proposed industrial area to strengthen the relationship of the existing Forrestdale townsite and Armadale.

A complete description of community comments is provided in Table 6.3.

6. Preparation and Consideration of Structure Plan Options



Preliminary Options – Option 3 Figure 6.3

Table 6.3 – Community Comments (Option 3)

Community Objective	Community Comments
Land Suitability	• Retain Kennel zone. • Develop dispersed commercial areas. • Develop retail on main roads. • Retain rural land south of Forrestdale Lake. • Strong objections to dispersed industrial areas. • Reduce open space (including Bush Forever sites).
Infrastructure – Transport	• Develop dispersed commercial areas. • Develop retail on main roads. • Strong objection to dispersed industrial areas. • Provide strong focal point.
Employment	• Develop dispersed commercial areas. • Develop retail on main roads. • Provide strong focal point.
Lifestyle and Streetscape	• Retain Kennel zones. • Develop dispersed commercial centres. • Develop retail on main roads. • Retain rural land south of Forrestdale Lake. • Strong objections to dispersed industry. • Less open space (and Bush Forever sites). • Provide strong focal point.
Conservation and Environment	• Retain rural land south of Forrestdale Lake. • Reduce open space (including Bush Forever sites).
Implementation – Including Compensation	• Reduce open space (including Bush Forever sites).
Roles/Responsibilities and Decision making	• Nil.

6.4 Draft Preferred Option

Based on comments received during the community consultation process, a draft Preferred Option was prepared for further consideration by the community on 9th June 1999.

The plan (refer to Figure 6.4) comprised a number of key elements:

- Limited extension of development west to Armadale Road (based on hydrological data from JDA).
- No development west of Tonkin Highway.
- Deletion of the two kennel zones in favour of residential, recreational and community activities.
- Retention of the proposed Forrestdale Business Park as the primary employment node.
- Provision of links to existing District and Regional Centres to increase their viability, role and function.
- Typically no development within any Bush Forever areas (subject to negotiated solutions).

6. Preparation and Consideration of Structure Plan Options

Preliminary Options – The Preferred Option Figure 6.4

The community was asked to comment on the draft Preferred Option using the community derived objectives. In general, the community agreed that the plan met its objectives but requested:

- Additional opportunities for employment be identified.
- Retention of the Southern River Kennel Zone.
- Equitable compensation for land affected by the recommendations of Bush Forever.

Following the third workshop, a further revised District Structure Plan was prepared. A full description of the plan is provided in Chapter 7.

6. Preparation and Consideration of Structure Plan Options

7. District Structure Plan Description

The purpose of this section is to describe the District Structure Plan. The District Structure Plan seeks to provide the long-term framework for:

- *Open space.*
- *Community infrastructure.*
- *Metropolitan Region Scheme amendments.*
- *Town planning scheme amendments.*
- *Future development areas.*
- *The 'on the ground' physical arrangement of urban areas, primary road systems, public transport, neighbourhoods, schools, open space, shopping facilities and major infrastructure.*
- *Servicing infrastructure requirements.*

It is intended that the District Structure Plan will:

- *Be used as a basis for preparing outline development plans which will guide subdivision applications for individual neighbourhood areas;*
- *Facilitate Metropolitan Region Scheme and town planning scheme amendments for the development or conservation of land; and*
- *Facilitate infrastructure provision.*

A full description of the District Structure Plan is provided under the following headings. The plan is attached to and follows the Executive Summary.

7.1 The District Structure Plan – Main Features

7.1.1 Retail

The District Structure Plan shows expansion of the existing urban development occurring along Warton and Ranford Roads, along Garden Street, adjoining Forrestdale Lake and in the Brookdale/Wungong area south of Armadale.

This development is not self-contained; it is an extension of these existing areas. As such, the new urban areas will be serviced by existing District Centres at Canning Vale, Maddington and Gosnells as well as the Armadale Regional Centre. Local and Village or neighbourhood shopping needs are provided for within the new urban areas as are local commercial and employment opportunities.

Eight village centres are proposed within the urban areas of the District Structure Plan. These are located at the corner of Warton Road and Holmes Street in Southern River/Canning Vale, Southern River Road, Garden Street east, corner of Ranford and Wright Roads, Nicholson Road in Forrestdale, Eleventh Road east and west and in Rowley Road. The neighbourhood centres shown on the District Structure Plan are indicative only. Village centres and neighbourhood centres are proposed in accordance with the *Liveable Neighbourhoods Community Design Code* and would contain such retail, commercial and community facilities as would be appropriate based upon market requirements and demand. These centres would also include locations for home businesses and medium density housing.

It is emphasised that the centres shown on the District Structure Plan propose a district hierarchy but are conceptual only and retail floor space requirements would be subject to further investigation in conjunction with the local government's commercial strategy.

7.1.2 Industry

A major light industrial area is to be located at the junction of Armadale Road, Ranford Road and the Tonkin Highway. It includes land west of the intersection on both sides of Ranford Road. This industrial area includes the existing Metropolitan Region Scheme Industrial zoning.

7.1.3 Rural

Land south of Forrestdale Lake is identified predominantly as either Regional Open Space or Rural. The Rural area adjoining Rowley Road is identified as a location without development constraints (except for service extensions) and is earmarked for Possible Future Urban Development as it is not likely to be required for urbanization for more than 30 years. A decision on its use can be made then; the District Structure Plan does not close off future options.

7.1.4 Conservation

Significant EPP Wetland and conservation areas, together with Bush Forever sites and multiple use corridors are defined on the plan based upon the detailed investigations of this study and fixed constraints (such as drains and watercourses). The MUCs are indicative; they are not fixed and need to be refined based upon more detailed investigations of biophysical criteria at the subsequent detailed planning stages. It should be noted that land set aside for conservation purposes will be in addition to the normal 10 per cent public open space requirement for residential land.

Conservation Category Wetlands are shown indicatively on the plan. The definitive boundaries of these wetlands should be determined in consultation with the DEP and WRC in the more detailed stages of planning.

7.1.5 Bush Forever Sites

Three of the Bush Forever sites in Southern River have been earmarked for reservation as Parks and Recreation under the Metropolitan Region Scheme. These areas (described as Bush Forever sites 125, 413 and 465) are shown as both Bush Forever sites and Parks and Recreation reservation. The location of the Bush Forever sites is shown in Attachment 'B'.

Other privately owned Bush Forever sites are shown only as Bush Forever sites and will be subject to negotiated outcomes as recommended by Bush Forever. That process is separate from this District Structure Plan but its outcome will need to be incorporated in the detailed outline development plans prepared prior to subdivision.

7.1.6 Kennel Zones

i Southern River Kennel Zone

The Southern River Kennel Zone fronting Ranford Road has been retained because of the significant existing investment and consolidated use of the zone for the purpose. Management measures will include:

- Guidelines for best practice for the construction and management of kennels to reduce off-site noise impacts. This is to be applied to all new and additions to kennels. Implementation of such measures is critical to the successful management of noise impacts.
- A special control area between 500 metres and 1 kilometre around the Kennel zone applies within which urban development could occur subject to controls on the design and construction of housing where affected by noise nuisance.
- Residential use and subdivision proposed 500m to 1km from the kennel zone, where affected by noise nuisance, to be subject to covenants and memorials on titles advising of potential noise nuisance.
- Within 500m of the kennel zone, development is to demonstrate an acceptable noise impact and/or only non-noise-sensitive compatible land uses will be permitted.
- The 500m buffer area is shown on the District Structure Plan.

ii Forrestdale Kennel Zone

The Forrestdale Kennel zone will not be retained for the following reasons:

- The Forrestdale Kennel zone affects a significant area of potential urban land, but is only developed with a limited number of kennels.
- The relocation of a limited number of kennels within Forrestdale to a consolidated area (e.g., the Southern River Kennel zone) is considered a desirable mechanism to enable the release of constrained urban land while retaining a dedicated kennel area within the South-East Corridor.

- The Southern River Kennel zone is not developed to full capacity and may accommodate the relocation of Forrestdale kennels.
- Existing kennels will be able to continue operating under non-conforming use rights.

The following actions are recommended for this area:

- Rezoning by the City of Armadale to delete the existing kennel zone.
- Best practice guidelines for the construction and management of kennels to reduce off-site noise impacts. This to be applied to all additions to kennels by the DEP and the City of Armadale.
- Residential use proposed within 500m of existing kennels to demonstrate an acceptable noise impact and/or only compatible land uses be permitted. This means that residential development would be restricted within 500 metres of the Forrestdale kennels while kennel use continues and noise nuisance exists, notwithstanding the Urban designation of this area.
- Residential use and subdivision proposed 500m to 1km from the kennels, where affected by noise nuisance, to be subject to covenants and memorials on titles advising of potential noise nuisance.

iii Kennel Taskforce

The Ministry for Planning has convened this taskforce to consider the future provision for and location of additional kennel zones throughout the metropolitan area.

7.1.7 Contaminated Sites

The former Southern River liquid waste disposable disposal facility has resulted in groundwater contamination. The remediation of the site and management of the contaminated groundwater plume has been the subject of a formal assessment by the EPA and setting of Ministerial conditions. The City of Gosnells is committed to complying with these conditions, which include requirements relating to the placement of restrictions on groundwater use in the vicinity of the site.

Nearby land that may be affected by the groundwater plume is proposed for urban development, industrial use and open space. This will necessitate controls to be applied to groundwater use and drainage associated with these land uses in the vicinity of the site.

7.1.8 Environmental Management Areas

The District Structure Plan shows Environmental Management Areas (EMAs) for Forrestdale Lake, a Ramsar wetland, and Balannup Lake. Proposed development within the EMA is required to be managed to be consistent with the objective for the EMA. The EPA does not support urban development within the EMA for Forrestdale Lake. Changes to the EMA boundaries are not supported unless long-term supporting data is supplied to the satisfaction of WRC and the EPA.

The Balannup Lake EMA objective is to ensure that changes to water quality and water levels in the wetland do not lead to unacceptable impacts.

The matter of appropriate land uses within environmentally sensitive groundwater areas is being addressed in a study by the Western Australian Planning Commission investigating the link between land use and groundwater quality.

7.1.9 Drainage and Watercourses

Major drainage routes are included in the Plan within multiple use corridors (often as linear open space). These are based on a detailed interpretation of the Middle Canning Catchment Study's multiple use corridors. The drainage and open space functions would be combined wherever possible. However, the

width of these MUCs would vary depending upon biophysical criteria, drainage requirements, natural topography and landscape features (as well as the need to incorporate cycleways and pedestrian walkways). The width of MUCs would be determined and agreed at the detailed planning stage.

The Water and Rivers Commission has recommended that the existing riparian vegetation zones of Southern River and Wungong Brook be extended, revegetated and major weeds removed. River restoration, including the conversion of drains back to broadly functioning waterways will widen the floodplain. Accordingly, the tributaries of the Southern River and Wungong Brook and their use as MUCs should be considered to include requirements for restoration, revegetation and reservation of an appropriate corridor width. These corridors need to incorporate the water course, floodplain, riparian, intermediate and dry land zone.

7.1.10 Drainage, Nutrient and Flood Management

The EPA has highlighted the need to carefully consider and manage drainage and nutrient export within the District Structure Plan area to ensure that land use changes will not lead to unacceptable impacts on groundwater resources, wetlands and the Swan and Canning Rivers. To this end it is necessary to develop a detailed urban water management strategy for the District Structure Plan area.

The strategy will involve all key agencies and be completed prior to rezoning or major changes in land use being finalised. The strategy will criteria for nutrient export associated with development and include criteria on both the surface and groundwater quality. It will demonstrate that changes in land use can be adequately managed to ensure that reductions in environmental quality will not occur. Detailed planning of local and regional drainage infrastructure needs to be undertaken, along with the formulation of design criteria and standards for development and subdivision design and management. In addition, this work should lead to the formulation of administrative and management frameworks for the implementation of drainage and nutrient management.

Because of the lack of demonstrated success of the management of nutrient export from large-scale urban development at the local level, it is considered that an innovative and strategic approach to the issue will be necessary for the proposed land use changes within the District Structure Plan area to be acceptable. It is likely that a more regulatory approach to those commonly in place elsewhere may be required. This will also require the formulation and implementation of strategies for development, drainage and nutrient export which are unique to the characteristics of the catchment and for which technical details are currently insufficient.

The strategy should demonstrate that changes in land use proposed in the District Structure Plan area can be adequately managed to meet the objectives and targets identified within the SCCP and Swan-Canning EPP.

To effectively manage this additional work and to oversee the formulation of the strategy and its subsequent implementation the EPA has recommended that a Technical Review Committee be created.

Following the preparation and endorsement of the overall urban water management study for the District Structure Plan area, landowners

preparing outline development plans will be required to prepared detailed drainage and nutrient management plans consistent with the UWMS. The Technical Review Committee would also be responsible for reviewing the detailed drainage and nutrient management plans.

7.1.11 Transport

Major transport routes include the future extension of Tonkin Highway, Garden Street, Ranford Road and Armadale Road. Tonkin Highway forms a north-south spine through the study area that will provide improved accessibility to the north and, in time, to the south. Nicholson Road will decrease as a major transport route once the Tonkin Highway is in place. However, in the interim it will continue as a major freight route and abutting urban development should not have direct frontage – access should be restricted. Restrictions on frontage access apply particularly to the proposed village centres in Forrestdale on Ranford Road and Nicholson Road.

Rowley Road west of the Tonkin Highway will become an important east-west arterial road. Rowley Road east, although it is proposed to connect to the Great Southern Highway is not a direct route and is not intended to become an arterial road.

Bus services can be expanded into the study area to provide links to existing and planned railway stations. Major bus routes are shown indicatively on the District Structure Plan.

7.1.12 Summary of Proposed Land Use

A summary of proposed land use is provided in the following table:

Table 7.1 – District Structure Plan - Approximate Land Use Areas

Lot Type	Area (hectares)
Single Residential including POS	1,957
Medium density residential	139
Pedestrian based retail	25
Other retail/mixed business/commercial	117
Light industrial	206
Community facilities	115
Open space – incl. Golf Course/Bush Forever dual use	1,664
Rural	689
Rural living – lots 1ha+	343
Semi-rural living	151
Public Utility – Sewage Treatment Plant	16
Lake	177
Bush Forever – including dual use	499
EPP Wetlands	17
Bush Forever/single residential dual use	35
Bush Forever/open space dual use	133
Canine Association	14
Golf Course	63
Kennel Area	72
Existing single residential	25

7.2 Residential Development Potential

The study area was divided into four residential precincts as shown in Attachment D. These precincts, their approximate residential areas and capacity (population and dwellings) are detailed in the following tables:

7. District Structure Plan Description

Table 7.2 – Area 1 – Southern River (North of Ranford Road)

	Area (hectares)	Estimated Dwellings	Estimated Population
Single Residential	483	4,830	12,550
Medium Density	64	1,600	3,200
Totals	**547**	**6,430**	**15,750**

Table 7.3 – Area 2 – Forrestdale (Ranford Road South to Armadale Road)

	Area (hectares)	Estimated Dwellings	Estimated Population
Single Residential	502	5,020	13,050
Medium Density	24	600	1,200
Totals	**526**	**5,620**	**14,250**

Table 7.4 – Area 3 – Forrestdale Lake (North of Forrestdale Lake)

	Area (hectares)	Estimated Dwellings	Estimated Population
Single Residential	131	1,310	3,400
Medium Density	5	125	250
Totals	**136**	**1,435**	**3,650**

Table 7.5 – Area 4 – Brookdale/Wungong (South of Armadale)

	Area (hectares)	Estimated Dwellings	Estimated Population
Single Residential	729	7,290	18,950
Medium Density	75	1,875	3,750
Totals	**804**	**9,165**	**22,700**

Table 7.6 – Total – Study Area

	Area (hectares)	Estimated Dwellings	Estimated Population
Single Residential	2013	22650	56350
Medium Density dwellings 4200 or 18.5% of total dwelling potential			

Assumptions:

i. Single Residential 10 dwellings per hectare
2.6 persons per dwelling

ii. Medium Density Residential – density at R 25 (2 per dwelling)

The area designated for residential land use totals approximately 2,013 hectares, with a total potential of 22,650 dwellings, of which, 4,200 or 18.5% are medium density (R 25) residential dwellings.

7.3 Population Projections

Demographic projections for Armadale and Gosnells have been prepared by Ibecon Pty Ltd (consultants in Market Research, Retail and Economics). Attachment D (Appendix A) contains population projections as well as aggregate populations for Armadale and Gosnells local government areas and selected suburbs for the areas between 1976 and 2026. Average annual increases in population are also shown.

Note that in this data, Forrestdale (Area 2) is included as part of the Southern River area for ease of statistical analysis.

Combined population projections for the Armadale plus Gosnells local government areas indicate a population increase from an estimated 132,143 in 1998 to 199,000 in 2026. This represents a 66,857 person increase over a 28year period.

It is possible that Perth's overall growth rate will be marginally higher than used in these base projections. If so, then Gosnells and Armadale would be beneficiaries of this higher growth rate.

A sensitivity test has been undertaken based upon an assumption of higher, earlier growth rates in these two Local government areas to demonstrate the effect of that scenario (see Attachment 'D' – Appendix 'B'). This shows the 2026 projected population increases from 199,000 to 213,000 – an additional 14,000 persons for a total of 80,859.

7.4 Development Growth

Ibecon assigned the population growth to each of Areas 1, 2, 3, and 4 for each of the five year projections from 1998 to 2026. Appendix A (Attachment 'D') shows these projections (Appendix B highlights the higher growth rate scenario). In summary, the basic projections by 2026 show the development pattern indicated in Table 7.7.

Thus, within the study area, the population is projected to comprise 29,200 persons by 2026. This compares to the capacity population of 56,350 persons. Accordingly, over the 1998 to 2026 period of 28 years it is predicted that only some 51.8% of the study area will be developed. Using the higher population growth scenario, it is anticipated that there will be a population of 38,800 persons or 68.8% of the population capacity.

7.5 Workforce

The Ibecon assessment shows the total projected population by five year intervals for the four areas. A resident workforce of 50% has been adopted by Ibecon. The adopted percentile (i.e. 50% of the resident population being employed) is based on other comparable parts of the metropolitan region. This has been applied to indicate the expected resident workforce for each of the four areas.

Local employment is assumed to be 10% of the local population (also based on comparable parts of the metropolitan region). The higher projected population growth rate scenario shows a corresponding increase in numbers in the resident workforce and local employment.

Table 7.7 – Projected Growth

Area	Projected Growth
Area 1 (Southern River)	10000 persons or 57.6% capacity
Area 2 (Forrestdale)	7500 persons or 44.4% of capacity
Area 3 (Forrestdale Lake)	No significant increase
Area 4 (Brookdale/Wungong)	11700 persons or 48.5% of capacity

7. District Structure Plan Description

The number of jobs in each of the residential areas has been based on current typical jobs as a percentage of the total population in the outer suburbs of the Perth Metropolitan Region (excluding major employment nodes such as Regional and District Centres). Although efforts are under way to encourage higher local employment in these types of suburbs/locations (i.e. liveable neighbourhoods, decentralisation), Ibecon's experience to date indicates that in other locations in Australia, these expections have not been met.

Notwithstanding this, the District Structure Plan provides opportunities for increased local jobs by incorporating commercial land uses within the commercial centres at the hub of most neighbourhoods.

7.6 Education Facilities

The Western Australian Planning Commission Policy DC 2.4 (School Sites) establishes standards for the provision of school sites within urban areas based upon the following standards:

- Primary Schools
  1 primary school for 1500 housing units.
- Secondary Schools
  1 High School per 4 or 5 primary schools.
- Private Schools
  1 private school for every 3 primary schools.
  1 private high school per 2 high schools
- TAFE
  1 TAFE site per 60-70,000 persons up to 250,000

Based upon these standards, with 22,600 dwellings the requirements to cater for the new development in the study area are:

- 12–15 Primary Schools.
- 3 High Schools.
- 4 Private Primary Schools.
- 1 or 2 Private High Schools.
- 1 TAFE site (as existing TAFE sites are located adjacent to the study area it is unlikely that any TAFE sites will be required. If required in the long term, a TAFE site may be more appropriately located within or adjoining the Armadale Strategic Regional Centre).

A breakdown of public school site requirements by area reveals the following needs:

Potential private school sites are not identified on the District Structure Plan. These sites are typically sought by providers and rezoned (on a site-by-site basis) in consultation with Local Governments.

Using the above criteria and assessment, public school sites have been shown on the District Structure Plan.

Table 7.8 – School Requirements

Area	School Requirements
Area 1 (Southern River)	3 to 4 Primary Schools + 1 High School
Area 2 (Forrestdale)	3 to 4 Primary Schools + 1 High School (additional catchment is required for a High School. e.g. F/dale Lakes
Area 3 (Forrestdale Lake)	1 Primary School
Area 4 (Brookdale/Wungong)	5 Primary Schools + 1 High School (please note that various High School catchments are adjacent to the Southern portion of the study area).

7.7 Overview of District Structure Plan Issues

Land within the District Structure Plan may be affected in any of the following ways:

7.7.1 Environmental/Conservation

The land has been identified as having conservation value, including:

- Wetland(conservation category).
- Remnant bushland (where Bush Forever or otherwise).
- Drainage or riverine feature.
- Flora or fauna.

Land identified for conservation purposes will be in addition to the normal 10 per cent Public Open Space requirements.

There are also legal or policy issues such as:

- The environmental management areas (groundwater management) for Forrestdale Lake and Balannup Lake.
- The Rural Water Protection Zone under the Metropolitan Region Scheme.
- Bush Forever.
- Environmental Protection Policy (i.e. lakes).

7.7.2 Buffers

Buffers are established around incompatible uses or activities. They include land uses such as poultry and pig farms, rubbish disposal sites, power lines, gas supply mains, contaminated sites and kennels. Each of these activities have impacts which extend beyond their immediate boundaries.

The buffers will affect the way in which adjacent land is dealt with when a change of land use or development occurs. The incompatible land uses that generate these buffers must be removed to release surrounding land for alternative activities in accordance with the District Structure Plan.

7.7.3 Public Uses

Some land is earmarked in the District Structure Plan for future public use such as high school sites, open space, drainage, regional roads and sites for public utilities. Note that the 10 per cent Public Open Space requirement within residential land is not shown on the District Structure Plan.

7.7.4 Land Use Classification

Land uses proposed within the District Structure Plan include:

- Urban.
- Industry.
- Kennels.
- Retail and other centres.
- Commercial uses.
- Rural and semi-rural uses.

7.7.5 Development Constraints

Land use classifications which provide for development do not imply land is ready for development. Infrastructure may need to be extended on a frontal basis to facilitate economic servicing or new development. Drainage, groundwater and nutrient management must be dealt with in a comprehensive manner. Roads, open space, schools and detailed design issues must be co-ordinated to ensure different owner's plans match the overall District Structure Plan objectives.

Each of the above issues needs to be addressed within an implementation strategy.

7.8 Options for Implementation

There are a number of options for implementation of the District Structure Plan which are discussed under the following headings.

7.8.1 Western Australian Planning Commission Improvement Plan

While the power to pool land and jointly plan and develop it exists under the *Metropolitan Region Town Planning Scheme Act 1959* (as an Improvement Plan), it also requires all owners to agree.

7.8.2 Local Government (Guided) Development Scheme

Extensive powers exist for local government to co-ordinate planning, development and service provision as part of a development scheme. The *Town Planning and Development Act 1928* allows local governments to adopt individual town planning schemes that seek to implement subdivision and development through co-ordination, zoning, land pooling, management and cost recovery.

Notwithstanding, local governments have, on occasion, expressed reluctance to administer such schemes due to complex, time-consuming and costly management arrangements. Often these concerns are exacerbated by increased multiple ownership and staged development.

7.8.3 Infrastructure Sharing (Local Government Scheme Provisions)

A number of provisions exist or can be introduced into local government town planning schemes to permit cost-sharing of district or regional infrastructure. These costs are generally co-ordinated as part of outline development plans. They include Council administered infrastructure generally at the time of lodging subdivision applications. This approach is becoming as comprehensive as a development scheme.

This approach is guided by the Western Australian Planning Commission's Planning Bulletin No. 18.

7.8.4 Reservation

The reservation of land under the Metropolitan Region Scheme triggers a mechanism for the acquisition and compensation of landowners where land can only be used for public purposes. A claim is triggered by the sale of the reserved land or refusal of development. Reservation under local government town planning schemes has the same purpose. However, claims for injurious affection have to be made within one year of the reservation taking effect.

In both cases, the Western Australian Planning Commission or Local Government have strict guidelines/protocols for compensating landowners and establishing land values. The Reservation approach places a financial imposition on the Western Australian Planning Commission and/or Council.

7.8.5 Subdividers Contribution

When subdividing, landowners/developers accept normal requirements for the provision of public open space, contributions to schools sites, upgrading roads, provision of drainage reserves and compensating basins. The infrastructure sharing option extends to cover additional items with the Council being responsible for co-ordinating cost sharing and acting as banker for accumulated funds.

7.8.6 Headworks

The Water Corporation is able to set drainage headworks charges at levels which enable it to build and manage drainage infrastructure.

7.8.7 Separate/Differential Rate

Local governments have the ability to establish a separate rate for a specific area which has unique considerations. Such a rate would apply to all land in the area based on land value and not related to timing of development.

7.8.8 Negotiations

Negotiated planning solutions are part of the Bush Forever implementation Strategy. This approach seeks to achieve development solutions whereby developers agree to contributions or provide additional facilities in return for zoning and subdivision.

7.8.9 Agreements

This is an agreement between owners, with voluntary arrangements among themselves, to co-ordinate the planning in a mutually agreed manner. In this approach, the owners agree to share costs and profits based upon their initial land values.

It is often difficult for all owners in an area to agree to such financial arrangements due to different marketing, servicing and development agendas.

7.8.10 District Structure Plan Provisions

In this option landowners/developers are required to submit a District Structure Plan for approval to include not only planning co-ordination but also an implementation strategy for infrastructure provisions.

7.9 Preferred Approach

The community expressed a strong desire for landowners (adversely affected by the District Structure Plan) to be fairly compensated. They also proposed that landowners who benefited by development potential should contribute to an equitable arrangement.

It is considered that these principles should underscore any implementation approach.

7.9.1 Western Australian Planning Commission

As some issues are of regional significance, the cost of these implementation issues should be the responsibility of the Western Australian Planning Commission. This specifically includes the proposed Regional Open Space and any Bush Forever areas now proposed to be included under the Metropolitan Region Scheme as Parks and Recreation. Regional roads, high school sites and larger infrastructure sites should be the responsibility of the Western Australian Planning Commission (in terms of identifying need and preferred locations).

7.9.2 Local Government

The two local governments should have the principal role in implementation of the District Structure Plan. This should include the planning and management of local infrastructure contributions and acting as banker for the infrastructure implementation.

The City of Armadale through proposed Town Planning Scheme Amendment No. 157 has progressed a range of statutory implementation mechanisms for cost sharing and preparing a co-ordinated plan. The City of Gosnells is pursuing a similar approach at Canning Vale (through an established outline development plan process).

7.9.3 Water and Rivers Commission

The Water and Rivers Commission will undertake the preparation of a detailed urban water management strategy for the study area. This strategy should involve all key agencies and be completed as a prerequisite to finalising major changes in zoning or land use within the District Structure Plan area. Note that the urban water management strategy and re-zoning processes could run concurrently. Following the

preparation and endorsement of the strategy the Commission would continue to be involved in the Technical Review Committee formed to oversee the formulation of the strategy and the implementation of it through detailed drainage and nutrient management plans undertaken as part of outline development plans.

The Commission would also continue in its advisory role with Conservation Category Wetlands, evaluation of MUC proposals and the impacts upon environmental management areas.

7.9.4 Water Corporation

As part of the Corporation's normal requirements for water supply, sewerage and main drainage, it is proposed that the Corporation declare the whole area as a main drainage area. In doing so, the Water Corporation will be able to levy drainage headworks (on new subdivided lots) to cater for the extensive main drainage network throughout the study area. The Corporation should also participate in the urban water management strategy for the area and the ongoing Technical Review Committee. The Water Corporation would then design and implement the main drain system in the area.

As is the case with Thomsons Lake (Jandakot), the headworks charge would reflect the particular costs associated with an integrated urban water management strategy for the locality. Drainage will be a critical issue requiring resolution prior to development in much of the study area.

7.9.5 Department of Environmental Protection

In addition to the Department's advisory and administrative role for the EPA, the DEP would be part of the Technical Review Committee to oversee the formulation of drainage and nutrient management strategies for the District Structure Plan area.

7.9.6 Western Power

Provision of underground electrical services throughout the study area should be costed and a uniform headworks charge imposed on new subdivision areas. This means that major infrastructure items, such as power line relocation, can be included within an upfront, uniform headworks charge for the whole area (rather than each owner's portion).

7.9.7 Landowners

Landowners wishing to develop land have a responsibility to co-ordinate the planning with adjoining landowners. A number of pre-requisites to development which the landowner should address include:

i. Removal of, or resolution of, incompatible land uses together with their buffer requirements (particularly poultry farm buffers) prior to development.

ii. Preparation of co-ordinated detailed Outline Development Plans for combined development areas.

iii. Joint ventures or arrangement with other landowners to provide comprehensive plans for development, cost sharing, co-ordinated neighbourhoods, drainage management and open space.

7.9.8 Summary

The proposed implementation of the District Structure Plan can use a variety of mechanisms. However, local government has a crucial role in the co-ordination of planning and equitable cost sharing across the study area. Armadale and Gosnells areas can be dealt with separately and it may be convenient to further subdivide these areas into smaller units (probably based on drainage catchments), for the purposes of overall management of development.

The preparation of the Urban Water Management Strategy and the establishment of

a technical review committee with representation from all agencies is a prerequisite to major development in the District Structure Plan area.

A fundamental principle proposed by this District Structure Plan is the cost sharing of facilities and infrastructure over the whole study area or larger precincts. Due to the projected time frame for development in the study area, the implementation strategy may be divided into 5 or 10 year programs for implementation.

Development is dependent upon removal of many physical and legal constraints in the area and a co-ordinated approach to servicing land. A frontal development pattern is recommended to facilitate economic and efficient development.

7.10 Vision Statement (Urban Design Objectives)

7.10.1 The Context

The study area is not a self-contained entity. Rather, it is an extension of the existing and abutting communities. While the area will be progressively developed on many fronts as extensions of existing suburbs, the District Structure Plan emphasises the creation of liveable neighbourhoods. As groups of liveable neighbourhoods are developed they will form villages or towns with a high degree of self-containment but also with good access to shared district and regional facilities in the nearby existing urban areas.

7.10.2 Inherent Image

The District Structure Plan provides a balance between securing areas of high conservation value and facilitating urban and semi-rural development to provide a variety of lifestyles.

The conservation/bushland areas establish a natural bushland theme for the study area. However, this will be in sharp contrast with the image of areas to be developed which will generally require major earthworks and drainage within a reconstructed landscape. Thus the image of the area will be a contrasting mix of natural and constructed landscapes.

Furthermore, the identity of locations within the area is diverse and will reflect urban, semi-rural, kennel and rural environments within the bushland framework.

7.10.3 Implementing the Vision

The preparation of the District Structure Plan in close consultation with the community has set an overriding vision to promote fair and equitable outcomes for all parties with transparent decision-making and responsibilities.

7.11 Objectives

The objectives and strategies for the District Structure Plan are also listed below:

i. Land Suitability

Objective

- To identify all land capable of providing a range of land uses which balances conservation and development and provides for a mix of lifestyle opportunities within the intended community.

Strategies to Achieve Objective

- Identify (through mapping and consultation) the most significant conservation areas.
- Identify (through mapping and consultation) the appropriate existing land uses.
- Develop a framework for the continuation of appropriate existing land uses.
- Identify (through consultation) an appropriate and desirable mix of land uses.
- Develop various plan options for future development and conservation areas for consideration by key players.

- Develop a framework for the implementation of the preferred plan.

ii. Infrastructure – Transport

Objective

- To provide accessible and cost-effective infrastructure which complements the natural and built environment for existing and future communities.

Strategies to Achieve Objective

- Liaise with public transport providers to discover their current plans for the area and to develop a framework for a high level of service.
- Prepare design guidelines relating to minimum service provision (i.e. cycleways, pedestrian accessways).
- Adopt Liveable Neighbourhoods design options to enable the final District Structure Plan to incorporate permeability and accessibility of transport infrastructure.
- Prepare District Structure Plan design options incorporating drainage as water features.
- Provide a design framework for the safe design of drainage features and re-use of stormwater.
- To identify land capability and conservation areas relating to drainage.

iii. Employment

Objective

- To exploit the local geographic features, resources and linkages to other areas to provide accessible, appropriate and sustainable employment opportunities.

Strategies to Achieve Objective

- Develop a range of educational facilities/opportunities within the area.
- Identify industries compatible to the area.
- Promote tourism opportunities (i.e. nature reserves).
- Reinforce self-sufficient employment centres (i.e. accessibility, linkages).
- Develop a plan to provide for all employment types (i.e. casual, self, industry, full-time, home-based).

iv. Lifestyle & Streetscape

Objective

- To develop a safe and attractive environment with a sense of identity based upon the best attributes of the existing environment, where a full range of lifestyles and employment opportunities can be accommodated.

Strategies to Achieve Objective

- Identify and retain an appropriate amount of local flora.
- Retain areas of appropriate rural use.
- Incorporate local flora species within an integrated landscape theme.
- Encourage the development of a range of employment uses.
- Provide for a range of housing types and lot sizes to allow for different lifestyles.
- Reduce car dependence by creating walkable environments.
- Passive security of the public domain.
- Provide a well-lit street network.
- Develop integrated landscaping themes.
- Provide 10 per cent public open space for passive and active recreation which is in addition to areas set aside for conservation purposes.
- Provide a range of locally available community and commercial services.
- Provide appropriate management of the public domain and community services.
- Identify current land uses that are compatible with urban development.

- Determine the most suitable locations for viable commercial and community development.

v. Conservation & Environment

Objective

- To set aside land having a high conservation value.

Strategies to Achieve Objective

- Identify (through mapping, consultation and research) the most significant conservation areas.
- Identify other areas which have been proposed for conservation and determine their likely long-term viability and costs of management.
- From the above, identify areas which should be included in the conservation estate and which should have other values enhanced.
- Provide wetland buffers to reduce impact on adjacent urbanization of nuisance insects arising from wetlands.

vi. Implementation – Including Compensation

Objective

- To implement a District Structure Plan that will provide a fair and equitable outcome for all participants.

Strategies to Achieve Objectives

- Develop a District Structure Plan that is acceptable to both the community and steering committee.
- Develop feasible solutions to infrastructure issues and their financing.
- Critique proposed land uses that may quarantine parcels of land from commercial development and/or realisation of its perceived commercial value.
- Develop a mechanism for a regulated implementation of the District Structure Plan.
- Facilitate better communication links between the community and Government and also between government departments.
- To have Government adopt the District Structure Plan and endorse the strategy for its implementation.

vii. Roles/Responsibilities/Decision-Making

Objective

- To define (as precisely as possible) the decision-making and other responsibilities of those involved in the preparation, assessment and implementation of the District Structure Plan.

Strategies to Achieve Objective

- Clearly outline the government structure of those on the project.
- Notice that the community and others are concerned about these processes and perceived bias, and take that into consideration in communicating with stakeholders.
- Find ways to manage the actual or perceived conflicts which exist between stakeholders and which predate this study.
- Identify bodies to whom community members can seek remedies (e.g. compensation, assurance of process and influence).
- Agree on an integrated response to issues from the Steering Committee and “stick to it”.
- Deliver on agreed processes and times in an accountable way.
- Notice and remove management vacuums.
- Challenge the status quo.
- Clearly define the limits of the study area.
- Deal with the previous plans and their effect on this planning process.

7.12 Development Program

Section 7.2 contains population projections for the four residential precincts which comprise the study area. These are summarized as 2026 population capacities:

- Area 1 (Southern River)
  57.6% of capacity.
- Area 2 (Forrestdale)
  44.4% of capacity.
- Area 3 (Forrestdale Lake)
  No significant increase.
- Area 4 (Brookdale/Wungong)
  48.5% of capacity.

It is not considered reasonable to set targets beyond these predictions as actual achievement will be the result of many factors beyond the influence of this District Structure Plan. However, the planning process can supply adequate zoned land and influence the release of land on a frontal basis for economies of servicing.

7.13 Employment Target

Section 7.5 noted that local employment within typical outer suburbs of the Perth Metropolitan Area is about 10 percent of the local population. This does not include jobs in major industrial and business areas. A principle of Liveable Neighbourhoods is to promote a higher resident workforce within the neighbourhood. This is also an objective of this District Structure Plan.

Accordingly, the District Structure Plan shows significant areas allocated for commercial land use at the centre of neighbourhoods and also provision for home based businesses. It is proposed to achieve a target for local employment the equivalent of 15 per cent of the resident population. This workforce comprises employment in local schools, shops and other small local neighbourhood employment activities.

7.14 Land Development

7.14.1 Land Consolidation for Development

It is not recommended to use town planning schemes or other mechanisms to force the consolidation of land for development. As noted in Section 7.9.5 landowners will need to use joint ventures and other similar arrangements to overcome difficulties associated with fragmented land ownership.

In the event that an owner does not wish to develop and as a result creates an impediment to the planning and development of adjoining lands which are proposed to be developed, mechanisms need to be in place to achieve the following:

- Enabling the landowner to continue existing enjoyment of his property.
- Transferring of those parts of the land necessary for the adjoining development by agreement or acquisition by the local government.
- Recoupment of headworks costs plus interest against the property, upon the eventual development of the land.
- Paying of costs of acquisition and construction of necessary road linkages, open space and utilities services from an Infrastructure Fund created for the area.

Local governments should be empowered to act in these matters under their schemes. Incorporating special enabling provisions in local government town planning schemes will facilitate this action.

7.14.2 Financial Arrangements

The financial arrangements require detailed evaluation through an amendment to the local government town planning schemes. The principles for such arrangements are:

- Local government town planning scheme amendments be initiated to provide for Infrastructure contributions by subdivision as a condition to be imposed by the Western Australian Planning Commission.
- Local governments are empowered to collect and manage the payment of such contributions and to act as a banker for infrastructure items and works.
- The local governments are empowered to acquire land and enter into agreements to facilitate development as noted in Section 7.12.1 and to expend funds for such purposes.
- Infrastructure within local government town planning scheme amendments should include:
  i. Public Open Space.
  ii. Community Facilities.
  iii. Regional Road upgrading.
  iv. 50% Local (existing) road upgrading.
  v. Acquisition of land for implementation of the District Structure Plan.
  vi. Payment of utility services extensions as above.
  vii. Management costs.
  viii. Such other infrastructure costs as may be necessary to implement the planning in accordance with Western Australian Planning Commission Bulletin No. 18.
- Constraints to development (i.e. poultry farms and services provided by other authorities) are not included in these infrastructure arrangements. This is on the principle that where there is an authority responsible for the specific item, then the local government should not be involved. For example, the Water Corporation retains responsibility for a main drainage scheme and Western Power should be responsible for power supply.
- Public school sites will be set aside (and acquired as necessary) through the subdivision condition process.
- All costs are paid by developers upon subdivision and landowners not developing do not incur up-front costs.
- All acquisitions shall be based upon fair market value and shall be allocated to properties in a fair and equitable manner. Resumption shall be a last resort, failing negotiated agreement.

7.15 Rezoning Recommendations

7.15.1 Metropolitan Region Scheme

Any re-zoning to Urban should occur incrementally and be cognisant of a range of factors outlined in this District Structure Plan including development within the urban front.

7.15.2 Local Government Schemes

Local government town planning schemes require the introduction of provisions to enable cost sharing of infrastructure and procedures for approval of outline development plans in accordance with this District Structure Plan.

7.16 Development Sequence

The following steps illustrate the matters to be addressed and the sequence of actions necessary for development in accordance with the District Structure Plan. Note that not all situations will be identical; this is a guide only.

- Adoption of District Structure Plan by WAPC and local governments.
- Urban Water Management Strategy
- MRS rezoning

7. District Structure Plan Description

- Local government town planning scheme amendments for procedures, infrastructure contributions, outline development plans, etc.
- Landowners prepare outline development plans and conduct detailed research and design including environmental assessment documentation, detailed drainage and nutrient management plans and Outline Development Plans. An "infrastructure provision submission" and documentation of these matters will form the basis of a request for initiation of rezoning.
- Local government initiates rezoning.
- EPA Environmental Assessment (Includes Technical Review Committee advice).
- WAPC transfers land from Urban Deferred to Urban zone.
- Local government rezoning is finalized and the Outline Development Plan approved.
- Landowner submits subdivision application.
- WAPC approves subdivision with conditions included to implement EPA/Ministerial Environmental Assessment conditions and local government implementation measures.
- Land development proceeds.

References

City of Armadale, (1999), *Town Planning Scheme Amendment No. 148*

Department of Planning and Urban Development, 1990, *Metroplan – A Planning Strategy for the Perth Metropolitan Region.*

Department of Planning and Urban Development, 1990, *Urban Expansion Policy Statement for the Perth Metropolitan Region.*

Evangeliste and Associates, Landvision and V and C Semeniuk Research Group, 1996, Water Resources Management Study, Middle Canning Catchment Stage 2 Volume 1, *Stormwater Management Plan for Forrestdale, Banjup, and Huntingdale Areas.*

Jim Davies and Associates, 1999, *Forrestdale, Southern River District Structure Plan: Hydrological Report.*

Legislative Assembly of the Parliament of Western Australia, 1994, *Select Committee Report on Metropolitan Development on Groundwater Supplies.*

Metropolitan Region Planning Government, 1978, *Planning Structure for the South East Corridor-Stage A Report.*

Muir Environmental, 1999, *Evaluation of Conservation Issues: Southern River Planning Study.*

Ove Arup and Partneers, 1995, *South East Corridor Transport Study.*

Review Group, 1987, *Planning for the Future of the Perth Metropolitan Region.*

RJ Nairn and Partners 1995, *Canning Vale and Southern River Transport Assessment.*

State Planning Commission, 1993, *Metropolitan Region Scheme Amendment (927/33).*

State Planning Commission, 1994, *South West Corridor Omnibus Amendment Stage A (938/77).*

State Planning Commission, 1992, *Jandakot Land Use and Water Management Strategy.*

State Planning Commission, 1994, *Forrestdale Industrial Study.*

Taylor and Burrell, 1995, *Structure Plan for South Armadale – Brookdale.*

Western Australian Planning Commission, 1995, *Jandakot Land Use and Water Management Strategy.*

Western Australian Planning Commission, 1995, *Statement of Planning Policy No 6 – Jandakot Groundwater Protection Policy.*

Western Australian Planning Commission, 1999, *Development Control Policy Manual.*

Western Australian Planning Commission, 1997, *Development Contributions for Infrastructure – Planning Bulletin No 18.*

Western Australian Planning Commission, 1996, *South East Corridor Omnibus Amendment No 2 (979/33)*

Western Australian Planning Commission, 1997, *Liveable Neighbourhoods Community Design Code Edition 1.*

Western Australian Planning Commission, 1998, *Bush Forever.*